



Project Manual

For construction contracts greater than \$20,000

HUB Café Renovation

SU-200002

August 30, 2019

State University of New York Purchase College
735 Anderson Hill Road
Purchase, New York 10577-1402
Eugene Harris, Economic Project Solutions, Inc.

Project Number: SU-200002 Date: August 30, 2019
 Project Name: HUB Café Renovation
 Agency/Div Code: SUNY Purchase College/28260 Contract No.: T200002

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State University of New York Construction Agreement

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4. [Form 7554-10](#) - Bid Bond and Acknowledgement (*required with bid*)
5. Affirmative Action and Minority & Women Owned Business Enterprises from *SUNY Procedure Item #7557 “Participation by Minority Group Members and Women (MWBEs) with Respect to State University of New York Contract” (applies >\$100,000)*
 - a. [Form 7557-121b](#) – MWBE Prospective Bidders Notice
 - b. [Form 7557-107](#) - M/WBE Utilization Plan (*required within seven days of the bid*)
 - c. The Contractor’s EEO Policy Statement or [Form 7557-104](#) (*required within seven days of the bid*)
 - d. [Form 7557-108](#) - M/WBE-EEO Work Plan (*required within seven days of the bid*)

Note: In accordance Procedure Item #7557 MWBE Utilization Plans, EEO policy statements and EEO Work Plans are due within seven days of submittal of the bid.

6. Service Disabled Owned Business Enterprise from *SUNY Procedure Item #7564 “Participation by Service-Disabled Veteran-Owned Business (SDVOBs) with Respect to State University of New York Contracts” (applies >\$100,000)*
 - a. [Form 7564-121b](#) – SDVOB Prospective Bidders Notice
 - b. [Form 7564-107](#) - SDVOB Utilization Plan (*required with the bid*)

Attachments –Additional Contractor Documentation (required after bid opening from the low bidder)

7. State Finance Law §§139-j and 139-k from *SUNY Procedure Item #7552 “Procurement Lobbying Procedure for State University of New York” (applies >\$15,000)*
 - a. [Form A](#) - Summary: Policy and Procedure of the State University of New York Relating to State Finance Law §§139-j and 139-k
 - b. [Form B](#) - Affirmation with respect to State Finance Law §§139-j and 139-k
 - c. [Form C](#) - Disclosure and Certification with respect to State Finance Law §§139-j and 139-k
8. Procurement Forms from *SUNY Procedure Item #7553 “Purchasing and Contracting (Procurement)*
 - [Form I](#) Omnibus Procurement Act of 1992 (*applies >\$1,000,000*)
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 - [Form XIII](#) Public Officers Law Compliance

9. Bonds and Certificate of Insurance *from SUNY Procedure Item #7554 "Construction Contracting Procedures"*
 - a. [Form 7554-11](#) Labor & Materials and Performance Bonds (*applies >\$50,000*)
 - b. [Form 7554-12](#) Certificate of Insurance (*applies to all contracts*)
 - c. NYS Workers Compensation and Disability Insurance (*applies all contracts*)
10. Vendor Responsibility
 - a. OSC's [Vendrep - Online System](#) or [Link to paper forms](#) (*form applies \geq \$100,000*)
11. NYS Labor Law, Section 220-a
 - a. [Form 7554-13](#)
 - i. Form AC 2947, Prime Contractor's Certification
 - ii. Form AC 2948, Subcontractor's Certification
 - iii. Form AC 2958, Sub-subcontractor's Certification

Notice to Bidders

The State University of New York at Purchase College will receive sealed bids clearly labeled on the exterior for project number **SU-200002** titled **Hub Café Renovation** until **1:00p.m.** local time on **Thursday, September 26th, 2019** at Purchasing and Accounts Payable Office, Administration Building, Purchase College, 735 Anderson Hill Road, Purchase New York 10577-1402, where such proposals will be publicly opened and read aloud. Proposals may be hand delivered or mailed to the above location. Bidders mailing their proposals must allow sufficient time to ensure receipt by the due date and time.

All work shall commence **immediately** upon award of contract, and completed within (95) calendar days.

A Pre-Bid Conference and site walk-through for prospective Bidders will be held at **11:00AM** on **Tuesday, September 10, 2019** at HUB Dining Facilities in Campus Center North (CCN) at Purchase College, 735 Anderson Hill Road, Purchase New York 10577-1402. Please note: This will be the only guided walk-through of the subject project facilities.

For directions to Purchase College, see
<https://www.purchase.edu/admissions/travel-and-transportation/#Directions>

For a campus map, see
<https://www.purchase.edu/live/files/220-campus-map>

Purchase College is dedicated to environmentally sustainable practices and development. In an effort to conserve resources and reduce waste, the Bidding and Contract Documents will only be available electronically in PDF format for viewing and downloading at the following website:
<https://www.purchase.edu/PurchaseMeansBusiness>

There will be a Question Period from **Tuesday, September 3rd until 3 pm Monday, September 16th**. During this time any questions must be submitted in writing (no telephone calls) to the following email address eharris@economicprojects.com. The email should reference the project in the subject line and include prospective bidder contact information and email address. A response to all questions submitted within the Question Period will be posted no later than the close of business on **Friday, September 20, 2019**.

Bids must be submitted in duplicate in accordance with the instructions contained in the Information for Bidders.

*Security will be required for each bid in an amount no less than five (5) percent of Total Bid.

It is the policy of the State of New York and the State University of New York to encourage minority business enterprise participation in this project by contractors, subcontractors and suppliers, and all bidders are expected to cooperate in implementing this policy. The minority (MBE) and women (WBE) owned business contract/subcontractor participation goals for this construction procurement are set at 22.06% for MBEs and 7.94% for WBEs.

The service disabled veteran owned business (SDVOB) subcontractor participation goal is 6%.

The rates of wages and supplements determined by the Industrial Commissioner of the State of New York as prevailing in the locality of the site at which the work will be performed can be found at:

<https://applications.labor.ny.gov/wpp/publicViewProject.do?method=showIt&id=1485387>

The Prevailing Rate Case (PRC) Number assigned to this project is 2019011358.

Pursuant to State Finance Law §§139-j and 139-k, this solicitation includes and imposes certain restrictions on communications between Purchase College and an Offeror/Bidder during the procurement process. An Offeror/Bidder is restricted from making contacts from the earliest notice of intent to solicit proposals through final award and approval of the Procurement Contract by Purchase College/State University of New York and, if applicable, the Office of the State Comptroller (“restricted period”) to other than designated staff unless it is a contact that is included among certain statutory exceptions set forth in State Finance Law §139-j(3)(a). Pursuant to the statute, Purchase College employees are also required to obtain certain information when contacted during the restricted period and maintain a record of the communication, and make a determination of a knowing and willful contact. Contact made to other than designated staff regarding this procurement may disqualify the vendor from the current award and affect future procurements with government entities in the State of New York.

Designated Contacts:

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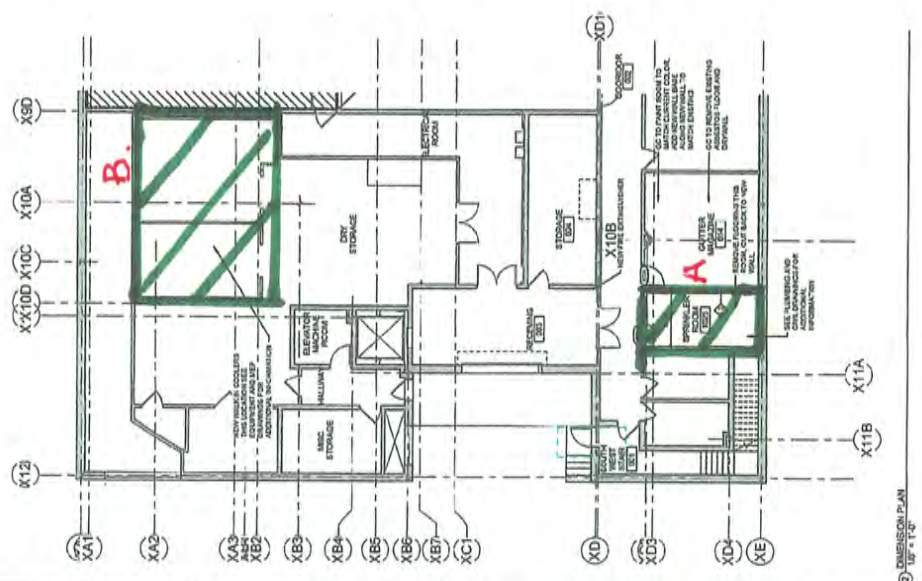
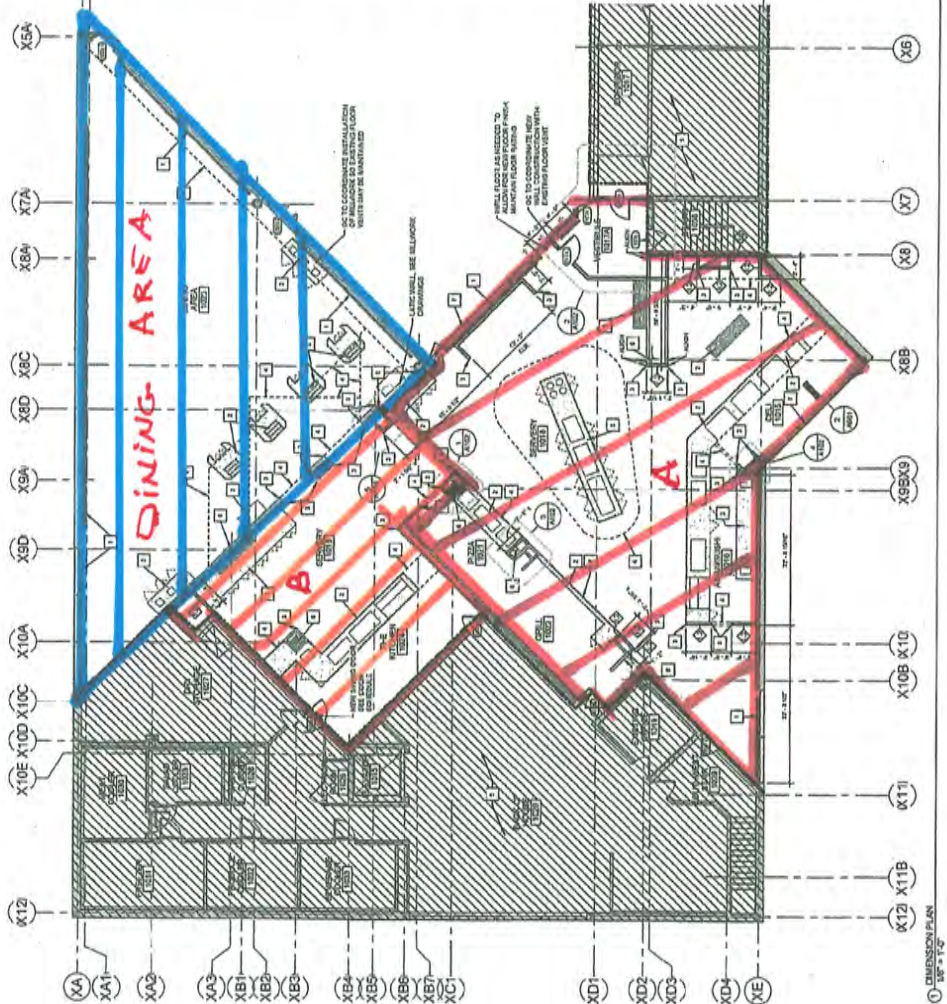
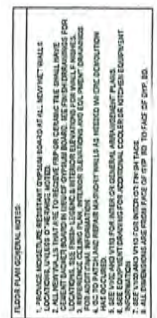
The State University of New York reserves the right to reject any or all bids.

August 30, 2019

SUNY Purchase
HUB Renovation
Phasing Plan

The intent of phasing the project is to keep dining options available to the students, faculty and staff of SUNY Purchase College.

1. The Basement Fire Sprinkler Riser Room (Green "A") has been completed and is not part of this scope.
2. The Basement Freezer/Cooler mechanical scope (Green "B") is included in this scope and should be completed in the first phase.
3. Servery area "B (Orange)" is intended to be the first area of work completed – along with the basement freezer/cooler scope.
 - a. It is intended that Servery area "A (Red)" will remain open and accessible to students, faculty and staff during this phase.
 - b. Dining Area (Blue) will remain open and accessible during this phase.
 - c. NOTE – Dining area may be subdivided for use in staging and storage by the GC during all phases as negotiated with SUNY Purchase Project Manager. Provided a minimum number of POS stations and seating is maintained for students, faculty and staff.
4. Upon completion and opening operation of Servery area "B (Orange)" – Servery Area "A (Red)" will be the next phase. Access to Servery area "B (Orange)" will need to be maintained for students, faculty and staff during this phase.
 - a. Dining Area (Blue) will remain open and accessible during this phase.
 - b. NOTE – Dining area may be subdivided for use in staging and storage by the GC during all phases as negotiated with SUNY Purchase Project Manager. Provided a minimum number of POS stations and seating is maintained for students, faculty and staff.
5. Dining Area (Blue) can be completed concurrent with other phases or post other phases provided service is maintained at all times for students, faculty and staff to include a minimal number of operating POS stations and seating.



PROPOSAL

- Mechanical Contractor
- Estimating Department
-
-
-

No.: 180327bgR2
Date: August 14, 2019
Valid for: 30 days
Fax No.:

Project: SUNY Purchase CAFE

Engineer: Innovative Engineering

Proposal: We propose to furnish and install a Siemens Industry, Inc., Building Technologies Division automatic temperature control system for the above project as follows:

Net Price: \$ 45,300.00 plus tax

Forty-five thousand three hundred and 00/100

DOLLARS

Remarks: See Scope of Work on following pages
We do not include Consequential, Liquidated or Indirect Damages
Price is based on a Tax Exempt Certificate being provided

The Terms and Conditions of Sale shown on the attached are a part hereof

Proposal Accepted:
Siemens Industry, Inc. is authorized to proceed
with the work as proposed.

Proposal Submitted:
Siemens Industry, Inc.

Purchaser _____

Seller Siemens Industry, Inc.

By _____

By Brian Greda

Title _____

Title Account Executive

Date _____

Date August 14, 2019

Brian.greda@siemens.com 973-332-0789

Siemens Industry, Inc.

8 Fernwood Road
Florham Park, NJ 07932
Tel: 973-575-6300

No.: 180327bgR2
Date: August 14, 2019
Project: SUNY Purchase CAFE

Siemens Industry, Inc.

- I. This proposal is based on the following bid documents as prepared by Innovative Engineering:
 - A. Mechanical Drawings Drawings M-100 to M-204 dated 2/16/2018
 - B. Specification Pages
 - C. Mechanical Drawings Addendum #1 3/30/18
 - D. Mechanical Drawings dated 7/26/19

- II. We include the following:
 - A. Extend existing Siemens BMS system to control and monitor the following:
 - B. Hot Water Unit Heater (2): Wiring of thermostat to heater. Power by others.
 - C. Electric Unit Heater (1): Wiring of thermostat to heater. Power by others.
 - D. Hot Water Reheat Coil (1): New Pneumatic control valve connected to thermostat for stand alone operation
 - E. Thermostats (4) – Furnish and install pneumatic thermostats and reconnect to existing Reheat Coil valve.
 - F. Interlock Pneumatic damper actuators (5) – to existing AC unit.
 - G. Control wiring of Siemens Industry, Inc. controls only including open cabling in hung ceilings, EMT in mechanical rooms.
 - H. Technical labor for system design, programming, color graphics, checkout, startup and project supervision.
 - I. Use of Siemens DDC equipment, sensors, and end devices.
 - J. One year warranty.

- III. We do not include the following (unless noted otherwise in this proposal):
 - A. Overtime
 - B. Connection to BMS system
 - C. Taxes on labor and Material
 - D. Fire Smoke damper work or interlock wiring.
 - E. Cutting, patching, and painting.
 - F. Misc wiring and power to manufacturer or 3rd party supplied equipment
 - G. Furnishing thermostats/space sensors to be wired to manufacturer's controller
 - H. Installation of valves, dampers, pipewells, flow meters and all other items under the jurisdiction of other trades.
 - I. Furnishing and installing fire/smoke, smoke, and automatic dampers.
 - J. Smoke detectors and all fire alarm related work.
 - K. Work in asbestos areas
 - L. Service and maintenance

- IV. Terms of Payment:
Net 30 days after receipt of invoice

- V. Alternate Pricing:
 - A. CHWP-1 **Add \$26,000**
 - B. If Siemens is required to provide "Per Project Aggregate Insurance" then **Add \$2,500.00**

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GENERAL TERMS AND CONDITIONS (Solutions)

Article 1: General

1.1 These General Terms and Conditions, including any supplemental terms (each a "Rider"), are attached to and made part of the Proposal or other document as the case may be including any change order, in which these General Terms and Conditions are incorporated (the "Document"), that when approved in writing by the Customer and accepted by an authorized representative of Siemens shall (a) constitute the entire, complete and exclusive contract between the parties (this "Agreement") (i) to implement the work and services identified in the Scope of Work or Proposed Solution section of the Document (collectively, the "Work") to be provided by Siemens and (ii) for the physical equipment ("Equipment"), software owned or licensable by Siemens ("Software"), any related documentation ("Related Documentation"), deliverable Instruments (as defined in Section 2.2), and Work Product Deliverables (as defined in Section 2.1) identified in the Document to be provided by Siemens under the Agreement in accordance with the performance of the Work (collectively, the "Deliverables") and (b) supersedes and cancels all prior proposals, agreements and understandings, written or oral, relating to the subject matter of this Agreement.

1.2 Neither party may assign this Agreement or any rights or obligations hereunder without the prior written consent of the other except that either party may assign this Agreement to its affiliates and Siemens may grant a security interest in the proceeds to be paid to Siemens under this Agreement; assign proceeds of this Agreement; and/or use subcontractors in performance of the Work.

1.3 The terms and conditions of this Agreement shall not be modified or rescinded except in writing signed by duly authorized officers or managers of Siemens and Customer.

1.4 In the event of conflict between the other sections of the Document and these General Terms and Conditions, these General Terms and Conditions shall control. In the event of conflict between a Rider and any section of the Document or these General Terms and Conditions, the Rider shall control. Any differing or additional terms and conditions in any purchase order or other document are of no force and effect unless specifically accepted in writing by the parties.

1.5 Nothing contained in this Agreement shall be construed to give any rights or benefits to anyone other than the Customer and Siemens without the express written consent of both parties. All provisions of this Agreement allocating responsibility or liability between the parties shall survive the completion of the Work and termination of this Agreement.

1.6 Certain terms and conditions contained herein may not apply to the Work to be provided hereunder. It is the intent of the parties, however, that the interpretation to be given to the terms and conditions is to apply all terms and conditions unless clearly inapplicable given the type of Work included.

1.7 This Agreement shall be governed by and enforced in accordance with the laws of the State of Illinois. Any litigation arising under this Agreement shall be brought in the State or Commonwealth in which the Work is provided to Customer. TO THE EXTENT PERMITTED BY LAW, THE PARTIES WAIVE ANY RIGHT TO A JURY TRIAL ON MATTERS ARISING OUT OF THIS AGREEMENT. Prior to either party initiating any action against the other party, the issues shall first be referred to each party's senior management. Senior management of each party shall take reasonable steps to resolve the matter at issue. Any permitted action may be taken if the raised issue is not resolved within fourteen (14) days of its initial referral to senior management.

1.8 If, during or within ninety (90) days after the term of this Agreement, Customer engages any Siemens employee who has performed work under this or any other agreement between Customer and Siemens, Customer shall pay Siemens an amount equal to the employee's latest annual salary.

Article 2: License and Intellectual Property

2.1 Any tangible form of a report or drawing specifically developed for, commissioned by and deliverable to the Customer in connection with Work performed by Siemens under this Agreement ("Work Product Deliverables") shall become the Customer's property upon receipt by the Customer and payment of any fees due Siemens under this Agreement. Siemens may retain file copies of such Work Product Deliverables.

2.2 If any know-how, tools and related documentation owned or licensed by Siemens and used by Siemens to install or commission Equipment and Software for operation at the Site, including but not limited to tools for installing any Software, performing diagnostics on Equipment as installed at the Site as well as any reports, notes, calculations, data, drawings, estimates, specifications, manuals, documents, all computer programs, codes and computerized materials prepared by or for Siemens and used by Siemens to provide the Work ("Instruments") are provided to the Customer under this Agreement, any such Instruments shall remain Siemens property, including the intellectual property conceived or developed by Siemens in the Instruments.

2.3 In addition, all intellectual property: (i) that has been conceived or developed by an employee or subcontractor of Siemens before Siemens performs any Work under this Agreement; (ii) that is conceived or developed by such employee or subcontractor at any time wholly independently of Siemens performing the Work under this Agreement; or, (iii) if developed while performing the Work under this Agreement, where the development of intellectual property for the benefit of the Customer is not expressly identified as an item of Work to be provided to the Customer or where such Work comprised or corresponded to an update, improvement, configuration, or modification of Equipment or Software made in the ordinary course of business solely to allow such products to interface with any software and/or equipment and/or to operate at a site specified by Customer, (collectively, "Siemens Pre-existing Intellectual Property") that may be included in scope provided to the Customer under this Agreement shall also remain Siemens' property including the Siemens Pre-existing Intellectual Property included in the Work Product Deliverables. Siemens Pre-existing Intellectual Property is also included in all reports, notes, calculations, data, drawings, estimates, specifications, manuals, documents, all computer programs, codes and computerized materials prepared by or for Siemens.

2.4 All Work Product Deliverables and any Instruments provided to the Customer are for the Customer's use and only for the purposes disclosed to Siemens. Siemens hereby grants the Customer a royalty-free (once all payments due under this Agreement are paid to Siemens), non-transferable, perpetual, nonexclusive license to use any Siemens Pre-existing Intellectual Property solely as incorporated into the Work and Deliverables

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(including Work Product Deliverables and any Instruments provided to the Customer under this Agreement). Under such license, and following agreement to be bound to confidentiality provisions under this Agreement and/or in accordance with any separate confidentiality agreement that may exist between the parties, Customer shall have a right to: (a) Use, in object code form only, the Software that is owned or licensed by Siemens or its affiliates and that is either separately deliverable for use in the Equipment or for use in a computer system owned by the Customer or delivered as firmware embedded in the Equipment ("*Software Deliverables*"); (b) Make and retain archival and emergency copies of such Software Deliverables (subject to any confidentiality provisions) except if the Software Deliverable is embedded in the Equipment; and, (c) Use all such Equipment, Work Product Deliverables, and such Instruments, provided however, the Equipment, Work Product Deliverables, and Instruments shall not be used or relied upon by any third-party, and such use shall be limited to the particular project and location for which the Work is provided.

2.5 The Customer shall not transfer the Equipment, Software, Work Product Deliverables, or Instruments to others or use them or permit them to be used for any extension of the Work or any other project or purpose, without Siemens' prior express written consent.

2.6 Any reuse of Equipment, Software, Work Product Deliverable, or such Instruments for other projects or locations without the written consent of Siemens, or use by any third party will be at the users risk and without liability to Siemens; and, the Customer shall indemnify, defend and hold Siemens harmless from any claims, losses or damages arising therefrom.

2.7 In consideration of such license, the Customer agrees not to reverse engineer any Equipment or Software to reconstruct or discover any source code, object code, firmware, underlying ideas, or algorithms of such Equipment or Software even to the extent such restriction is allowable by law.

2.8 Customer acknowledges that Siemens, in the normal conduct of its business, may use concepts, skills and know-how developed while performing other contracts. Customer acknowledges the benefit which may accrue to it though this practice, and accordingly agrees that anything in this Agreement notwithstanding, Siemens may continue, without payment of a royalty, this practice of using concepts, skills and know-how developed while performing this Agreement.

2.9 Customer acknowledges that all Facilities Data (as defined in paragraph 3.7) is owned by Siemens and may be used by Siemens in a commingled or other reasonable manner, provided that such use does not identify Customer or the location(s) of the facility or facilities to which Facilities Data pertains.

Article 3: Work by Siemens

3.1 Siemens will perform the Work expressly described in this Agreement and in any work release documents or change orders that are issued under this Agreement and signed by the parties. The Work performed by Siemens shall be conducted in a manner consistent with the degree of care and skill ordinarily exercised by reputable firms performing the same or similar work in the same locale acting under similar circumstances and conditions.

3.2 Siemens shall perform the Work during its normal working hours, Monday through Friday, excluding holidays, unless otherwise agreed herein.

3.3 Siemens is not required to conduct safety or other tests, install new devices or equipment or make modifications to any Equipment beyond the scope set forth in this Agreement. Any Customer request to change the scope or the nature of the Work must be in the form of a mutually agreed change order, effective only when executed by all parties hereto.

3.4 Siemens shall be responsible for any portion of the Work performed by any subcontractor of Siemens. Siemens shall not have any responsibility, duty or authority to direct, supervise or oversee any contractors of Customer or their work or to provide the means, methods or sequence of their work or to stop their work. Siemens' work and/or presence at a site shall not relieve others of their responsibility to Customer or to others. Siemens shall not be liable for the failure of Customer's contractors or others to fulfill their responsibilities, and Customer agrees to indemnify, hold harmless and defend Siemens against any claims arising out of such failures.

3.5 Siemens may rely on the accuracy and completeness of the information furnished by the Customer. Siemens does not represent that Siemens has made a detailed examination, audit or arithmetic verification of the documentation submitted by Customer or of other supporting data. Siemens does not represent that it has made exhaustive or continuous on-site inspections.

3.6 To the extent that Work on a Fire and Life Safety ("FLS") system is included, the entire FLS system will be tested and inspected as set forth in the National Fire Protection Association ("NFPA") guidelines 72 2013 edition (or most current edition), Chapter 14, (hereby incorporated by reference), or as otherwise may be required pursuant to the law of the applicable jurisdiction. All testing of any FLS system will be performed at the time and place and in the manner deemed appropriate by Siemens, in accordance with applicable law and the requirements of NFPA and other relevant standards. Customer will be solely responsible for, and hereby indemnifies and holds Siemens harmless from and against, any liability arising from the Customer's specification of any testing schedule other than in accordance with NFPA guidelines or other applicable standards.

3.7 In the event that a data backup or data collection product or service is part of the Work and Siemens is to store the data, Siemens will take reasonable steps to protect the security of all Facilities Data stored offsite. Siemens does not represent or warrant that Facilities Data will not be disseminated, compromised or corrupted by reason of unauthorized actions of third parties. For the purposes of these General Terms and Conditions, "Facilities Data" means electronic data that is collected or generated by Siemens through scheduled back-ups of the databases and/or graphics residing in the workstation(s) and/or field panel(s) that constitute part of Customer's automation control system.

Article 4: Responsibilities of Customer

4.1 Customer, without cost to Siemens, shall:

(a) Designate a contact person with authority to make decisions for Customer regarding the Work and provide Siemens with information sufficient to contact such person in an emergency. If such representative cannot be

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reached, any request for Work received from a person located at Customer's site will be deemed authorized by Customer, and Siemens will, in its reasonable discretion, act accordingly;

(b) Provide or arrange for reasonable access and make all provisions for Siemens to enter any site where Work is to be performed;

(c) Permit Siemens to control and/or operate all facility controls, systems, apparatus, equipment and machinery necessary to perform the Work;

(d) Furnish Siemens with all available information pertinent to the Work including but not limited to, and within ten (10) days of receipt of a written request, all required reviews and approvals (or other appropriate action) with respect to a reasonable request for information, samples, estimates, schedules, shop drawings, drawings, specifications, purchase orders, contracts, and other items submitted and/or proposed by Siemens;

(e) Obtain and furnish Siemens with all approvals, permits and consents from government authorities and others as may be required for performance of the Work except for those Siemens has expressly agreed in writing to obtain;

(f) Notify Siemens promptly of any site conditions requiring special care, and provide Siemens with any available documents describing the quantity, nature, location and extent of such conditions;

(g) Comply with all laws and provide any notices required to be given to any government authorities in connection with the Work, except such notices Siemens has expressly agreed in writing to give;

(h) Provide Siemens with Material Safety Data Sheets (MSDS) conforming to OSHA requirements related to all Hazardous Materials at the site which may impact the Work;

(i) Furnish to Siemens any contingency plans related to the site; and

(j) Furnish the specified operating environment, including without limitation, suitable, clean, stable, properly conditioned electrical power to all Equipment; telephone lines, capacity and connectivity as required by such Equipment; and heat, light, air conditioning and other utilities in accordance with the specifications for the Equipment.

4.2 Unless contrary to applicable law or regulation, Customer acknowledges that the technical and pricing information contained in this Agreement is confidential and proprietary to Siemens and agrees not to disclose it or otherwise make it available to others.

4.3 Customer acknowledges that it is now and shall be at all times in control of the Work site. Siemens shall not have any responsibility, duty or authority to direct, supervise or oversee any employees or contractors of Customer or their work or to provide the means, methods or sequence of their work or to stop their work. Siemens' Work and/or presence at a site shall not relieve others of their responsibility to Customer or to others. Except as expressly provided herein, Siemens is not responsible for the adequacy of the health, safety or security programs or precautions related to Customer's or its other contractors' activities or operations; the work of any other person or entity; or Customer's site conditions. Siemens is not responsible for inspecting, observing, reporting or correcting health or safety conditions or deficiencies of Customer or others at Customer's site. So as not to discourage Siemens from voluntarily addressing such issues, in the event Siemens does make observations, reports, suggestions or otherwise regarding such issues, Siemens shall not be liable or responsible for same.

4.4 Customer is solely responsible for any removal, replacement or refinishing of the building structure or finishes that may be required to gain access to the Work.

4.5 Customer represents and warrants that it will not use workstations or field panels that constitute parts of its automation control for electronic storage of any Personally Identifiable Information. For the purposes of these Terms and Conditions, "Personally Identifiable Information" means any personal information that relates to, describes, or is capable of being associated with, a particular individual. By way of example and not of limitation, Personally Identifiable Information includes an individual's first name or first initial and last name, plus one or more of the following: social security number, health insurance identification number, medical information, insurance policy number, passport number, taxpayer identification number, account number, credit card number or any other financial information.

4.6 SIEMENS HEREBY DISCLAIMS ANY AND ALL LIABILITY FOR DAMAGES, INJURY OR LOSS ARISING OUT OF DISCLOSURE OR DISSEMINATION OF PERSONALLY IDENTIFIABLE INFORMATION THAT WAS STORED IN VIOLATION OF PARAGRAPH 4.5 OF THIS ARTICLE.

4.7 To the extent permitted by law, Customer shall indemnify, defend and hold Siemens harmless from any claims, losses or damages arising out of disclosure or dissemination of Personally Identifiable Information that was stored in violation of paragraph 4.5 of this Article.

Article 5: Compensation

5.1 Siemens shall be compensated for the Work at its prevailing rates and reimbursed for costs and expenses (plus reasonable profit and overhead) incurred in its performance of the Work. All other work, including but not limited to the following, shall be separately billed or surcharged on a time and materials basis: (a) emergency work performed at Customer's request, if inspection does not reveal any deficiency covered by the Agreement; (b) work performed other than during Siemens' normal working hours; and, (c) work performed on equipment not covered by the Agreement.

5.2 Siemens may invoice Customer on a monthly or other progress billing basis. Invoices are due and payable upon receipt or as otherwise set forth in the Agreement. If any payment is not received when due, Siemens may deem Customer to be in breach hereof and may enforce any remedies available to it hereunder or at law, including without limitation, acceleration of payments and suspension or termination of the Work at any time and without notice and shall be entitled to compensation for the Work previously performed and for costs reasonably incurred in connection with the suspension or termination. In the event any payment due hereunder is not made when due, the Customer agrees to pay, on demand, as a late charge, one and one-half percent (1.5%) of the amount of the payment per month, limited by the maximum rate permitted by law, of each overdue amount (including accelerated balances) under the Agreement. Customer shall reimburse Siemens for Siemens' costs and expenses (including reasonable attorneys' and witnesses' fees) incurred for collection under this Agreement. In the

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event of a dispute by Customer regarding any portion or all of an invoiced amount, it shall notify Siemens in writing of the amount in dispute and the reason for its disagreement within 21 days of receipt of the invoice, the undisputed portion shall be paid when due, and interest on the disputed, unpaid portion shall accrue as aforesaid, from the date due until the date of payment, to the extent that such amounts are finally determined to be payable to Siemens.

5.3 Except to the extent expressly agreed in writing, Siemens' fees do not include any taxes, excises, fees, duties or other government charges related to the Work, and Customer shall pay such amounts or reimburse Siemens for any amounts it pays. If Customer claims a tax exemption or direct payment permit, it shall provide Siemens with a valid exemption certificate or permit and indemnify, defend and hold Siemens harmless from any taxes, costs and penalties arising out of same.

Article 6: Changes; Delays; Excused Performance

6.1 As the Work is performed, conditions may change or circumstances outside Siemens' reasonable control (such as changes of law) may develop which require Siemens to expend additional costs, effort or time to complete the Work, in which case Siemens shall notify Customer and an equitable adjustment made to the compensation and time for performance. In the event conditions or circumstances require the Work to be suspended or terminated, Siemens shall be compensated for the Work performed and for costs reasonable incurred in connection with the suspension or termination.

6.2 Siemens shall not be responsible for loss, delay, injury, damage or failure of performance that may be caused by circumstances beyond its control, including but not limited to acts or omissions by Customer or its employees, agents or contractors, Acts of God, war, terrorism, civil commotion, acts or omissions of government authorities, fire, theft, corrosion, flood, water damage, lightning, freeze-ups, computer viruses, program or system hackers, strikes, lockouts, differences with workmen, riots, explosions, quarantine restrictions, delays in transportation, or shortage of vehicles, fuel, labor or materials. In the event of any such circumstances, Siemens shall be excused from performance of the Work and the time for performance shall be extended by a period equal to the time lost plus a reasonable recovery period and the compensation equitably adjusted to compensate for additional costs Siemens incurs due to such circumstances.

Article 7: Warranty; Disclaimers; Insurance; Allocation of Risk

7.1 (a) Until one year from either the date the Equipment is installed or the date of first beneficial use, whichever first occurs, all Equipment manufactured by Siemens or bearing its nameplate will be free from defects in material and workmanship arising from normal use and service.

(b) Labor for all Work under this Agreement is warranted to be free from defects for one year after the earlier of the date the Work is substantially completed or the date of first beneficial use.

(c) To the extent that Software is a Deliverable as part of the Work for use in the Equipment or in a computer owned by the Customer, Customer agrees to take delivery of any such Software subject to (i) any applicable Siemens or third party end-user license agreement ("EULA") accompanying such Software, or (ii), if no EULA accompanies such Software, the EULA posted at www.usa.siemens.com/btcpseula (Siemens' EULA web site) for such Software used in or with the Equipment identified by product model or part number on the Siemens EULA web site. Such Software shall be warranted in accordance with its applicable EULA unless an exception is explicitly identified in the Document under this Agreement. For all other Equipment, Siemens hereby assigns to Customer, without recourse, any and all assignable warranties available from any manufacturer or supplier of such Equipment and such Software and will assist Customer in enforcement of such assigned warranties.

7.2 (a) The limited warranties set forth in Section 7.1 will be void as to, and shall not apply to, any Work, Equipment or Software (i) repaired, altered or improperly installed by any person other than Siemens or its authorized representative; (ii) Equipment subjected to unreasonable or improper use or storage, used beyond rated conditions, operated other than per Siemens' or the manufacturer's instructions, or otherwise subjected to improper maintenance, negligence or accident; (iii) damaged because of any use of the Work after Customer has, or should have, knowledge of any defect in the Work; or (iv) Equipment not manufactured, fabricated and assembled by Siemens or not bearing Siemens' nameplate. However, Siemens assigns to Customer, without recourse, any and all assignable warranties available from any manufacturer, supplier, or subcontractor of such Equipment and will assist Customer in enforcement of such assigned warranties.

(b) Any claim under the limited warranty granted above must be made in writing to Siemens within thirty (30) days after discovery of the claimed defect unless discovered directly by Siemens. Such limited warranty only extends to Customer and not to any subsequent owner of the Equipment. Customer's sole and exclusive remedy for any Work not conforming with this limited warranty is limited to, at Siemens' option, (i) repair or replacement of defective components of covered Equipment, or (ii) reperformance of the defective portion of the Work.

(c) Siemens shall not be required to repair or replace more than the component(s) of the Equipment actually found to be defective. Siemens' warranty liability shall not exceed the purchase price of such component(s). Repaired or replaced Equipment will be warranted hereunder only for the remaining portion of the original warranty period.

7.3 THE EXPRESS LIMITED WARRANTIES PROVIDED ABOVE ARE IN LIEU OF AND EXCLUDE ALL OTHER WARRANTIES, STATUTORY, EXPRESS, OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, QUALITY, CAPACITY OR WORKMANSHIP, ALL EXPRESS OR IMPLIED WARRANTIES AGAINST THIRD PARTY INTELLECTUAL PROPERTY ("IP") INFRINGEMENTS (INCLUDING PATENT, COPYRIGHT AND OTHER REGISTERED OR UNREGISTERED THIRD PARTY IP RIGHTS) OR DEFECTS, WHETHER HIDDEN OR APPARENT, AND EXPRESS OR IMPLIED WARRANTIES WITH RESPECT TO COMPLIANCE OF THE EQUIPMENT AND DELIVERABLES WITH THE REQUIREMENTS OF ANY LAW, REGULATION, SPECIFICATION OR CONTRACT RELATIVE THERETO, WHICH ARE HEREBY EXPRESSLY DISCLAIMED. SIEMENS MAKES NO WARRANTY, EXPRESS OR IMPLIED, THAT ANY EQUIPMENT PROVIDED HEREUNDER WILL PREVENT ANY LOSS, OR WILL IN ALL CASES PROVIDE THE PROTECTION FOR WHICH IT IS INSTALLED OR

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INTENDED. The limited express warranties and representation set forth in this Agreement may only be modified or supplemented in a writing signed by a duly authorized signatory of Siemens.

7.4 Siemens shall maintain the following insurance while performing the Work:

Workers' Compensation	Statutory
Employers' Liability	\$1,000,000 each accident
Commercial General Liability	\$1,000,000 per occurrence and \$5,000,000 in the aggregate
Automobile Liability	\$1,000,000 per occurrence/aggregate

7.5 Risk of loss of materials and Equipment furnished by Siemens shall pass to Customer upon delivery to Customer's premises, and Customer shall be responsible for protecting and insuring them against theft and damage.

7.6 WITH RESPECT TO ANY LIABILITY (WARRANTY OR OTHERWISE) THAT SIEMENS MAY HAVE UNDER THIS AGREEMENT, IN NO EVENT SHALL SIEMENS BE LIABLE (INCLUDING WITHOUT LIMITATION, UNDER ANY THEORY IN TORTS) FOR ANY LOSS OF USE, REVENUE, ANTICIPATED PROFITS OR SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES (INCLUDING WITHOUT LIMITATION LOST PROFITS AND/OR LOST BUSINESS OPPORTUNITIES) ARISING OUT OF OR IN CONNECTION WITH THIS AGREEMENT OR THE WORK WHETHER ARISING IN WARRANTY, TORT, CONTRACT, STRICT LIABILITY, OR ANY OTHER THEORY OF LIABILITY, WHETHER, FOR WARRANTY, LATE OR NON-DELIVERY OF ANY WORK, AND WHETHER SIEMENS HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. Siemens reserves the right to control the defense and settlement of any claim for which Siemens has an obligation to indemnify hereunder.

7.7 It is understood and agreed by and between the parties that Siemens is not an insurer and this Agreement is not intended to be an insurance policy or a substitute for an insurance policy. Pricing for the Work is based solely upon the value of the Work provided hereunder, and are unrelated to the value of Customer's property or the property of others on Customer's premises. Accordingly, Siemens' aggregate liability for any and all claims, losses or expenses (including attorneys fees) arising out of this Agreement, or out of any Work or goods furnished under this Agreement, whether based in contract, negligence, strict liability, agency, warranty, trespass, indemnity or any other theory of liability, shall be limited to the lesser of \$1,000,000 or the total compensation received by Siemens from Customer under this Agreement; EXCEPT FOR SUCH CLAIMS, LOSSES OR EXPENSES ARISING FROM, OR CAUSED BY, THE FAILURE OF A SIEMENS INSTALLED FLS SYSTEM TO OPERATE PROPERLY. IN SUCH EVENT, CUSTOMER'S SOLE REMEDY FOR A DEFECTIVE NON-CONFORMING FLS SYSTEM PROVIDED HEREUNDER SHALL BE IN ACCORDANCE WITH THE WARRANTY TERMS CONTAINED HEREIN.

7.8 The parties acknowledge that the price which Siemens has agreed to perform its Work and obligations under this Agreement is calculated based upon the foregoing limitations of liability, and that Siemens has expressly relied on, and would not have entered into this Agreement but for such limitations of liability.

Article 8: Hazardous Materials Provisions

8.1 The Work does not include directly or indirectly performing or arranging for the detection, monitoring, handling, storage, removal, transportation, disposal or treatment of Oil or Hazardous Materials. Except as disclosed pursuant to Section 8.3, Customer represents that there is no asbestos or any other hazardous or toxic materials, as defined in the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended, the regulations promulgated thereunder, and other applicable federal, state or local law ("*Hazardous Materials*"), present at Customer's locations where Work is performed. Siemens will notify Customer immediately if it discovers or suspects the presence of any Hazardous Material. All Work has been priced and agreed to by Siemens in reliance on Customer's representations as set forth in this Section 8.1. The presence of Hazardous Materials constitutes a change in the Proposed Solution equivalent to a change order whose terms must be agreed to by Siemens before its obligations hereunder will continue.

8.2 Customer shall be solely responsible for testing, abating, encapsulating, removing, remediating or neutralizing such Hazardous Materials, and for the costs thereof. Even if an appropriate change order has been entered into pursuant to Section 8.1 above, Siemens will continue to have the right to stop the Work until the job site is free from Hazardous Materials. In such event, Siemens will receive an equitable extension of time to complete its Work, and compensation for delays caused by Hazardous Materials remediation. In no event shall Siemens be required or construed to take title, ownership or responsibility for such Oil or Hazardous Materials. Customer shall sign any required waste manifests in conformance with all government regulations, listing Customer as the generator of the waste.

8.3 Customer warrants that, prior to the execution of the Agreement, it has notified Siemens in writing of any and all Hazardous Materials present, potentially present or likely to become present at Customer's locations and has provided a copy of any jobsite safety policies, including but not limited to lock-out and tag procedures, laboratory procedures, chemical hygiene plan, material safety data sheets or other items covered or required to be disclosed or maintained by federal, state, or local laws, regulations or ordinances.

8.4 For separate consideration of \$10 and other good and valuable consideration, the receipt and adequacy of which are hereby acknowledge, Customer shall indemnify, defend and hold Siemens harmless from and against any damages, losses, costs, liabilities or expenses (including attorneys' fees) arising out of any Oil or Hazardous Materials or from Customer's breach of, or failure to perform its obligations under, Sections 8.1, 8.2 or 8.3.

Article 9: Import / Export Indemnity

9.1 Customer acknowledges that Siemens is required to comply with applicable export laws and regulations relating to the sale, exportation, transfer, assignment, disposal and usage of the Work or Equipment or services provided under the Contract, including any export license requirements. Customer agrees that such Work or Equipment or Software shall not at any time directly or indirectly be used, exported, sold, transferred, assigned or otherwise disposed of in a manner which will result in non-compliance with such

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Tel: 973-575-6300

GENERAL TERMS AND CONDITIONS (Solutions)

applicable export laws and regulations. It shall be a condition of the continuing performance by Siemens of its obligations hereunder that compliance with such export laws and regulations be maintained at all times. CUSTOMER AGREES TO INDEMNIFY AND HOLD SIEMENS HARMLESS FROM ANY AND ALL COSTS, LIABILITIES, PENALTIES, SANCTIONS AND FINES RELATED TO NON-COMPLIANCE WITH APPLICABLE EXPORT LAWS AND REGULATIONS.

Article 10: Small Business Concern

SIEMENS shall adhere to FAR 52.219-8 regarding the "Utilization of Small Business Concerns", as part of its Commercial Small Business Subcontracting Agreement with the federal government. SIEMENS' policy is to offer small business concerns, including small disadvantaged businesses, women owned small-businesses, HUBZone small businesses, veteran owned small businesses and service disabled veteran owned small businesses, the "maximum practical opportunity" to participate in performing contracts let by any commercial entity, local government or federal agency, including subcontracts for subsystems, assemblies, components, and related services for major systems.

Siemens Industry, Inc.

8 Fernwood Road
Florham Park, NJ 07932
Tel: 973-575-6300

INFORMATION FOR BIDDERS

Section 1 Definitions

All definitions set forth in the Agreement are applicable to the Notice to Bidders, Information for Bidders and the Proposal, all of which documents are hereinafter referred to as the Bidding Documents.

Section 2 Issuance of Bidding and Contract Documents

- (1) Purchase College is dedicated to environmentally sustainable development. In an effort to conserve resources and reduce waste, the Bidding and Contract Documents will only be available electronically in PDF format for viewing and downloading at the following website:
<https://www.purchase.edu/purchasemeansbusiness>

Section 3 Proposals

- (1) Proposals must be submitted in duplicate on the forms provided by the University. They shall be addressed to the University in a sealed envelope, marked with the name and address of the bidder, the title of the Project and the Project number. The University accepts no responsibility for Proposals that may be delivered by any courier or other messenger service that does not contain all of the above-noted information on the outside of a sealed envelope. Facsimile or email copies of the Proposal will not be accepted.

Sealed Proposals are to be delivered to:

Elizabeth Pleva
Associate Director, Contract and Procurement Services
Purchase College – 3rd Floor Campus Center South
State University of New York
735 Anderson Hill Road
Purchase, NY 10577-1402

Proposals must be received in the Purchasing & Accounts Payable Office by the due date and time. Bidders mailing their Proposals must allow sufficient time to ensure receipt of their Proposals by the date and time specified. Bidders are cautioned that, although using a trackable mailing/courier/messenger service, bids must be received in the Purchasing & Accounts Payable Office by the due date and time. Although bids may be signed for by Purchase College Mail Operations personnel prior to bid opening time on the day of the bid, this does not guarantee that the Purchasing & Accounts Payable Office will receive the bid by bid opening time. No bid will be considered that is not physically received in the Purchase College Purchasing & Accounts Payable Office by the bid opening time.

- (2) All blank spaces in the Proposal must be filled in and, except as otherwise expressly provided in the Bidding Documents; no change is to be made in the phraseology of the Proposal or in the items mentioned therein.
- (3) Proposals that are illegible or that contains omissions, alterations, additions or items not called for in the Bidding Documents may be rejected as informal. In the event any bidder modifies, limits or restricts all or any part of its Proposal in a manner other than that expressly provided for in the Bidding Documents, its Proposal may be rejected as informal.

- (4) Any Proposal may be considered informal which does not contain prices in words and figures in all of the spaces provided or which is not accompanied by a bid security in proper form. In case any price shown in words and its equivalent shown in figures do not agree, the written words shall be binding upon the bidder. In case of a discrepancy in the prices contained in the Proposal forms submitted in duplicate by the bidder, the Proposal form which contains the lower bid shall be deemed the bid of the bidder; provided, however, the University at its election may consider the Proposal of such bidder informal.
- (5) If the Proposal is made by a corporation, the names and places of residence of the president, secretary and treasurer shall be given. If by a partnership, the names and places of residence of the partners shall be given. If by a joint venture, the names and addresses of the members of the joint venture shall be given. If by an individual, the name and place of residence shall be given.
- (6) No Proposal will be considered which has not been deposited with the University at the location designated in and prior to the time of opening of bids designated in the Bidding and Contract Documents or prior to the time of opening as extended by Addendum.
- (7) Bids may be modified, withdrawn or canceled only in writing or by email notice received by the University prior to the time of opening of bids designated in the Bidding and Contract Documents. A written or email notice of modification, withdrawal or cancellation shall be marked by the bidder with the name and address of the bidder, the title of the Project and the Project number. Upon receipt by the University a duly authorized employee of the University, who shall note thereon the date and time of receipt and shall thereupon attach said written or email notice of modification, withdrawal or cancellation to the envelope submitted by the bidder pursuant to subdivision (1) of this
- (8) Permission will not be given to modify, explain, withdraw or cancel any Proposal or part thereof after the time designated in the Bidding and Contract Documents for the opening of bids, unless such modification, explanation, withdrawal or cancellation is permitted by law and the University is of the opinion that it is in the public interest to permit the same.

Section 4 Examination of Bidding and Contract Documents

- (1) Prospective bidders shall examine the Bidding and Contract Documents carefully and, before bidding, shall make written request to the Consultant (with a copy thereof to the University) for an interpretation or correction of any ambiguity, inconsistency or error therein which should be discovered by a reasonably prudent bidder. Such interpretation or correction as well as any additional Contract provision the University shall decide to include will be issued in writing by the Consultant as an Addendum, which will be sent to each person recorded as having received a copy of the Bidding and Contract Documents from the Consultant, and which also will be available at the places where the Bidding and Contract Documents are available for inspection by prospective bidders. Upon such emailing or delivery and making available for inspection, such Addendum will become a part of the Bidding and Contract Documents and will be binding on all bidders whether or not the bidder receives or acknowledges the actual notice of it. Prospective bidders are responsible for ensuring that all addenda have been incorporated into the bid. The requirements contained in all Bidding and Contract Documents shall apply to all Addenda.
- (2) Only the written interpretation or correction so given by Addendum shall be binding. Prospective bidders are warned that no trustee, officer, agent or employee of the University or the Consultant

is authorized to explain or interpret the Bidding and Contract Documents by any other method, and any such explanation or interpretation, if given, must not be relied upon.

Section 5 Computation of Bid

- (1) In computing their bids, bidders are not to include the sales and compensating use taxes of the State of New York or of any city and county in the State of New York for any supplies or materials which are incorporated into the completed Project as the University is exempt from such taxes.
- (2) Unit prices may be inserted in the Proposal by the University or the bidder at the discretion of the University. Any unit prices listed in the Proposal by the University are based upon the Consultant's appraisal of a fair cost for the work involved. Such listed prices will be binding upon both the bidder and the University unless the bidder wishes to change any of such unit prices by crossing out the listed unit price and inserting a revised unit price. Such revised unit price shall not be binding upon the University unless it accepts the same, in writing, before it issues a Notice of Award. In the event the Proposal contains blank spaces for unit prices or the bidder revises any stated unit price, the amount of such unit prices for additions shall not vary by more than 15 percent from the prices inserted by the bidder for deductions, and, if the variance of such prices exceeds 15 percent, the University may adjust the deduction price inserted by the bidder so that it is only 15 percent lower than the addition price inserted by the bidder. In addition, the University may adjust any unit price filled in by a bidder to an amount agreeable to both the bidder and the University or it may reject any unit prices.
- (3) Alternates, if any, listed in the Proposal shall be accepted in the order indicated and will be used in combination with the Base Bid to determine the low bidder. Unit prices will not be used to determine the low bidder.
- (4) If a tie bid should occur the University reserves the right to use one of the following methods to determine the successful bidder. For tie bids between two contractors the University representative shall flip a coin, both affected contractors must be present for the coin toss. For tie bids between three or more contractors the University representative shall pull names from a bowl, hat or other container. The affected contractors must be present for the drawing.

Section 6 Payment of Bid Security

- (1) Each Proposal must be accompanied by the required amount of the bid security, which is 5% or the full and just sum of the difference between the Principal and the Total Bid of the bidders submitting the next lowest bid, whichever sum is higher, in the form of a bank draft or certified check, payable at sight to the University and drawn on a bank authorized to do business in the United States, or by a Bid Bond, on a form approved by the University, duly executed by the bidder as principal and having as surety thereon a surety company or companies, approved by the University, authorized to do business in the State of New York as a surety. Attorneys-in-fact who execute a Bid Bond on behalf of a surety must affix thereto a certified and effectively dated copy of their power of attorney.
- (2) The University will return, without interest, bid securities in accordance with the following procedure:
 - a. To all bidders except the apparent three (3) lowest bidders within two (2) working days after the opening of bids.
 - b. To any bidder submitting a Bid Bond as a replacement for a previously provided bank draft

- or certified check, within two (2) working days after the University's approval of such Bid Bond.
- c. To the apparent three (3) lowest bidders, unless their bid security was previously returned, within two (2) working days after delivery to the University by the successful bidder of the executed Agreement and required Bonds, or within two (2) working days of the University's rejection of all bids or within two (2) working days after the expiration of forty-five (45) calendar days after the bid opening, whichever event shall occur first.
 - d. Bid Bonds, due to their nature, will not be returned.
- (3) The University reserves the right to deposit bid security drafts or checks pending final disposal of them.

Section 7 Qualifications of Bidders

- (1) A bidder must demonstrate, to the satisfaction of the University, that it has successfully completed three (3) contracts similar in size, scope and complexity to this contract within the last five (5) years.
 - a. For scope and complexity, similar work is defined as **general contractor, site work, masonry, metals/steel, carpentry, thermal protection waterproofing, window and doors, drywall, flooring, painting, fireproofing, plumbing, mechanical, HVAC, electrical work**, of as further described in the General Requirements, Description of Work.
 - b. The determination of relevant contract experience in terms of size, scope and complexity will be at the sole discretion of the University.
 - c. The above three projects shall be submitted on Attachment A of the Proposal (Form 7554-07), "List of Completed Similar Construction Projects" (the List). If the List is not provided or is missing information, and/or is found to have erroneous information or information that is no longer current, a Proposal may be rejected as not responsive. If requested by the University, the bidder may be permitted to add missing information, modify and/or explain erroneous information or information that is no longer current on the List. Modifications and/or explanations of the List must be received within 48 hours of receipt of the University's request.
- (2) All prospective bidders must demonstrate to the satisfaction of the University that they have the skill and experience, as well as the necessary facilities, ample financial resources, ability to manage staff and subcontractors effectively, ability to anticipate and plan construction work for optimal progress, ability to create, strive for and maintain working environments and relationships that are constructive, communicative and cooperative, organization and general reliability to do the work to be performed under the provisions of the Contract in a satisfactory manner and within the time specified.
- (3) Each bidder must demonstrate to the satisfaction of the University that it has working capital available for the Project upon which it is bidding in an amount equal to 15 percent of the first \$100,000 of the amount of its Base Bid plus 10 percent of the next \$900,000 plus 5 percent of the remainder of its Base Bid. Working capital is defined as the excess of current assets over current liabilities. The University defines current assets as assets which can be reasonably expected to be

converted into cash within a year, and current liabilities as debts which will have to be paid within a year.

- (4). The University may make such investigation as the University deems necessary to determine the ability of any bidder to perform the Work. Bidders shall furnish to the University all information and data required by the University, including complete financial data, within the time and in the form and manner required by the University. The University reserves the right to reject any bid if the evidence submitted by or an investigation of such bidder fails to satisfy the University that such bidder is properly qualified to carry out its obligations of the contract and to complete the work contemplated therein. Conditional bids will not be accepted.
- (5) At the time of the bid opening, all bidders and subcontractors, domestic and foreign, must be in compliance with New York State business registration requirements. Contact the NYS Department of State regarding compliance.

Section 8 Submission of Post-Bid Information

- (1) Within forty-eight (48) hours after the opening of bids, each of the apparent three lowest bidders, unless otherwise directed by the University or otherwise provided in the Bidding and Contract Documents, shall submit to both the University and the Consultant:
 - a. Evidence of a completed New York State Uniform Contracting Questionnaire (Vendor Responsibility Questionnaire For-Profit Construction (CCA-2)). Either email confirmation that the bidder's CCA-2 is current and certified in the New York State VendRep System (VendRep) within the last six months from the bid date, or deliver a certified paper format CCA-2, including all attachments, to the University.

The University recommends that vendors file the required CCA-2 online via the VendRep. To enroll in and use the VendRep, see the VendRep Instructions at http://www.osc.state.ny.us/vendrep/vendor_index.htm or go directly to the VendRep online at <https://portal.osc.state.ny.us>. To request assistance, contact the Office of the State Comptroller's ("OSC") Help Desk at 866-370-4672 or 518- 408-4672 or by email at ciohelpdesk@osc.state.ny.us.

The paper format CCA-2 and accompanying definitions are available on the OSC website at the following location:

http://www.osc.state.ny.us/vendrep/forms_vendor.htm

- b. A working plan and schedule showing clearly, in sequence and time-scale, all significant activities of the work. The working plan and schedule shall be in the form of suitable charts, diagrams or bar graphs and shall be based on the Contractor's logic and time estimates for the anticipated time of commencement and completion of the work and its significant phases and activities and the interrelationship between such significant activities and other items pertinent to the work. This requirement is in addition to and not a substitute for the schedule requirements of section 3.02 (Time Progress Schedule) of the Agreement. Although the working plan and schedule submitted shall not be used in determining the lowest responsible bidder, failure to submit the working plan and schedule may result in the rejection of the Proposal as not responsive. A preliminary Phasing Plan for the scopes of work is included in the bid documents

- c. The names and addresses of the bidder's proposed subcontractor for the Asbestos Abatement work of any value, and proposed subcontractors for Electrical Work, the Heating, Ventilating and Air-Conditioning Work and the Plumbing Work for each of said work categories valued at \$100,000 or more.
- i. For each proposed subcontractor named, provide a completed "List of Completed Similar Construction Projects (the List)." If the List is not provided or is missing information, and/or is found to have erroneous information or information that is no longer current, a proposed subcontractor may be rejected. If requested by the University, the bidder may be permitted to add missing information, modify and/or explain erroneous information or information that is no longer current on the List; modifications and/or explanations of the List must be received promptly after receipt of the University's request.
 - ii. Only one proposed subcontractor should be named for each of such trades. Proposed subcontractors of the bidder may not be changed except with the specific written approval of the University.
 - iii. The naming of the bidder itself for any of such work is not acceptable and may result in rejection of the bidder unless the bidder can demonstrate to the University that it has successfully completed or substantially completed three (3) contracts similar in size, scope and complexity for the designated work within the last five (5) years. The determination of relevant contract experience in terms of size, scope and complexity will be at the sole discretion of the University.
 - iv. The bidder will be required to establish, to the satisfaction of the Consultant and the University, the reliability and responsibility of each of their said proposed subcontractors to furnish and perform the work described in the sections of the Specifications pertaining to each of such proposed subcontractors' respective trades. By submission of the "List of Completed Similar Construction Projects," a proposed subcontractor must be able to demonstrate that they have successfully completed or substantially completed three (3) contracts similar in size, scope and complexity for the designated work within the last five (5) years. The determination of relevant contract experience in terms of size, scope and complexity will be at the sole discretion of the University.
 - v. For each of the proposed subcontractors, the bidders must submit to the University, within seven (7) calendar days after the bid opening, evidence of a completed New York State Uniform Contracting Questionnaire (Vendor Responsibility Questionnaire For-Profit Construction (CCA-2)). Either email confirmation that the subcontractor's CCA-2 is current and certified in the New York State VendRep System (VendRep) within the last six months from the bid date, or deliver a certified paper format CCA-2, including all attachments, to the University.
 - vi. In the event that the University and the Consultant reject any of said proposed subcontractors, the bidder, within two (2) working days after receipt of notification of such rejection, shall again submit to the University and the Consultant the name of another proposed subcontractor in place of the one rejected and it will be required to establish to the satisfaction of the University and the Consultant the reliability and responsibility of said proposed subcontractor; When naming another proposed subcontractor, the bidder must promptly submit the proposed subcontractor's

completed "List of Completed Similar Construction Projects" and their completed CCA-2.

- vii. The bidder will not be permitted to submit another proposed subcontractor if it designated itself for any of the aforesaid categories of work.
 - viii. Proposed subcontractors of the bidder, approved by the University and the Consultant, must be used on the work for which they were proposed and approved and they may not be changed except with the specific written approval of the University.
 - d. A breakdown of the amount of the bidder's Proposal. Such breakdown shall be prepared in accordance with industry standards. No bidder shall be barred from revising, in the Contract breakdown required under the provisions of Section 4.08 of the Agreement, the various amounts listed in the bid breakdown required under the provisions of this Section. The amount set forth in said bid breakdown will not be considered as fixing the basis for additions to or deductions from the Contract consideration.
- (2) Except for Contracts of \$100,000 or less, within seven (7) calendar days after the opening of bids, unless otherwise directed by the University, the three low bidders shall submit to the University for its approval, a Minority and Women-owned Business Enterprise Utilization Plan (Form 7557-107).
- (3) Except for contracts of \$100,000 or less, within seven (7) calendar days after the opening of bids, the three low bidders shall submit to the University for its approval, an Equal Employment Opportunity Statement and EEO Plan (Form 7557-105) to ensure equal employment opportunities without discrimination because of race, creed, color, sex or national origin. Such Statement and plan should demonstrate the bidder's intent to comply with the provisions of Article VI of the Agreement. The EEO plan should include the methods that the bidder will use to address nondiscrimination and affirmative action so that minorities and women will be included in the work force. The Equal Employment Opportunity ("EEO") Policy Statement that shall contain, but not necessarily be limited to, a provision that the bidder, as a precondition to entering into a valid and binding Contract with the University, shall during the performance of the Contract, agree to the following:
- a. It will not discriminate against any employee or applicant for employment because of race, creed, color, national origin, sex, age, disability or marital status, will undertake or continue existing programs of affirmative action to ensure that minority group membership and women are afforded equal employment opportunities without discrimination, and shall make and document its conscientious and active efforts to employ and utilize minority group members and women in its work force on the Contract.
 - b. It shall state in all solicitations or advertisements for employees that, in the performance of the Contract, all qualified applicants will be afforded equal employment opportunities without discrimination because of race, creed, color, national origin, sex, age, disability or marital status.
 - c. At the request of the University, it shall request each employment agency, labor union or authorized representative of workers, with which it has collective bargaining or other agreement or understanding, to furnish a written statement that such employment agency, labor union or representative will not discriminate on the basis of race, creed, color, national origin, sex, age, disability or marital status and that such union or representative will affirmatively cooperate in the implementation of the bidder's obligations herein.

- d. After the award of the contract, it shall submit to the University a work force utilization report, in a form and manner required by the University, of the work force actually utilized on the Contract, broken down by specified ethnic background, gender and Federal occupational categories or other appropriate categories specified by the University.
- (4) The above information and such other information as the University or the Consultant may request or obtain will be used by the University in determining the reliability and responsibility of the bidder and any proposed subcontractors. Each bidder must comply promptly with all requests by the University and the Consultant for information and must actively cooperate with the University and the Consultant in their efforts to determine the qualifications of the bidder and any proposed subcontractors. Failure to comply with the latter may result in the rejection of the Proposal as not responsive. All information required to be furnished to the University under this Section shall be sent to the State University at {insert address or email address}.

Section 9 Award of Contract

- (1) The award of the Contract shall be made to the bidder submitting the lowest bid that is responsive to the solicitation and who, in the sole opinion of the University, is qualified to perform the work. The University shall determine the lowest bid by adding to or deducting from the Base Bid of the bidders the additive or deductive alternates, if any, the University elects to accept after the opening of the Proposals. Alternates will be accepted in the order they are set forth in the Proposal. The unit prices set forth in the Proposal for additions to or deductions from the work shall not be considered in determining the lowest bid.

The lowest base bid shall not exceed the amount of funds then estimated by the University as available to finance the contract. If the lowest bidder exceeds such amount, the University may reject all bids, or may award the contract on the base bid combined with deductive alternates applied in the order they are set forth in the Proposal as produces the net amount which is within the available funds.

- (2) The right is reserved, if, in the University's judgment, the public interest will be promoted thereby, to reject any or all Proposals, to waive any informality in any Proposal received or to afford any bidder an opportunity to remedy any deficiency resulting from a minor informality or irregularity. Without limiting the generality of the foregoing:
 - a. A Proposal may be rejected as not responsive if the bidder fails to furnish the required bid security or to submit the data required with or after its Proposal and this Information for Bidders.
 - b. A Proposal may be rejected as not responsive if the bidder cannot show to the satisfaction of the University: (i) that it has the necessary qualifications and capital; or (ii) that it owns, controls or can procure the necessary plant and equipment to commence the work at the time prescribed in the Contract and thereafter to prosecute and complete the work at the rate, or within the time specified; or (iii) that it is not already obligated by the performance of so much other work as is likely to delay the commencement, prosecution or completion of the work contemplated by the Contract.
 - c. A Proposal will be rejected as not responsive if it does not provide for the completion of the work by the date of completion specified in the Proposal.

- (3) The University also expressly reserves the right to reject any Proposal as not responsive if, in its opinion, considering the work to be performed, the facts, as to the bidder's business or technical organization, plant, financial and other sources of business experience compared with the work bid upon, justify rejection.
- (4) The award of the Contract shall not be construed as a guarantee by the University that the plant, equipment and the general scheme of operations and other data submitted by the bidder with or after its Proposal is either adequate or suitable for the satisfactory performance of the work.

Section 10 Required Bonds and Insurance

- (1) Unless otherwise agreed to by the University, within ten (10) working days after the receipt of Letter of Intent, the Contractor shall procure, execute and deliver to the University and maintain, at its own cost and expense:
 - a. A Performance Bond and a Labor and Material Bond, both of which bonds shall be on the form prescribed by the University and in an amount not less than 100 percent of the total amount of the Contract awarded to the Contractor by the University said bonds must be issued by a surety company approved by the University and authorized to do business in the State of New York as a surety.
 - b. Attorneys-in-fact who execute said Bonds on behalf of a surety must affix thereto a certified and effectively dated copy of their power of appointment.
- (2) Prior to the commencement of work the Successful Bidder will provide, at its sole cost and expense, Certificates of Insurance in accordance with Section 5.06 and 5.07 of the Construction Agreement, which shall remain in force throughout the term of the agreement, or any extension thereof. Such Certificates of Insurances shall be from an insurance company licensed by the New York State Department of Insurance with a rating of at least "A-" as published with Standard & Poor's, and a liability insurance policy with limits no less than 2,000,000.00 per claim. If during the term of the policy, the carrier's rating falls below "A-", the liability insurance must be replaced no later than the renewal date of the policy with an insurer acceptable to the State of New York. Such policies shall name the STATE UNIVERSITY OF NEW YORK as an additional insured. The policy shall designate the State University of New York as the loss payee and shall contain a provision that the State University of New York shall receive at least thirty (30) days' notice prior to material change, cancellation or expiration of any such policy.
- (3) **Workers Compensation Insurance & Disability Benefits Coverage**
All employees of the Successful Bidder shall be adequately and properly covered by Workers' Compensation Insurance and Disability Benefits coverage for all work related to the resultant contract. Such policies shall name the STATE UNIVERSITY OF NEW YORK as an additional insured and are to be written by recognized and well-rated insurance companies authorized to transact business in the State of New York. The Successful Bidder shall deliver certificates of such coverage, or proof that such coverage is not required, in the required format, as required by the Workers' Compensation Board, to the following when the agreement is signed by the parties and thereafter not less than thirty (30) days prior to material change or cancellation of such coverage.
- (4) Proof of insurances with the specific coverage and limits required in Article V of the Agreement. Acceptable documents are:
 - i. Proof of NYS Worker's Compensation is only accepted on the C-105.2 or U-26.3 form.

- ii. Proof of Disability insurance is only accepted on the DB-120.1 form.

Use the link below for a description of the required forms for Workers Compensation and Disability:

<http://www.osc.state.ny.us/agencies/guide/MyWebHelp/Content/XI/18/G.htm>

- iii. All other proof of insurance must be on the Acord 25 Certificate of Liability Insurance form.
- iv. A 60 day schedule
 - a. After receipt of the Letter of Intent but before receipt of the Contract is Awarded, the Contractor, unless otherwise directed by the University, shall update the working plan and schedule previously submitted in accordance with the Information for Bidders to define the contractor's planned operations during the first 60 days and submit it to the University and the Consultant for their acceptance. The updated working plan and schedule shall be in the form of suitable charts, diagrams or bar graphs and shall be based on the Contractor's logic and time estimates. When updated, such plan and schedule shall be sufficiently detailed to show clearly, in sequence, all salient features of the work of each trade including: the anticipated time of commencement and completion of such work and the interrelationship between such work, submission of Shop Drawings and Samples for approval, approval of Shop Drawings and Samples, placing of orders of materials, fabrication and delivery of materials, installation and testing of materials, contiguous or related work under other contracts, and other items pertinent to the work. The Notice to Proceed may be withheld until this schedule is received and is deemed responsive to the project requirements.
 - b. After Contract Award, but before processing second progress payment application, the Contractor, unless otherwise directed by the University, shall submit to the University and the Consultant for their acceptance its proposed working plan and project time schedule for all the work covered by the Contract, and shall include activities for preparation and submission of all Shop Drawings and Samples. Said proposed working plan and schedule shall be prepared in accordance with the form and requirements set forth in the preceding paragraph.

Section 11 Opportunities Programs

(1) Minority and Women's Business Enterprises

- a. Pursuant to New York State Executive Law Article 15-A, the University recognizes its obligation under the law to promote opportunities for maximum feasible participation of certified minority-and women-owned business enterprises and the employment of minority group members and women in the performance of University contracts.
- b. For purposes of this solicitation, the University hereby establishes an overall goal of **30%** for MWBE participation, **22.06%** for Minority-Owned Business Enterprises ("MBE") participation and **7.94%** for Women-Owned Business Enterprises ("WBE") participation (based on the current availability of qualified MBEs and WBEs). For additional information please refer to the MWBE requirements outlined in the Prospective Bidders Notice ([Form 7557-121b](#)) and Exhibit A-1.

- c. For guidance on how the University will determine a Contractor's "good faith efforts," refer to 5 NYCRR §142.8.
- d. Please note the forms identified in the Prospective Bidders Notice ([Form 7557-121b](#)) must be submitted within seven days of the bid opening. Required forms include the MWBE-EEO Policy Statement ([Form 7557-104](#) or equivalent), the MWBE Utilization Plan ([Form 7557-107](#)) and the EEO Staffing Plan ([Form 7557-108](#)).
- e. Any modifications or changes to the MWBE Utilization Plan after the Contract award and during the term of the Contract must be reported on a revised MWBE Utilization Plan and submitted to the University. The University will review the submitted MWBE Utilization Plan and advise the Bidder of the University's acceptance, or issue a notice of deficiency within 30 days of receipt.

(2) Service Disabled Veteran Owned Business Enterprises

- a. Consistent with the State University of New York's commitment to, and in accordance with, Article 17-B of the New York State Executive Law, contractors are required to ensure that good faith efforts are made to include meaningful participation by Service Disabled Veteran-Owned Business in SUNY's MWBE Program. The requirements apply to contracts in excess of \$100,000.
- b. To ensure that SDVOB Enterprises are afforded the opportunity for meaningful participation in the performance of the University's contracts, and to assist in achieving the SDVOB Act's statewide goal for participation on state contracts the University hereby establishes an overall goal of 6% for SDVOB participation for this solicitation.
- c. For additional information please refer to the SDVOB requirements outlined in the Prospective Bidders Notice ([Form 7564-121b](#)). Please note the SDVOB Utilization Plan [Form 7564-107](#) must be submitted within seven days of the bid opening.

Section 12 Encouraging Use of New York State Business Businesses in Contract Performance

- (1) New York State businesses have a substantial presence in State contracts and strongly contribute to the economies of the state and the nation. In recognition of their economic activity and leadership in doing business in New York State, bidders/proposers for this contract for commodities, services or technology are strongly encouraged and expected to consider New York State businesses in the fulfillment of the requirements of the contract. Such partnering may be as subcontractors, suppliers, protégés or other supporting roles.

Bidders/proposers need to be aware that all authorized users of this contract will be strongly encouraged, to the maximum extent practical and consistent with legal requirements, to use responsible and responsive New York State businesses in purchasing commodities that are of equal quality and functionality and in utilizing services and technology. Furthermore, bidders/proposers are reminded that they must continue to utilize small, minority and women-owned businesses, consistent with current State law.

Utilizing New York State businesses in State contracts will help create more private sector jobs,

rebuild New York's infrastructure, and maximize economic activity to the mutual benefit of the contractor and its New York State business partners. New York State businesses will promote the contractor's optimal performance under the contract, thereby fully benefiting the public sector programs that are supported by associated procurements.

Public procurements can drive and improve the State's economic engine through promotion of the use of New York businesses by its contractors. The State therefore expects bidders/proposers to provide maximum assistance to New York businesses in their use of the contract. The potential participation by all kinds of New York businesses will deliver great value to the State and its taxpayers.

- a. Information on the availability of New York State subcontractors and suppliers is available from: New York State Department of Economic Development, Procurement Assistance Unit, One Commerce Plaza, Albany, New York 12245, Phone: (518) 474-7756, Fax: (518) 486-7577.

Section 13 Single Contract Responsibility

This is a single bid general construction project. The Contractor submitting the bid is responsible for all work associated with this Project.

Section 14 Examination of Site and Conditions of Work

- (1) A pre-bid conference and project walk-through will be held on Tuesday, September 10, 2019 at 11:00 a.m. with all contractors assembled at **HUB Dining Facility, Campus Center North, State University of New York Purchase College, 735 Anderson Hill Road, Purchase, NY 10577**. No individual or additional walk-throughs will be provided. Failure to attend a walk-through shall not be the cause for extra payment.
- (2) Each bidder must inform itself fully of the conditions relating to the construction of the project and the employment of labor on the project. Failure to do so will not relieve a successful bidder of their obligation to furnish all material and labor necessary to carry out the provisions of their contract. To the extent possible, the contractor, in carrying out the work, must employ such methods or means as will not cause any interruption of or interference with the work of any other contractor.

Section 15 General Terms and Conditions

- (1) The following items will be incorporated into, and made part of, the formal agreement: (1) the University's Invitation for Bid; (2) the Successful Bidder's proposal; (3) Exhibit A, Standard Contract Clauses; (4) Exhibit A-1, Affirmative Action Clauses; and, (5) Forms A and B Procurement Lobbying Forms.
- (2) In the event of any inconsistency in or conflict among the document elements of the agreement described above, such inconsistency or conflict shall be resolved by giving precedence to the document elements in the following order: (1) Exhibits A and A-1; (2) Forms A and B Procurement Lobbying Forms, (3) the Agreement; (4) this IFB; and (5) the Successful Bidder's proposal.

Section 15.1 Vendor Debriefing and Contract Award Protest Procedure

- (1) Upon being notified of their unsuccessful bids, unsuccessful bidders may request in writing a

debriefing within 15 calendar days of such notice. The 15 day period starts once unsuccessful bidders are notified. Once a request is made by the bidder, the University must schedule a debriefing within a reasonable time of such request. Unless the campus and bidder mutually agree to use another method such as by telephone, video conference or another type of electronic communication the debriefing must be conducted in person with the bidder.

- (2) This procurement is subject to SUNY Procedure Item 7561, Contract Award Protest Procedure.

Section 15.2 Proposal Confidentiality

- (1) All proposals and qualifications submitted for the University's consideration will be held in confidence. However, the resulting contract is subject to the New York State Freedom of Information Law (FOIL). Therefore, if an Bidder believes that any information in its proposal constitutes a trade secret or should otherwise be treated as confidential and wishes such information not to be disclosed the Bidder shall submit with its proposal a separate letter to the designated contact. The letter shall specifically identify the page number(s), line(s) or other appropriate designation(s) containing such information, explaining in detail why such information is a trade secret and formally requesting that such information be kept confidential. Failure by an Bidder to submit such a letter will constitute a waiver by the Bidder of any rights it may have under Section 89(5) of the Public Officers' Law relating to protection of trade secrets.
- (2) The proprietary nature of the information designated confidential by the Bidder may be subject to disclosure if ordered by a court of competent jurisdiction. A request that an entire proposal be kept confidential is not advisable since a proposal cannot reasonably consist of all data subject to FOIL proprietary status.

Section 15.3 Information Security Breach and Notification Act

- (1) The Bidder shall comply with the provisions of the New York State Information Security Breach and Notification Act (General Business Law Section 899-aa and State Technology Law, Section 208). The Bidder shall be liable for the costs associated with such breach if caused by its negligent or willful acts or omissions, or the negligent or willful acts or omissions of its agents, officers, employees or subcontractors.

Section 15.4 State Finance Law §§ 139-j and 139-k

- (1) State Finance Law §§139-j and 139-k imposes certain restrictions on communications between the University and a Bidder during the procurement process. During the restricted period the Bidder is restricted from making contacts to other than designated contact unless it is a contact that is included among certain statutory exceptions set forth in State Finance Law §139-j(3)(a). The restricted period is from the earliest notice of intent to solicit offers through final award and approval of the Contract.
- (2) University employees and their designated representatives are also required to obtain certain information when contacted during the restricted period and make a determination of the responsibility of the Bidder pursuant to these two statutes. Certain findings of non-responsibility can result in rejection for contract award and in the event of two findings within a 4 year period the Bidder is debarred from obtaining government procurement contracts.

Section 16 Additional Terms and Conditions

- (1) The terms and conditions of the State University of New York Construction Agreement (Form 7554-09) shall apply, and is provided as an attachment to this IFB.
- (2) The resulting agreement shall be binding upon its execution by both parties and, if required by New York State law, upon the approval of the Attorney General and the Office of the State Comptroller.
- (3) The agreement may be revised at any time upon mutual consent of the parties in writing. Such written consent will not be effective until signed by both parties and, if required by New York State law, approved by the Attorney General and the Office of the State Comptroller.
- (4) The relationship of the Successful Bidder to the University shall be that of independent contractor.
- (5) Compliance with the post-employment restrictions of the Ethics in Government Act is required.
- (6) The submission of a proposal constitutes a binding offer to perform and provide said services.
- (7) In the event the Successful Bidder uses partners, subcontracts or subcontractors, the Successful Bidder will remain responsible for compliance with all specifications and performance of all obligations under the contract resulting from this IFB. For the resulting agreement, the Successful Bidder will be the prime contractor.
- (8) The University will not be liable for any costs associated with the preparation, transmittal, or presentation of any proposals or materials submitted in response to this IFB.
- (9) Public announcements or news releases regarding this IFB or any subsequent award of a contract must not be made by any Bidder without the prior written approval of SUNY.
- (10) The Successful Bidder is responsible for compliance with all applicable rules and regulations pertaining to cities, towns, counties and State where the services are provided, and all other laws applicable to the performance of the resulting contract. The Successful Offeror shall provide all necessary safeguards for safety and protection as set forth by the United States Department of Labor, Occupational Safety and Health Administration.
- (11) The Successful Bidder will be responsible for the work, direction and compensation of its employees, consultants, agents and contractors. Nothing in the resulting agreement or the performance thereof by the Successful Bidder will impose any liability or duty whatsoever on the University including, but not limited to, any liability for taxes, compensation, commissions, Workers' Compensation, disability benefits, Social Security, or other employee benefits for any person or entity.
- (12) In the event the Successful Bidder is required to be reimbursed for travel, Bidder shall be reimbursed at rates not to exceed the current NYS Schedule of Allowable Reimbursable Travel Expenses. Refer to the U.S. Government Administration Rates for Travel at: <http://www.gsa.gov>
- (13) In addition, the University reserves the right to:
 - a. Not accept any and all proposals received in response to this IFB, waive requirements or amend this IFB upon notification to all bidders, waive minor irregularities or adjust or correct cost or cost figures with the concurrence of the bidder if mathematical or typographical errors exist.

- b. To terminate any resulting contract for: (1) unavailability of funds; (2) cause; (3) convenience; (4) in the event it is found that the certification filed by the Bidder in accordance with State Finance Law §§139-j and 139-k are found to be intentionally false or intentionally incomplete; and if applicable, the Department of Taxation and Finance Contractor Certification Form ST-220CA was false or incomplete. Upon such finding the University may exercise its termination right by providing written notification to the Bidder in accordance with the written notification terms of the contract.
- c. Request certified audited financial statements for the past three (3) completed fiscal years and/or other appropriate supplementation including, but not limited to, interim financial statements and credit reports.
- d. Contact any or all references.
- e. Request clarifications from Bidders for purposes of assuring a full understanding of responsiveness, and further to permit revisions from all Bidders determined to be susceptible to being selected for contract award, prior to award.
- e. Advise Bidder of any objectionable employee(s) and/or subcontractor(s) and request their removal from the project. Such removal shall not be reasonably withheld by the Bidder.

NAME OF BIDDER

ADDRESS OF BIDDER

PROPOSAL FOR

Project Number: **SU-200002**
Project Name: HUB Café Renovation

Date: **8/30/2019**

TO THE STATE UNIVERSITY OF NEW YORK:

1. **The Work Proposed Herein Will Be Completed Within 95 Calendar Days, Starting Immediately After the Contract Approval Date.** In the event the bidder fails to complete such work by said date or dates, or within the time to which such completion may have been extended in accordance with the Contract Documents, the bidder agrees to pay the University liquidated damages in an amount equal to the values indicate in the Liquidated Damages Schedule below for each calendar day of delay in completing the work.

LIQUIDATED DAMAGES SCHEDULE

<u>Contract Amount</u>	<u>Liquidated Damages</u>
Under \$100,000	\$100/day
\$100,000-\$499,999.....	\$200/day
\$500,000-\$999,999.....	\$300/day
\$1MM-\$1,999,999	\$400/day
\$2MM-\$3,499,999	\$500/day
\$3.5MM-\$5MM	\$700/day
Over \$5MM (to be determined by the University in each instance)	\$ ____/day

2. The bidder hereby declares that it has carefully examined all Bidding and Contract Documents and that it has personally inspected the actual location of the work, together with the local sources of supply, has satisfied itself as to all the quantities and conditions, and understands that in signing this Proposal, it waives all right to plead any misunderstanding regarding the same.
3. The bidder further understands and agrees that it is to do, perform and complete all work in accordance with the Contract Documents and to accept in full compensation therefore the amount of the Total Bid, modified by such additive or deductive alternates, if any, as are accepted by the University.
4. The bidder further agrees to accept the unit prices, if any, set forth in paragraph (5) of this proposal, except as the same may be modified pursuant to the provisions of Section (5) of the Information to Bidders, as full payment for the amount of the credit to the University for any deletions, additions, modifications or changes to the portion or portions of work covered by said unit prices.

5. BID CALCULATION

a. **BASE BID** (*does not include allowances*)

\$ _____
(in numbers)

(in words)

b. **ALLOWANCES:** In accordance with the Schedule I and Section 4.05 of Agreement, the bidder further agrees to the following additions to the Base Bid: NONE

Work or Materials Description	Amount in Words	Amount in Figures
BMS Controls	Forty-five thousand three hundred dollars and no cents	\$45,300.00 + tax

c. **TOTAL BID** (*base bid + allowances = total bid*)

\$ _____
(in numbers)

(in words)

d. **ALTERNATES:** In accordance with Section B of the General Requirements the bidder proposes the following additions to or deductions from the Total Bid for the alternates listed below: NONE

Alternate Number	Add/Deduct	Amount in Words	Amount in Figures
NONE			

e. **UNIT PRICES:** In accordance with Section (5) paragraph (2) of the Information to Bidders and Section 4.04 of the Agreement the bidder or the University may insert unit prices for the work or materials listed below for clarification.

Work or Materials Description	Amount in Words	Amount in Figures

6. By submission of this bid, each bidder and each person signing on behalf of any bidder certifies, and in the case of a joint bid, each party thereto certifies as to its own organization, under penalty of perjury, that to the best of its knowledge and belief: (a) the prices in this bid have been arrived at independently without collusion, consultation, communication, or agreement, for the purpose of restricting competition, as to any matter relating to such prices with any other bidder or with any competitor; (b) unless otherwise required by law, the prices have been quoted in this bid have not been knowingly disclosed by the bidder and will not knowingly be disclosed by the bidder prior to opening, directly or indirectly, to any other bidder or to any competitor; and (c) no attempt has been made or will be made by the bidder to induce any person, partnership or corporation to submit or not to submit a bid for the purpose of restricting competition.

A bid shall not be considered for award nor shall any award be made where (a), (b) and (c) above have not been complied with; provided, however, that if in any case the bidder cannot make the foregoing certification the bidder shall so state and shall furnish with the bid a signed statement which sets forth in detail the reasons therefor. Where (a), (b), and (c) above shall have not been complied with, the bid shall not be considered for award nor shall any award be made unless the Campus President, or designee, or Vice Chancellor for Capital Facilities, or designee, determines that such disclosure was not made for purposes of restricting competition.

The fact that a bidder (a) has published price lists, rates, or tariffs covering items being procured, (b) has informed prospective customers of proposed or pending publication of new or revised price lists for such items, or (c) has sold the same items to other customers at the same prices being bid, does not constitute, without more, a disclosure within the meaning of this Section.

7. The bidder agrees that if awarded the Contract, it will commence work within (10) calendar days after date of receipt of a fully executed Agreement and that it will fully complete the work by the date stated herein.
8. The bidder acknowledges the receipt of the following addenda, but agrees that it is bound by all addenda whether or not listed herein.

Addendum Number	Date	Addendum Number	Date
_____	____/____/____	_____	____/____/____
_____	____/____/____	_____	____/____/____
_____	____/____/____	_____	____/____/____

9. The bidder submits herewith bid security in an amount not less than five (5) percent of the Total Bid.

In the event that (a) the bidder's Total Bid is the lowest one submitted and the bidder does not timely provide the Post-Bid Information required by the Information for Bidders or (b) this Proposal is accepted by the University and the bidder shall refuse or neglect, within ten (10) calendar days after date of receipt of Agreement, to execute and deliver said Agreement in the form provided herein, or to execute and deliver a Performance Bond and a Labor and Material Bond in the amounts required and in the form prescribed, the bidder shall be liable to the University, as liquidated damages, for the amount of the bid security or the difference between the Total Bid of the bidder and the Total Bid of the bidder submitting the next lowest bid, whichever sum shall be higher, otherwise the total amount of the bid security will be returned to the bidder in accordance with the provisions set forth in the Information for Bidders. The University may apply the bid security in full or partial payments, as the case may be, of said liquidated damages and in the event the bid security is less than the amount of liquidated damages to which the University is entitled, the bidder shall pay the difference, upon demand, to the University.

10. The bidder certifies that all wood products that are to be used in the performance of this Contract shall be in accordance with the Specifications and provisions of Section 167 b. of the State Finance Law which Section prohibits the purchase and use of tropical hardwoods.
11. The bidder affirms that it understands and agrees to comply with the procedures of the Fund relative to permissible contacts as required by Sections 139-j(3) and 139-j-(6)(b) of the State Finance Law.
12. The bidder certifies that all information provided or to be provided to the University in connection with this procurement is, as required by Section 139-k of the State Finance Law, complete, true and accurate.

Dated ____ / ____ / ____

Firm's Federal ID Number or
Social Security Number as applicable _____

Legal name of person, partnership, joint venture or corporation:

By _____
(signature)

Title _____

Email address _____

ACKNOWLEDGMENT FOR THE PROPOSAL

THE LEGAL ADDRESS OF THE BIDDER

Telephone No. _____ Facsimile No. _____

If a Corporation

Name

Address

_____ PRESIDENT _____

_____ SECRETARY _____

_____ TREASURER _____

If a Partnership

Name of Partners

Address

If a Joint Venture

Name of Members

Address

If an Individual

Name of Individual

Address

Attachment A – List of Completed Similar Construction Projects

Bidder Name:

Project No.:

Bidders must provide three (3) example projects completed in the past five (5) years in which the Bidder served as the prime contractor. Example projects must be of similar size, scope and complexity to the project currently being bid, as further described in the Description of Work. Each project must include the Owner/Agency, Award Date, Contract Amount, Date Completed, Contact Person, Telephone number of the contact, Architect and/or Engineer's Name, Contract Number, Contact Email, and the Project Title and a brief scope description. Reference contacts may be used to verify project size, scope, dollar value, percentages and quality of performance.

1.	Agency/Owner			Award Date	Contract Amount	Date Completed
	Agency/Owner Contact Person		Telephone No.	Designer Architect and /or Design Engineer		
	Contract No.	Contact Email	Project Title & Scope			
2.	Agency/Owner			Award Date	Contract Amount	Date Completed
	Agency/Owner Contact Person		Telephone No.	Designer Architect and /or Design Engineer		
	Contract No.	Contact Email	Project Title & Scope			
3.	Agency/Owner			Award Date	Contract Amount	Date Completed
	Agency/Owner Contact Person		Telephone No.	Designer Architect and /or Design Engineer		
	Contract No.	Contact Email	Project Title & Scope			
Completed By:				Phone Number: Email: Date:		

Division 1 - General Requirements
SECTION A - Description of Work

1. Work to be Done

The work to be done under the Contract, in accordance with the Contract Documents, consists of performing, installing, furnishing and supplying all materials, equipment, labor and incidentals necessary or convenient for the construction of Project Number **SU-200002**, titled **HUB Café Renovation** and carry out all of the duties and obligations imposed upon the Contractor by the Contract Documents.

The main features of the work shall include, but not be limited to the following:

Full interior renovation to an existing dining commons. Extent of work shall include (1) the modification of mechanical, electrical, plumbing, and fire protection within the scope area, (2) site work for new fire protection services, and (3) all new architectural design and finishes of scope area. See Phasing Plan included in the Bid Documents
Reference Project Manual – SUMMARY section for additional information.

2. Work Not Included:

Work not included in the work of the Contract are those items marked "N.I.C"; movable furnishings, except those specifically specified or indicated on the Drawings; and items marked "by others".

Work Not included in Contract shall include:

- ***Millwork (Blocking, preparation, and final utility connections shall be provided as part of contract)***
- ***Food service equipment. (Kitchen exhaust hoods shall be provided as part of contract)***
- ***Walk-in coolers and freezers***
- ***All Furniture***
- ***Data/low voltage cabling and associated equipment. (All pathways and power shall be provided as part of contract)***

Reference Project Manual – SUMMARY section for additional information.

SECTION B - Alternates

1. General

- a. Refer to Proposal Form. State thereon the amount to be added to or deducted from the Total Bid for the Alternates described herein.
- b. Extent and details of the Alternates are indicated on the Drawings, and described in the Specifications.
- c. Where reference is made in the description of the Alternate to products, materials, or workmanship, the specification requirements applicable to similar products, materials or workmanship in the Total Bid shall govern the products, materials, and workmanship of the Alternate as if these specification requirements were included in full in the description of the Alternates.

2. Alternates

None

SECTION C - Special Conditions

1. Cutting and Patching

- a. The Contractor shall do all cutting, fitting, and patching of its work that may be required to make its several parts come together properly and fitted as shown upon or reasonably implied from the Drawings and Specifications for the completed project.
- b. Any cost caused by defective or ill-timed work shall be borne by the Contractor. Except as otherwise expressly provided in the Contract Documents, the Contractor shall not cut or alter the work of any other Contractor or existing work without the consent of the University.
- c. Existing construction, finishes, equipment, wiring, etc., that is to remain and which is damaged or defaced by reason of work done under this contract shall be restored by the Contractor to a condition satisfactory to the University, or replaced with new, at no additional cost.
- d. Existing surfaces, materials, and work shall be prepared as necessary to receive the new installations. Such preparatory work shall be as required by the conditions and in each case shall be subject to approval by the University.
- e. Newly exposed work or surfaces which are presently concealed shall be made to match existing corresponding or adjoining new surfaces as directed, and the materials and methods to be employed shall be subject to approval by the University.
- f. All new, altered, or restored work in the building shall match existing corresponding work in the material, construction finish, etc., unless otherwise specified or required by the drawings.

Reference Project Manual – CUTTING AND PATCHING section for additional information.

2. Clean-Up

- a. Periodic Cleaning: The Contractor shall at all times during the progress of the work keep the Site free from accumulation of waste matter or rubbish and shall confine its apparatus, materials and operations of its workmen to limits prescribed by law or by the Contract Limit Lines, except as the latter may be extended with the approval of the University. Cleaning of the structure(s), once enclosed, must be performed daily and removal of waste matter or rubbish must be performed at least once a week.
- b. Final Clean Up: Upon completion of the work covered by the Contract, the Contractor shall leave the completed project ready for use without the need of further cleaning of any kind and with all work in new condition and perfect order. In addition, upon completion of all work, the Contractor shall remove from the vicinity of the work and from the property owned or occupied by the State of New York, the State University of New York or the University, all plant, buildings, rubbish, unused materials, concrete forms and other materials belonging to it or used under its direction during construction or impairing the use or appearance of the property and shall restore such areas affected by the work to their original condition, and, in the event of its failure to do so, the same shall be removed by the University at the expense of the Contractor, and it and its surety shall be liable therefor.

Reference Project Manual – CLOSEOUT PROCEDURES and EXECUTION sections for additional information.

3. Temporary Access and Parking

Reference site drawings for staging location and reference Project Manual – TEMPORARY FACILITIES AND CONTROLS section for general requirements

4. Field Meetings

Periodic job meetings will be scheduled by the Consultant and the University during the course of construction. The Contractor, and, upon request of the Consultant and the University, its principal subcontractors and manufacturer's representatives, shall attend such meetings and be prepared to furnish answers to questions on progress, workmanship, or any other subject on which the Consultant and the University might reasonably require information.

Reference Project Manual – PROJECT MANAGEMENT AND COORDINATION section for additional information.

5. Operating Instructions and Manuals

The Contractor shall furnish three (3) complete sets of operating instructions and manuals which shall include definite and specific instructions on all mechanical and electrical systems involved in the Project. Said instructions and manuals should set forth: (1) the manner of operation; (2) the necessary precautions and care to be followed; (3) periodic prevention maintenance requirements; and (4) a complete set of spare parts lists, catalogs, service manuals and manufacturing data on said systems. Said instructions and manuals are to be made available by the Contractor for review and comment by the University a minimum of six (6) weeks prior to the scheduled completion of the Project.

Reference Project Manual – OPERATION AND MAINTENANCE DATA section for additional information.

6. Utility Shutdowns and Cut Overs

- a. Except as otherwise expressly provided in the Contract Documents, the Contractor shall be responsible for submitting to the University, for its approval, a proposed schedule of all utility shutdowns and Cut overs of all types which will be required to complete the Project; said schedule should contain a minimum of two (2) week's advance notice prior to the time of the proposed shutdown and cut over. Most campuses of the State University of New York are in full operation 12 months of the year, and shutdowns and Cut overs, depending upon their type, generally must be scheduled on weekends, at night, or during holiday periods. The contract consideration is deemed to include all necessary overtime and all premium time, if any, that is required by the Contractor to complete the shutdowns or Cut overs.
- b. Temporary Connections: In the event the Contractor shall disrupt any existing services, the Contractor shall immediately make temporary connection to place such service back into operation and maintain the temporary connection until the Contractor makes the permanent connection. All work must be acceptable to the University.

7. Temporary Power for Construction Activities

Electrical energy will be available at no cost to the Contractor from existing outlets or panels from locations approved by the College. This power may be used for small power tools (not exceeding 1/2 HP), etc., and the Contractor shall not exceed the capacity of the existing circuits being used. The Contractor shall be responsible for providing all necessary connections, cables, etc. and removal of the same at completion of construction with approval from the University. The Contractor shall in no way modify the existing circuits at the panel boards to increase capacities of the circuits. If the required power load exceeds the capacities of the available power sources, the Contractor shall be responsible and pay for furnishing and installing all necessary temporary power poles, cables, fused disconnect switches, transformers and electric meters necessary to provide a temporary power system for the project, and remove the same at completion. Install all temporary wiring and equipment and make all connections in conformity with the National Electrical Code. Make all replacements required by temporary use of the permanent wiring system. Provide ground fault protection.

Reference Project Manual – TEMPORARY FACILITIES AND CONTROLS section for additional

information.

8. Sanitary Facilities

The Contractor will be permitted to use existing toilet and janitor closet facilities as designated by the College provided the existing facilities are not misused, defaced, or left in an unsanitary condition. If the University deems that the existing facilities have been subject to misuse or left unsanitary, the Contractor shall be informed and caused to install and maintain (at its own cost) temporary, sanitary facilities at approved locations. The Contractor shall also be held responsible for the cost of cleaning and repair of any damage to said existing facilities and adherence to health and sanitary codes of the State of New York.

Reference Project Manual – TEMPORARY FACILITIES AND CONTROLS section for additional information.

9. Temporary Heat

- a. In those locations where it is required by the conditions of the work, the Contractor shall provide and pay for all temporary heating, coverings and enclosures necessary to properly protect all work and materials against damage by dampness and cold, dry out the work, and facilitate the completion thereof. Fuel, equipment, materials, operating personnel and the methods used therefor shall be at all times satisfactory to the University and adequate for the purpose intended. The Contractor shall maintain the critical installation temperatures, provided in the technical provisions of the specifications hereof, for all work in those areas where the same is being performed.
- b. Maintenance of proper heating, ventilation and adequate drying out of the work is the responsibility of the Contractor. Any work damaged by dampness, insufficient or abnormal heating shall be replaced to the satisfaction of the University by and at the sole cost and expense of the Contractor.
- c. The Contractor shall provide all necessary, temporary heating for the efficient and effective work by itself and all trades engaged in the work. Unless otherwise specified, the minimum temperature shall be 50 degrees F at all places where work is actually being performed within the project (where enclosed). Before and during the placing of wood finish and the application of other interior finishing, varnishing, painting, etc., and until final acceptance by the University of all work covered by the Contract, the Contractor shall, unless otherwise specified in the Contract Documents, provide sufficient heat to produce a temperature of not less than 68 degrees F nor more than 78 degrees F.

Reference Project Manual – TEMPORARY FACILITIES AND CONTROLS section for additional information.

10. Temporary Light

The contractor shall install, maintain and remove Underwriter's Label temporary lighting sockets, light bulbs, and intermittent power sockets as approved by the University. The minimum temporary lighting to be provided is at the rate of 1/4 watt per square foot and be maintained for 24 hours, 7 days per week at stairs and exit corridors; in all other spaces, temporary lighting is to be maintained during working hours. Installation shall be in accordance with the National Electric Code.

Reference Project Manual – TEMPORARY FACILITIES AND CONTROLS section for additional information.

11. Temporary Water for Construction Purposes

Water for construction is available through the campus system without charge to the Contractor from location designated by the College. The Contractor shall obtain the necessary permission, make all connections, as required, furnish and install all pipes and fittings, and remove the same at completion of work. The Contractor must provide for waste water discharge and shall take due care to prevent damage to existing structures or site and the waste of water. All pipes and fittings must be maintained in perfect condition at all times.

Reference Project Manual – TEMPORARY FACILITIES AND CONTROLS section for additional information.

12. Conducting Work

- a. All work is to be conducted in such a manner as to cause a minimum degree of interference with the College's operation and academic schedule.
- b. Safe and direct entrance to and exiting from the existing buildings shall be maintained at all times during regular hours while construction is in progress.
- c. No construction work will start in any area until the Contractor has all the required materials on-site.
- d. The Contractor and its employees shall comply with College regulations governing conduct, access to the premises, and operation of equipment.
- e. The building shall not be left "open" overnight or during any period of inclement weather. Temporary weather tight closures shall be provided for/by the Contractor to protect the structure and its contents.

Reference Project Manual – PROJECT MANAGEMENT AND COORDINATION section for additional information.

13. Safety and Protective Facilities

- a. The Contractor shall provide the necessary safeguards to prevent accidents, to avoid all necessary hazards and protect the public, the Staff, students, the work and property at all times, including Saturdays, Sundays, holidays and other times when no work is being done.
- b. The Contractor shall erect, maintain and remove appropriate barriers or other devices, including mechanical ventilation systems, as required by the conditions of the work for the protection of users of the project area, the protection of the work being done, or the containment of dust and debris. All such barriers or devices shall be provided in conformance with all applicable codes, laws and regulations, including OSHA and National Fire Prevention Association 241, for safeguarding of structures during construction.

Reference Project Manual – PROJECT MANAGEMENT AND COORDINATION section for additional information.

14. Protection of Existing Structures, Vegetation and Utilities

The Contractor, during the course of its work, shall not damage any buildings, structures and utilities, public or private, including poles, signs, services to buildings, utilities in the street, gas pipes, water pipes, hydrants, sewers, drains and electric power and lighting and telephone cables, lawns, curbs, plants and other improvements. Any damage resulting from the Contractor's operations shall be repaired or replaced at its expense.

Reference Project Manual – PROJECT MANAGEMENT AND COORDINATION section for additional information.

information.

15. Abbreviations and References

The following abbreviations may be used in these Specifications:

N.A.	Not Applicable
N.I.C	Not in Contract.
Fed. Spec. or F.S.	Federal Specifications
SUCF	State University Construction Fund
University or SUNY	State University of New York
College	A Campus of the State University of New York

Reference Project Manual – REFERENCES section for additional information.

16. Use of Elevators

The Contractor shall be permitted to make temporary use of elevators designated by the University and provided such use does not interfere with the normal activities of the College. Large and heavy items shall not be placed in elevators, and suitable padding shall be provided whenever a cab is used for construction purposes. Elevator pits shall be kept free of debris and dust by frequent cleaning out. The elevators shall be restored to original condition satisfactory to the University at the end of construction activities. Use of the top of the elevator may be permitted after obtaining approval of the University.

17. Salvage of Materials

Remove and legally dispose of all debris and other materials resulting from the alterations to State University property. The following items shall remain the property of the University and shall be stored at the site as directed by the University:

- **All Fixtures, Furniture, and Equipment**
- **All Kitchen and Food Service Equipment**
- **All IT devices**

18. Storage of Materials

- a. The Contractor shall store materials and equipment within the contract limits in areas on the site as designated by the University.
- b. All materials shall be stored in a neat and orderly manner, and shall be protected against the weather by raised floored weatherproof temporary storage facility or trailer.
- c. Security for stored materials shall be the responsibility of the Contractor.
- d. Storage of materials is not permitted on the roof of any building.

Reference Project Manual individual sections for additional storage information.

19. Shop Drawings and Samples - (Refer to Section 2.19 of the Agreement)

- a. The Contractor shall submit to the University for its approval five (5) sets of prints of all shop drawings required by the specifications. Those marked:

"REJECTED" are not in accordance with the Contract Documents and shall be resubmitted.

"REVISE AND RESUBMIT" Contractor shall correct and resubmit.

"MAKE CORRECTIONS NOTED": The contractor shall comply with corrections and may proceed.
Resubmittal is not required.

"APPROVED - NO EXCEPTIONS TAKEN": The contractor may proceed.

- b. All shop drawings and/or submittals used on the construction site must bear the impression of the consultant's review stamp as well as the General Contractor's review stamp, indicating the status of review and the date of review.
- c. All shop drawings shall reflect actual site conditions and accurate field dimensions. Dimensioned shop drawings shall be submitted for all fabricated items. Incomplete submittals will be rejected without review.
- d. All shop drawings, submittals and samples shall include:
 - 1). Date and revision dates.
 - 2). Project title and number.
 - 3). Names of:
 - a). Contractor
 - b). Subcontractor
 - c). Supplier
 - d). Manufacturer
 - 4). Identification of products or materials: Include Department of State (DOS) file number, manufacturers' name and market name of all covered products and applicable materials in accordance with Part 1120 of the Code. This information may be obtained by contacting the DOS, Office of Fire Prevention and Control: 518 474-6746 [voice] and 518 474-3240 [FAX]

Reference Project Manual – SUBMITTAL PROCEDURES section and individual sections for additional information.

20. U.S. Steel

All structural steel, reinforcing steel, or other major steel items to be incorporated in the work shall, if this Contract is in excess of \$100,000, be produced or made in whole or substantial part in the United States, its territories or possessions.

21. Non-Asbestos Products

- a. All materials specified herein shall contain no asbestos.
- b. Provide "Contains No Asbestos" permanent labels applied to the exterior jacket of all pipe insulation at 20 foot intervals with a minimum of one (1) label for each service in each work area.

22. Material Safety Data Sheet

The contractor shall submit MSDS (Material Safety Data Sheet) for all chemicals, solvents, and materials specified or proposed to be used on this project.

23. Architect's/Engineer's Seal

In accordance with Rules and Regulations of the New York State Education Law, Title 8, Part 69.5(b), to all plans, specifications and reports to which the seal of an architect has been applied, there shall also be applied a stamp with appropriate wording warning that it is a violation of the law for any person, unless acting under the direction of a licensed architect, to alter an item in any way. If an item bearing the seal of an architect is altered, the altering architect shall affix to his item the seal and the notation "altered by" followed by his signature and the date of such alteration, and a specific description of the alteration.

24. Construction Permit

The Code Compliance Manager for the State University Campus will, as required by law, issue a Construction Permit for this Project. The project is not subject to any local building code or permit requirements, except for work that the Contractor is to perform on property located outside of the boundaries of the campuses of the State University of New York.

25. Other Contracts

There may be other contracts let for work to be done in adjacent areas and, as such, this Contractor and such other contractors shall coordinate their work to conform with progressive operation of all the work covered by such contracts, and afford each other reasonable opportunities for the introduction and storage of their supplies, materials, equipment, and the execution of their work.

26. Asbestos

If the work to be done under this contract contains the abatement of asbestos the following shall apply:

- a. Applicable Regulations - All work to be done under this Contract shall be in compliance with Part 56 of Title 12 of the Official Compilation of Codes, Rules and Regulations of the State of New York (cited as 12 NYCRR Part 56) as amended effective November 9, 1994.
- b. Applicable Variance - The abatement contractor is responsible for obtaining any variance not issued to date that he feels may be applicable to the policies/procedures as set forth in 12 NYCRR Part 56.
- c. Owner Project Fact Sheet -The Contractor shall complete and submit as much information as possible on the Asbestos Material Fact Sheet to the University in triplicate prior to the project startup. Completion of the Fact Sheet shall be submitted prior to acceptance.
- d. Patent Infringement - The State University of New York and the State University Construction Fund have been given notice by a law firm representing GPAC, Inc. that the use of its process/procedure for asbestos containment and removal constitutes a patent infringement. All potential contractors are hereby notified that they may have to obtain a license to use certain patented Negative Air Containment systems, and that any liability of the University in connection therewith is covered by Section 2.21 of the Agreement. Therefore, all potential contractors are hereby notified that after opening of the bids they must advise the University as to the system they intend to use for Negative Air Containment and provide the University with either a copy of their license to use the same or written documentation, signed by an authorized officer of their surety, that their performance bond guarantees the Contractor's indemnification covering patent claims.
- e. Air Monitoring - The abatement contractor shall be responsible for hiring and paying an independent third party firm to perform the requirements of air monitoring

as called for in Subpart 56-17 of 12 NYCRR Part 56.

- f. Testing - The University and Campus reserve the right to employ an independent testing laboratory to perform testing on the work and air sampling. The Contractor shall be required to cooperate with the testing laboratory.
- g. Disposal Procedures - It is the responsibility of the asbestos contractor to determine current waste handling, transportation and disposal regulations for the work site and for each waste disposal landfill. The asbestos contractor must comply fully with these regulations, all appropriate U.S. Department of Transportation, EPA and Federal, State and local entities' regulations, and all other then current legal requirements. Submit originals or copies of all pertinent manifests in triplicate to the University.
- h. Submittals - Prior to commencement of the work on this project, the Contractor must submit the following to the University:
 - 1). Copy of original insurance policy.
 - 2). Copy of Department of Labor notification.
 - 3). Owner Fact Sheet.
 - 4). Copy of EPA notification.
- i. Special Requirements -.
 - 1) Size, location, and quantities of all pipes, joints, ducts, valves, tees, etc. must be field verified by all prospective bidders. Information given on the drawings and specifications is for general orientation and information only.
 - 2) The Contractor shall have at least one English-speaking supervisor on the job site at all times while the project is in progress.
 - 3) Prior to the commencement of work involving asbestos demolition, removal, renovation, the Contractor must submit to the University the name of its on-site asbestos supervisor responsible for such operations, together with documentation that such supervisor has completed an Environmental Protection Agency-approved training course for asbestos supervisors.

27. Wage Rates and Supplements

The following are the rates of wages and supplements determined by the Industrial Commissioner of the State of New York as prevailing in the locality of the site at which the work will be performed can be found at:

<https://applications.labor.ny.gov/wpp/publicViewProject.do?method=showIt&id=1485387>

The Prevailing Wage Case Number PRC# assigned to this project is: 2019011358

Special Conditions for Construction

Part 1 – Use of Premise

1.1 General

- A. Contractor shall confine operations at the site to areas permitted by law, ordinances, permits and the Contract Documents and shall not unreasonably encumber the site with materials or equipment. *For purposes of this provision, "site" shall include all existing structures.*
- B. The Building in which the Work is to be performed is currently occupied by residential areas, offices and/or classrooms. Each Contractor shall have limited use of premises for construction operations, including use of Project site, during the construction period. Each Contractor's use of premises is limited only as outlined in this section and/or any other section of the specifications, or at the College's discretion, to perform work or to retain other contractors on portions of Project.
- C. Coordination with Other Contractors:
 - 1). The Contractor will need to have their portion of the Work coordinated with other Contractors working on the site so that their work conforms to the progressive operation of all the work covered under other contracts that the College has let on this site.
 - 2). Each Contractor shall afford other Contractors reasonable opportunities for the introduction and storage of their supplies, materials, equipment, and execution of their work.
 - 3). If the Contractor or such other contractors contend that their work of the progress thereof is being interfered with by the acts or omissions of the others or that there is a failure to coordinate or properly arrange the sequence of the work on the part of the Contractor or such other contractors, they shall, within five (5) working days of the commencement of such interference or failure of coordination or failure to perform work in proper sequence, give written notification to the College of such contention. Upon receipt of such notification or on its own initiative, the College shall investigate the situation and issue such instructions to the Contractor or such other contractors with respect thereto as it may deem proper. The College shall determine the rights of the Contractor and of such other contractors and the sequence of work necessary to expedite the completion of the work covered by said other contracts.
- D. All work is to be conducted in such a manner as to cause a minimum degree of interference with the College's operations and academic schedule. Contractor is to coordinate their work with the College's classroom schedule.
- E. The Contractor and its employees shall comply with all College regulations governing conduct, access to the premises, and operation of equipment.
- F. Maintain all paths of egress and keep clear of all materials and debris.
- G. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, and other adjacent occupied or used facilities without written permission from College.
- H. Should it become necessary, in the judgment of the College, at any time during the course of the Work to move materials which are stored on the site and equipment which has been temporarily placed thereon, the Contractor upon request of the College shall move them or cause them to be moved at its sole cost and expense; provided, however, if materials and equipment that have been stored or placed by the Contractor at a location on the site expressly approved, in writing, by the College and the same are moved or caused to be moved by the Contractor at the College's request, such removal shall be deemed extra work and the Contractor shall be compensated.

1.2 Campus Regulations

- A. The contractor and his/her employees, subcontractors, etc., will not fraternize with any building or campus occupants. This includes but is not limited to students, faculty, and employees of the State other than those designated, visitors and guests. At no time will it be appropriate to say anything derogatory to the above referenced individuals. Harassment, verbal or otherwise, of the above referenced individuals will **not** be tolerated. If an incident arises, the Contractor will be directed to **permanently remove** the employee from the site.

- B. No drugs are permitted on campus.
- C. No smoking is permitted on campus.
- D. The contractor, employees and sub-contractors are required to stay within the construction boundary lines at all times.
- E. The contractor, employees, and sub-contractors must recognize the fact that this is an institute for learning. Flexibility will be required during certain times of the academic year.

1.3 Use of Permanent Utilities

- A. As the building is still under construction, when each permanent utility is operational, it may be used for construction purposes, if acceptable, in writing, by the College. The written request for permission for use of the system from the College shall include, as a minimum, the conditions and reasons for use and provisions for and effect on equipment warranties. In the event that the College accepts the Contractors use of the permanent utility for the balance of the Work, the Contractor shall be fully responsible for it, and shall pay all costs for operation, power, restoration and maintenance of same.
- B. If the existing facilities are not adequate for the Contractor, locate temporary facilities where they will serve Project adequately and result in minimum interference with performance of the Work and disruption to the College. Any temporary facilities location is to be reviewed and approved by College's Representative.

1.4 Storage and Staging of Materials

- A. The following shall apply to this project
 - 1). The Contractor shall store materials and equipment within areas designated by the College.
 - 2). Security for stored equipment and materials shall be the responsibility of the Contractor.
 - 3). No vehicles will be permitted on the Plaza. Any and all materials and/or equipment brought or stored on the Plaza shall not exceed the maximum weight limit of 150 psf.
 - 4). Access to the construction site for delivery of materials and equipment is limited. Temporary parking for the loading and unloading of the same shall be arranged only with prior approval of the College.
 - 5). The Contractor shall at all times keep access routes, and parking and staging areas clean of debris and other obstructions resulting from the work.

1.5 Temporary Power for Construction Activities

- A. Electrical energy, as it exists within the work area, will be available at **no** cost to the Contractor from existing outlets or panels from locations approved by the College. As this site is still under construction, if electrical power is not available in the area of work, it is the Contractor's responsibility to provide necessary power to perform the Work. Typically available power may be used for small power tools (not exceeding ½ HP).

1.6 Temporary Lighting / Heating & Cooling / Water

- A. Electrical lighting, as it exists within the work area, is available to the contractor at **no** cost. As this site is still under construction, if electrical lighting is not available in the area of work, it is the Contractor's responsibility to provide necessary temporary equipment to perform the Work at its cost.

1.7 Temporary Sanitary Facilities

- A. Toilet, Water, and Drinking Water Facilities: The Contractor shall make arrangements with the College for use of the existing toilet, water, and drinking water facilities. It is the Contractor's responsibility to maintain the facility during the construction and restore to original state upon completion of the project.

1.8 Temporary Parking

A. Contractor is to abide to the following:

- 1). The Contractor and its employees shall be subject to all the rules and regulations of the College, including parking regulations. The College is regulated by New York State Vehicle and Traffic Laws.
- 2). The Contractor and its employees shall only park in the designated areas in Lot #W-2. There shall be no parking in other areas of the campus (unless prior written authorization is provided by the College Chief of Police).
- 3). Parking violations are subject to fines and are the sole responsibility of the Contractor or its employees. Vehicles that are parked illegally may be towed at the expense of the owner/driver.
- 4). All vehicles are required at all times to register with the College's Public Safety Unit.
- 5). There is \$35.00 fee for parking permits. The fee is per vehicle and permits need to be display whenever the vehicle is parked on campus.

1.9 Temporary Support Facilities

- A. Construction Aids: Provide all items, such as lifting devices, all scaffolding, staging, platforms, runways, ladders; and all temporary flooring, as required by the various trades for the proper execution of the Work. Provide such construction aids with proper guys, bracing, guards, railings and other safety devices as required by the governing authorities and OSHA.
- B. Elevator and Loading Dock Usage: The Contractor shall make all arrangements with the College's Representative for the use of elevators as required for transporting material and workmen to the work areas and for the disposal of rubbish and waste materials.

1.10 Safety and Protection of Facilities

- A. The Contractor shall provide the necessary safeguards to prevent accidents, to avoid all necessary hazards and protect the public, the Faculty and Staff, students, the work, and the property at all times, including Saturdays, Sundays, holidays, and other times when no work is being done. The Contractor shall submit a safety plan which shall be certified by a Certified Safety Professional from the Board of Certified Safety Professionals (www.bcsp.org).
- B. The Contractor shall erect, maintain and remove appropriate barriers or other devices, including mechanical ventilation systems, as required by the conditions of the work for the protection of the users of the project area, adjoining areas, the protection of the work being done, or the containment of dust and debris. All such barriers or devices shall be provided in conformance with all applicable codes, laws and regulations, including OSHA and National Fire Prevention Association 241, for safeguarding of structures during construction.
- C. Fire safety during construction:
- 1). The Contractor shall provide all temporary equipment, labor and materials required for compliance with the applicable provisions of Chapter 14, Fire Safety during Construction and Demolition, of the Fire Code of New York State.
 - 2). For areas and spaces under their control, the Contractor shall comply with Chapter 14 of the Fire Code of New York State, titled "Fire Safety during Construction and Demolition". Subject to approval by the College's Consultant and the College, the Contractor shall designate one person as the **fire prevention program superintendent**. This superintendent shall be responsible for the fire prevention program required by Section 1408 of the Fire Code of New York State and implementing the minimum safeguards for construction, alteration, and demolition operations that provide reasonable safety to life and property from fire during the Contractor's operations. Responsibilities also include developing and maintaining pre-fire plans per 1408.2, the training of the Contractor's workforce per 1408.3, maintenance of the fire protection equipment per 1408.4, supervising hot work operations per 1408.5, and implementing temporary impairment to existing fire protection systems per 1408.6 & 1408.7. This superintendent shall also provide periodic written reports at the field meetings and respond to questions raised concerning compliance with Chapter 14 of the Fire Code of New York State.

D. Contractor shall comply with Labor Law Section 220-h; provide workers certified as having successfully completed the OSHA 10-hour construction safety and health course; and comply with applicable NYS DOL rules and regulations for monitoring and reporting compliance.

E. Temporary Fire Protection:

- 1). If the existing building is to be partially occupied during the course of the project, all existing exits and fire protection systems shall be continuously maintained in the occupied spaces/phases, or other measures must be taken which in the opinion of the College's Consultant and/or College will provide equal safety. Those portions occupied by the College must be available for their use 24hours a day, seven days a week during the contract period unless otherwise scheduled in these documents. Comply with all applicable State and Federal codes and regulations. The cost of all labor, fire watches, variances, materials, installations, maintenance and removal of such temporary fire protection systems or modifications to the existing systems are the responsibility of the Contractor.

F. Fire Watch Requirements:

- 1). If any of the work of the Contractor;
 - a) Disables any fire suppression systems, standpipes systems, fire alarm systems, fire detection systems, smoke control systems and/or smoke vents as defined in Chapter 9 of the Fire Code of New York State (FCNYS).
 - b) Involves welding, cutting, open torches and other hot work as defined in Chapter 26 of the FCNYS and/or involves demolition activities that are hazardous in nature as defined in Chapter 14 of the FCNYS.

Then the Contractor shall provide a fire watch or perform the work during the hours where the building is scheduled by the College to be closed, in accordance with Section 901.7 of the FCNYS, for structures that have campus occupancy.

- 2). If a fire watch is required, the Contractor shall provide all labor that is required. The Contractor shall:
 - a) Contact the New York State Department of State Office of Fire Prevention and Control (OFPC) at 41 State Street, Albany, NY 12231-0001, Phone: (518) 474-6746, Fax: (518) 474-3240, e-mail: fire@dos.state.ny.us and obtain its currently amended recommendation for fire watch procedures. Review the OFPC recommendations and notify the College's Consultant and/or College Representative if there are significant discrepancies with the requirements of this section.
 - b) Review the fire watch procedures with the College's alarm monitoring staff (University Police – 914-251-6900) and the fire department prior to disabling a fire protection system. Submit a plan for the fire watch for approval by the College's Consultant and/or College Representative, and schedule a pre-system shutdown meeting with the College's Consultant and/or College Representative.
 - c) Employ, instruct and maintain competent fire watch personnel. Provide the sufficient number of dedicated personnel that are required to patrol all portions of the means of egress system in the facility in the period of time required.
 - d) Notify University Police (UPD) prior to and at the conclusion of the fire watch.
 - e) Employ competent personnel to fix the fire protection system (see section 1.11 below).
- 3). Fire Watch Duties: Personnel serving as a fire watch have the following duties:
 - a) Conduct periodic patrols of the entire facility as specified below.
 - b) Identify any fire, life or property hazards.
 - c) Notify the UPD if a fire is discovered by call (914-251-6911), with the exact address and type of emergency.
 - d) Notify occupants of the facility of the need to evacuate. If sirens or public address function of the alarm system are still functional, use them to assist with evacuation of the building.
 - e) Have access to at least one means of direct communication with UPD. A cell phone is acceptable.
 - f) Maintain a written log of fire watch activities.

- g) Have knowledge of the location and use of fire protection equipment, such as fire extinguishers. (Note: The fire watch will not perform fire-fighting duties beyond the scope of the ordinary citizen).
 - h) Perform no other duties that are not directly part of the fire watch duties.
- 4). Frequency of Inspections: Fire watch personnel should patrol the entire facility patrol every 30 minutes except in the following situations, where patrols shall be every 15 minutes:
 - a) The facility has people sleeping.
- 5). Record Keeping: A fire watch log should be maintained at the facility. The log should show the following:
 - a) Address of the facility.
 - b) Times that the patrol has completed each tour of the facility.
 - c) Name of the person(s) conducting the fire watch.
 - d) Records of communication(s) to the University Police.
 - e) Record of other information directed by the College's Consultant and/of the College Representative.

1.11 Modifications / Alterations to Campus Existing Fire Alarm Systems

- A. The Campus standard for its fire alarm is the Edwards Fire Alarm System. Any contractor working on the Campus fire alarm system must be a licensed fire alarm installer. Any contractor working on adding to or modifying the existing fire alarm system's programming, must be certified to work on an Edwards Fire Alarm System and provide proof of that certification.
- B. A Pre-Fire Alarm construction meeting will be required between the Contractor, their fire alarm sub-contractors, and the College's Representative prior to any fire alarm work occurring.
- C. Contractor shall coordinate all modifications and/or alternations to the existing building's fire alarm systems with the College's Representative. If the work shall affect the existing fire alarm system in adjoining areas, the contractor must submit, in writing, their plan to protect and maintain the systems in the adjoining spaces, to the College's Representative for the College's review and approval, at least 72 hours in advance.
- D. Where demolition and dust may impact existing fire alarm smoke heads, the contractor shall protect these heads prior to beginning any work and follow the College's protocol listed below. If smoke heads are protected during the day, while work is occurring, the Contractor must uncover these heads at the end of each work day before leaving the site. The area protected by covered smoke heads must be continuously monitored while the heads are covered. The fire alarm systems must be operational at all times during construction. In the event that there is a need to shut down the system, the Contractor must notify the College in writing at least 72 hours in advance and provide a Fire Watch for all of the areas affected by the shutdown during the times the systems are non-operational.
- E. Where work will impact the existing fire alarm system, the contractor's site supervisor must follow the following protocol:
 - 1) Contractor Supervisor to contact the College's University Police (251-6900) prior to beginning work for the day and let them know where work is occurring and which smoke heads are being covered or device made inoperable.
 - 2) Cover smoke heads and make scheduled devices inoperable. Call University Police once heads are covered.
 - 3) Contractor to perform scheduled work. The area must be continuously monitored while the smoke heads are covered.
 - 4) At the end of the work day, Contractor Supervisor to College's University Police and let them know smoke head covers are being removed. It's strongly recommended that Contractor let's day's dust settle and clean around the devices prior to removing protective covers to avoid unintended activation.

Part 2 – Party Responsibilities

2.1 Information and Services Required of the College

- A. Furnished Information: College shall furnish (if available) surveys, existing plans, or other required information describing physical characteristics, legal limitation and utility locations for the site of the Project, and a legal description of the site. These documents are for information purposes only. They are to be field verified by the Contractor for accuracy. The College will not be responsible if actual conditions vary from what is indicated on the documents. Plans will be released to awarded Bidder in PDF electronic format.
- B. College's Right to Stop the Work: If Contractor fails to correct Work which is not in accordance with the requirements outlined, or fails to carry out Work in accordance with the Contract Documents, the College, by written order signed personally or by an agent specifically so empowered by the College in writing, may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the College to stop the Work shall not give rise to a duty on the part of the College to exercise this right for the benefit of Contractor or any other person or entity.
- C. College's Right to Carry Out the Work: If Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten (10) business-day period after receipt of written notice from College to commence and continue correction of such default or neglect with diligence and promptness, College may, without prejudice to other remedies College may have, correct such deficiencies. *College may offset* from payments then or thereafter due Contractor the cost of correcting such deficiencies, including compensation for Consultant's additional services and expenses made necessary by such default, neglect or failure. If payments then or thereafter due Contractor are not sufficient to cover such amounts, Contractor shall pay the difference to the College.

2.2 Information and Services Required of the Contractor

- A. Review of Contract Documents: Contractor shall carefully study and compare the Contract Documents with each other and with the information furnished by the College, and shall at once report to the College Representative errors, inconsistencies or omissions discovered.
- B. Review of Field Conditions: Contractor shall, *sufficiently in advance of undertaking the Work*, take field measurements and verify field conditions and shall carefully compare such field measurements and conditions and other information known to Contractor with the Contract Documents. Errors, inconsistencies or omissions discovered shall be reported to the College Representative at once. *If Contractor performs any construction activity which involves an error, inconsistency or omission which Contractor knew of or should reasonably have known of, without notice to College, Contractor shall assume responsibility for such performance and shall bear all costs of correction.*
- C. Construction Schedule: Contractor, promptly after being awarded the Contract, shall prepare and submit for College Representative, a Contractor's construction schedule for the Work.

Project Schedule shall include the following:

- 1). Contractor's work plan and/or schedule shall be sufficiently detailed to show clearly, in sequence, all salient features of the work of each trade including: the anticipated time of commencement and completion of such work and the interrelationship between such work, submission of Shop Drawings and Samples for approval, approval of Shop Drawings and Samples, placing of orders of materials, fabrication and delivery of materials, installation and testing of materials, contiguous or related work under other contracts, and other items pertinent to the work. The Notice to Proceed may be withheld until this schedule is received and is deemed responsive to the project requirements.
- 2). The proposed working plan and schedule shall be revised by the Contractor until they are satisfactory to the College and the Consultant, and the same shall be periodically updated bi-weekly thereafter. Whether or not the Consultant and the College have accepted the Project Schedule, submit the Project Schedule to the College and the Consultant for acceptance at such time or times as the College or the Consultant may request.
- 3). The proposed working plan and schedule, including any revision or revisions thereof, when accepted by both the College and the Consultant will become the Schedule of Record (SOR). The SOR, as the same may be revised as stated above by the Contractor and accepted by the College and the Consultant, shall be strictly adhered to by the Contractor.

Milestone Dates & Summary Activities (example)

- 1) Notice to Proceed (Milestone Date)
- 2) Mobilization
- 3) Site Preparation & Foundations
- 4) Demolition
- 5) Substantial Completion (Milestone Date)
- 6) Start of Guarantee Period
- 7) Contract Completion Date (if different from above)
- 8) Final Completion - All punch list/outstanding items satisfied (Milestone Date)

D. Supervision:

- 1). Contractor shall supervise and direct the Work, using Contractor's best skill and attention. Contractor shall be solely responsible for and have control over *construction means*, methods, techniques, sequences and procedures *including safety programs and procedures*, and for coordinating all portions of the Work under the Contract.
- 2). Contractor shall enforce strict discipline and good order among Contractor's employees and other persons carrying out the Contract. Contractor shall not permit employment of unfit persons or persons not skilled in tasks assigned to them.
- 3). Contractor shall be responsible for inspection of related portions of Work already performed, *as well as existing conditions*, to determine that such are in proper condition to receive subsequent Work.

E. Contractor shall be responsible to College for acts and omissions of Contractor's employees, Subcontractors and their agents and employees, and other *persons or entities directly or indirectly employed by them* performing portions of the Work under a contract with Contractor

F. Cutting and Patchwork:

- 1). Contractor shall be responsible for cutting, fitting or patching required to complete the Work or to make its parts fit together properly.
- 2). Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying or load-deflection ratio.
- 3). Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety (i.e., mechanical systems, plumbing, fire alarm, etc.).
- 4). Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
- 5). Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
- 6). Dispose of demolished items and materials promptly.
- 7). Return elements of construction and surfaces that are to remain to condition existing before selective demolition operations began.
- 8). Existing utilities services to the College must be maintained at all times. If the Contractor is required to affect these services in order to complete the Work, Contractor must obtain written permission from the College prior to this work (also see Special Requirements Section). Any damage or disruption of services shall need to be repaired immediately and at the Contractor's expense.

G. Hot Work Permits:

- 1) If the work requires any Hot Work (including cutting, welding, Thermit welding, brazing, soldering (except soldering electronics or electrical components with an electric soldering iron or gun), grinding, thermal spraying, thawing pipe, installation of torch-applied roof systems or any other similar situation), the Contractor shall be required to obtain a Hot Work Permit issued by the College. The Contractor shall request this through the College Representative, and be given a copy of the College's "Hot Work Guidelines and Permit Process" and the permit forms to be filled out. The Contractor must request, submit, and be given a permit before any Hot Work begins.

H. Cleaning Up:

- 1). Contractor shall *at all times* keep the premises and surrounding area free from accumulation of waste materials or rubbish caused by operations under the Contract. At completion of the Work Contractor shall remove from and about Project waste materials, rubbish, Contractor's tools, construction equipment, machinery and surplus materials.
- 2). If Contractor fails to clean up as provided in the Contract Documents, College may do so and the cost thereof shall be charged to Contractor.
- 3). If a dispute arises among Contractor, separate contractors and College as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish as described above, College may clean up and allocate the cost among those responsible

I. Access to Work: Contractor shall provide College access to *all portions of* the Work in preparation and progress wherever located.**J. Contractor's Coordination with the Utility Companies:**

- 1). The Contractor shall coordinate and cooperate with utility companies, including scheduling the work of other trades to sequence with the work schedule required by the utility companies.
- 2). The Contractor shall pay all costs associated with the work of the utility companies for extension and connection to their services on both a temporary and permanent basis. For gas services, standard fees and special fees for the specified pressure are required.
- 3). The Contractor shall accept the form of contract proposed by the utility companies without exception.
- 4). The Contractor shall provide any riders, amendments, etc. to its own insurance policies that it deems proper to cover the work of utility companies in accordance with the agreement or to cover other liabilities that may arise from the contractor's relationship with the utility companies on this project.
- 5). The Contractor shall provide prompt payments to utility companies as required to advance their work, but accept payment for such work from the College in accordance with the Agreement.
- 6). This project includes work to be performed by the following utility companies:

NAME	Contact	Telephone number
Con Edison	Steven Bell	914-925-6157

2.3 Communications Protocol for Contract Administration

- A. Except as otherwise provided in the Contract Documents or when direct communications have been specially authorized, Contractor shall communicate through the College Representative to the College. Communications by and with College's consultants shall be through College Representative. Communications by and with Subcontractors and material suppliers shall be through Contractor.

Part 3 – Construction Administration Management**3.1 Project Meetings**

- A. Periodic job meetings will be scheduled by the Consultant and the University during the course of construction. The Contractor, and, upon request of the Consultant and the University, its principal subcontractors and manufacturer's representatives, shall attend such meetings and be prepared to furnish answers to questions on progress, workmanship, or any other subject on which the Consultant and the University might reasonably require information.
- 1) In addition to the requirements of the Agreement, the Contractor shall submit bi-weekly reports to the Consultant summarizing the last two weeks of work and next two weeks of work anticipated, listing the percent of work complete by trade, tabulating manpower utilized / projected, relevant shop drawing and submittals progress, relevant offsite fabrication progress and providing other information which may be reasonably required to understand the progress of the work.

- 2) In addition to the above referenced meetings, the Contractor shall schedule and manage periodic coordination meetings at the site between it and all its trades, subcontractors, suppliers, manufacturers, etc. to settle the allotment of work per the Agreement and to review progress on submittals and shop drawing, progress on installation of the work, conflicts between work of trades, compliance with the design intent, adherence to the Contractor's schedule, quality control, planning for commissioning and training of campus personnel, and other items which require coordination and sharing of information. Representatives of the Consultant and the University may attend these meetings to observe and make comments. These meetings shall be held a minimum of once per month and more frequently where required to effectively coordinate the construction. The Contractor shall prepare and distribute summary minutes of these meetings within (5) five working days of the meeting, in accordance with the "Document Tracking and Change Control Paragraph" of this section. Distribution of the coordination meeting minutes shall be to all attendees with copies to the University and Consultant whether they are in attendance or not.
- 3) The personnel representing the Contractor and its principal subcontractors shall have the authority to make decisions directly affecting the work.
- 4) In addition to the above meetings, meet to review fire safety periodically during the work and, starting approximately (16) sixteen weeks prior to the scheduled date of substantial completion, the Contractor's principals, project manager and those of its significant subcontractors shall attend additional weekly meetings with the Owner and its consultant(s) to review the progress on preparing close out deliverables, including those in Sections Operating Instructions and Manuals, Warranties, and Training of Campus Personnel.

3.2 Requests for Information

- A. In the event that the Contractor determines that some portion of the Drawings and Project Manual for the project requires clarification or interpretation by the Consultant, the Contractor shall submit a Request for Information (RFI) in writing to the Consultant. The Contractor shall create an RFI log in a format approved by the Consultant. Submit the RFI log to the consultant prior to each periodic Field Meeting. Update the RFI log to reflect comments received at the Field Meetings. The Contractor shall define the issue that requires clarification or interpretation in clear and concise language as follows:
 - 1) The Contractor shall customize RFI forms and logs for this project and submit them to the Consultant for review and approval prior to submission of any RFIs.
 - 2) Forms should include provisions for the Consultant's response, Contractor acceptance of response or rephrasing of question, and the Consultant's additional response if requested.
 - 3) Forms should include provisions for locating the issue within the building, by room number, name and nearest columns.
 - 4) RFIs shall confirm that reasonable locations for the information required have been reviewed and document those locations by specific references to the Drawings and Project Manual on the RFI.
 - 5) The Contractor shall review the RFI for systemic or global implications, including review of other pending RFIs and work of other phases, so that the final RFI submitted represents a reasonable consolidation of similar requests.
 - 6) The Contractor shall coordinate and review the RFIs originating from its trades, subcontractors, suppliers, manufacturers, etc. for compliance with this process, including polling them and meeting with them onsite to review the issue prior to its submission as an RFI. The Consultant may attend such meetings.
 - 7) Contractor to coordinate response from Consultant with subcontractors.
 - 8) The RFI shall contain a description of what the Contractor believes to be the intent of the design documents, with due regard to the Agreement, along with reasons why the RFI is required.

- 9) RFIs shall only be submitted on the approved forms.
 - 10) RFIs that do not comply with the above requirements will be returned to the Contractor for revision and resubmission.
- B. The Consultant will review all RFIs to determine whether they are RFIs within the meaning of this term as defined above. If the Consultant determines that the document submitted is not an RFI, it will be returned to the Contractor un-reviewed as to content, for resubmission in the proper manner and it will be removed from the RFI log.
 - C. The Consultant will respond to all RFIs within (10) ten business days of its receipt, unless the Consultant determines that a longer time is required for an adequate, coordinated response. If the longer response time is deemed necessary, the Consultant will notify the Contractor of that necessity and indicate when the response will be completed within (10) ten business days of its original receipt.
 - D. Based on projects of similar complexity, it is anticipated that there may be up to (15) fifteen RFIs on this project and that multiple responses may be required to adequately answer each RFI.
 - E. Responses to RFIs shall not change any requirements of the documents.

3.3 Notice of Non-Compliance

- A. In the event the Consultant views the work or some portion thereof and finds that it has not been performed in accordance with the requirements of the contract documents, a Notice of Non-Compliance will be issued to the Contractor for action. Payment shall not be made for any portion of the work for which a Non-Compliance Notice has been issued and the work not corrected to the satisfaction of the Consultant.
- B. Upon receipt of a Non-Compliance Notice the Contractor shall provide a written response to the Notice within ten (10) working days after receipt of the Notice. The Contractor's response shall detail either:
 - 1) Why they believe that the work was performed in accordance with the contract documents, or,
 - 2) What corrective action they intend to take, at their sole expense, to correct the non-conforming work.
- C. Refer to the Agreement for Contractors contention to the decision.

3.4 Warranties

- A. Provide warranties for products, equipment, systems and installations required by other technical sections of Contract Documents for duration indicated. Warranties shall be individually listed in the project specific submittal log required by Shop Drawings and Samples.
 - 1) All warranties required by Contract Documents shall commence on date of Substantial Completion shown on Page a-1 of the Agreement.
 - a). At no additional cost to the College, for products, equipment, systems and installations completed prior to the date of Substantial Completion, obtain and pay for warranty extensions that cover the additional time between the earlier date of their completion and the date of Substantial Completion.
 - 2) Provide a list of all Contractor provided warranties that are specified in Divisions 1 through 48, inclusive, and list who will inspect the work covered by the warranty (if applicable), when it will be done, who witnessed it and when, results (pass/fail), follow up action, comments and other information requested by the Consultant.
 - a) Unless otherwise approved by the College, all inspections must be witnessed and signed off by the Consultant prior to acceptance of Contractor provided warranties that are specified in Divisions 1 through 48, inclusive.

- b) The Consultant will reject a Warranty issued prior to or without the manufacturer's field inspection of the work, if required in Divisions 1 through 48, inclusive.
- 3) Unless otherwise approved by the Consultant and if required in Divisions 1 through 48, inclusive, the scheduled value of a Contractor provided warranty in the Contract Breakdown required by the Agreement shall be 5% of the amount of the work being warranted.
- 4) Furnish and organize original warranties in a separate binder with a durable plastic cover. Organize the binder into separate sections by CSI number based on the table of contents of the project manual. Internally subdivide the binder contents with permanent page dividers, logically organized as described below, with tab titles clearly printed under reinforced laminated plastic tabs. Provide a printed Table of Contents.
 - a) Warranties shall be in the form required by the applicable technical sections of Contract Documents. Include procedures to follow and required notifications for warranty claims.
 - b) Warranty Certification: Written certification from the warrantor that the warranty is in effect and non-retractable due to any of the specified conditions. Warranties submitted without warranty certification will not be accepted.
 - c) Deliver the binder to the Consultant with the written notice of Substantial Completion required by the Agreement.
- 5). For uncompleted work delayed beyond date of Substantial Completion, provide updated binder submittal within (10) ten days after acceptance, indicating date of acceptance as start of warranty period for any work delayed beyond date of Substantial Completion.

Applications for payment after the date of Substantial Completion may not be approved until the warranty certification and warranty documents are delivered to the Consultant.

End of Special Conditions for Construction

SECTION 003126 – EXISTING HAZARDOUS MATERIALS INFORMATION

PART 1 - GENERAL

1.1 EXISTING HAZARDOUS MATERIAL INFORMATION

- A. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of Bidders' own investigations. They are made available for Bidders' convenience and information, but are not a warranty of existing conditions. This Document and its attachments are not part of the Contract Documents.
- B. A Pre-Renovation Inspection for Asbestos Containing Materials (ACM) report for Project, prepared by QuES&T, dated February 7, 2018, is appended to this Document.
- C. An existing lead report for Project, prepared by QuES&T, dated February 7, 2018, is appended to this Document.
- D. An existing PCB (Polychlorinate Biphenyl) information report for Project, prepared by QuES&T, dated February 7, 2018, is appended to this Document.
- E. Related Requirements:
 - 1. Division 00 Section "Geotechnical Data" for reports and soil-boring data from geotechnical investigations that are made available to bidders.
 - 2. Division 02 Section "Selective Demolition" for notification requirements if materials suspected of containing hazardous materials are encountered.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 003126



Quality Environmental Solutions & Technologies, Inc.

PRE-RENOVATION INSPECTION FOR ASBESTOS-CONTAINING MATERIALS (ACM)

for

**SUNY PURCHASE ASSOCIATION
735 Anderson Hill Rd.
Purchase, NY 10577**

at

**Café Building Renovation
735 Anderson Hill Rd.
Purchase, NY 10577**

Project #Q18-1530

QuES&T

Quality Environmental Solutions & Technologies, Inc.

February 7, 2018

SUNY Purchase Association
735 Anderson Hill Rd.
Purchase, NY 10577

ATTN: Patrick Savolskis

Via Email: patrick.savolskis@purchase.edu

Re.: SUNY Purchase
Café Building Renovation
Pre-Renovation Asbestos Inspection
QuES&T Project #Q18-1530

Dear Mrs. Savolskis,

Attached is the Pre-Renovation Inspection Report for Asbestos-containing Materials (ACM) identified throughout the interior Renovation Areas included within the above-referenced location(s) by **Quality Environmental Solutions & Technologies, Inc. (QuES&T)**. The inspection included visual assessment and representative sampling for the detection of ACM in compliance with the requirements of Title 12 NYCRR Part 56-5.1.

The attached report summarizes the inspection protocol and inspection results for your review. **QuES&T** believes this report accurately reflects the material condition existing in the functional spaces at the time of our inspection.

Should you wish to discuss this matter further or require additional information concerning this submittal, please contact us at (845) 298-6031. **QuES&T** appreciates the opportunity to assist SUNY Purchase Association in the environmental services area.

Sincerely,



Tanay Ranadive
Field and Technical Services
NYS AHERA Inspector
Cert. #AH 15-10696
NYS Mold Assessor

Cc: lgoldstein@qualityenv.com
QuES&T File



Quality Environmental Solutions & Technologies, Inc.

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Appendix A: Drawings & Floor Plans

Appendix B: Sample Results

Appendix C: Personnel Licenses & Certifications

I. INTRODUCTION:

Quality Environmental Solutions & Technologies, Inc. (**QuES&T**) performed an Asbestos Survey for Building/Structure Renovation, Remodeling and Repair, in conformance with Title 12 NYCRR Part 56-5.1, on January 17, 2018 and February 2, 2018 for SUNY Purchase Association in support of the upcoming renovation project in the Café Building at SUNY Purchase located at 735 Anderson Hill Rd, Purchase NY, 10577. The survey included a visual inspection/assessment suspect miscellaneous Asbestos-containing Materials (ACM) throughout accessible interior areas of Café.

QuES&T established functional spaces based either on physical barriers (i.e. walls, doors, etc.) or homogeneity of material. Within each functional space identified, a visual inspection was performed using reasonable care and judgment, to identify and assess location, quantity, friability and condition of all accessible installed ACM building materials observed at the affected portion of the building/structure.

Limited localized demolition of building surfaces was performed, as part of this survey, to access concealed surfaces. No disassembly of installed equipment was conducted as part of this inspection. ACM concealed within structural components and equipment interiors or that is accessible only through extensive mechanical or structural demolition may not have been identified as part of this survey. When any construction activity, such as demolition, remodeling, renovation or repair work, reveals PACM or suspect miscellaneous ACM that has not been identified, as part of this survey, all construction activities shall cease in the affected area.

The survey included both visual inspection of accessible spaces and representative sampling of suspect building materials for ACM. Samples collected were analyzed by a laboratory approved under the New York State Department of Health Environmental Laboratory Approval Program (NYSDOH ELAP). Samples were analyzed in the laboratory by Polarized Light Microscopy (PLM), Polarized Light Microscopy-NOB (PLM-NOB) and/or Quantitative Transmission Electron Microscopy (QTEM), as required. Sample collection and laboratory analysis were conducted in compliance with the requirements of Title 12 NYCRR Part 56-5.1, 29 CFR 1926.1101 and standard EPA & OSHA accepted methods. Samples consisting of multiple layers were separated and analyzed independently in the laboratory.

Certified **QuES&T** personnel (Appendix C), Mr. James D. Klemm (Cert. #AH 13-11486) & Mr. Shannon D. Talsma (Cert. #AH 16-07559) performed visual assessments throughout interior and exterior locations identified. A total of **one hundred twenty-six (126)** samples of installed and accessible suspect building materials were analyzed by a laboratory approved under the NYSDOH ELAP. **Forty-nine (49)** samples were analyzed using Polarized Light Microscopy (PLM) for friable materials; **thirty-eight (38)** samples were analyzed using Polarized Light Microscopy (PLM-NOB) for non-friable organically bound materials; and, **thirty-six (36)** samples were analyzed by Confirmatory-QTEM following negative-determinations using PLM-NOB protocols. **Three (3)** samples of Sprayed-On Fireproofing were analyzed by PLM (198.8) for surfacing materials containing vermiculite.

II. INSPECTION SUMMARY:

A visual inspection was performed and homogenous material types were established based on appearance, color and texture. The findings presented in this report are based upon reasonably available information and observed site conditions at the time the assessment was performed. The findings and conclusions of this report are not meant to be indicative of future conditions at the site and does not warrant against conditions that were not evident from visual observations or historical information obtained from others.

Representative bulk sampling was performed on suspect building materials for laboratory analysis using PLM, PLM-NOB and QTEM. The following is a summary of installed building materials sampled:

- Ceiling Materials – Sheetrock, Fiberboard, Ceiling Tile System (Multiple Varieties), Glue Dabs
- Wall Materials – Joint Compound & Sheetrock, Fiberboard, Cementitious Block & Mortar, Brick & Mortar, Adhesive, Cove Base Molding & Adhesive
- Flooring Materials – Quarry Tile, Grout & Mudset, Ceramic Tile System (Grout, Mudset), Cementitious Slab, Floor Tile & Mastic, Leveling Compound & Mastic, Epoxy Flooring
- Thermal System Insulation Materials – Mudded Joint Packing, Sprayed-On Fireproofing
- Exteriors Materials – Caulk, Waterproofing Tar, Weather Strip
- Miscellaneous Materials – Canvas Wrap, Sealant

III. IDENTIFIED ASBESTOS-CONTAINING MATERIALS (ACM):

(Please see attached Drawings for approx. ACM locations)

KEY: ACM = Materials containing greater than 1% of asbestos;
 LF = Linear Feet; SF = Square Feet; PACM = Presumed Asbestos-containing Materials;
Friable = ACM capable of being released into air, and which can be crumbled, pulverized, powdered, crushed or exposed by hand-pressure.

Location	Material	Approx. Qty.	Friable?	Condition
Café Building - Basement				
Basement, Storage Room, Closet A, Wall, on Cementitious Block	Glue Dabs	9 SF	No	Good
Basement, Storage Room, Closet A, Wall, on Cementitious Block	Glue Dabs	9 SF	No	Good
Storage Room, Rear Wall, By Closets A & B, on Sheetrock	Joint Compound	350 SF	Yes	Good
Closet A & B Upper Wall, Closet A Soffit, On Sheetrock	Joint Compound	150 SF	Yes	Good
Fan Room, Soffit, on Sheetrock	Joint Compound	300 SF	Yes	Good
Café Building – Main Area				
Staff Lounge, on Sheetrock	Joint Compound	150 SF	Yes	Good
Office 1 & 2, on Sheetrock	Joint Compound	350 SF	Yes	Good
Dining Area, on Sheetrock	Joint Compound	3,300 SF	Yes	Good
Café Building – Exteriors				

Note(S):

- ACM Waterproofing Tar was identified on concrete foundation below grade.

IV. GENERAL DISCUSSION:

All construction personnel as well as individuals who have access to locations where asbestos containing materials (ACM) exists should be informed of its presence and the proper work practices in these areas. Conspicuous labeling of all ACM is suggested to ensure personnel is adequately informed. Personnel should be informed not to rest, lean or store material or equipment on or near these surfaces and not to cut, saw, drill, sand or disturb ACM. All removal, disturbance, and repair of ACM should be performed in compliance with Title 12 NYCRR Part 56 by persons properly trained to handle ACM. Facility custodial and maintenance personnel should receive training commensurate with their work activities; as defined in 29 CFR 1910.1001.

The findings presented in this report are based upon reasonably available information and observed site conditions at the time the assessment was performed. Conditions may have changed since that time and the findings and conclusions of this report are not meant to be indicative of future conditions at the Site. This report does not warrant against conditions that were not evident from visual observations or historical information obtained, or conditions that could only be determined by physical sampling or other intrusive investigation techniques that are outside the proposed scope of work.

V. ABATEMENT REQUIRED:

As specified in Title 12 NYCRR Part 56-5.1 (h) and (i), "If the building/structure asbestos survey finds that the portion of the building/structure to be demolished, renovated, remodeled, or have repair work contains ACM, PACM, suspect miscellaneous ACM assumed to be ACM, or asbestos material, which is impacted by the work, the owner or the owner's agent shall conduct, or cause to have conducted, asbestos removal performed by a licensed asbestos abatement contractor in conformance with all standards set forth in this Part. All ACM, PACM, suspect miscellaneous ACM assumed to be ACM, or asbestos material impacted by the demolition, renovation, remodeling or repair project shall be removed as per this Part, prior to access or disturbance by other uncertified trades or personnel. No demolition, renovation, remodeling or repair work shall be commenced by any owner or the owner's agent prior to the completion of the asbestos abatement in accordance with the notification requirements of this Part...All building/structure owners and asbestos abatement contractors on a demolition, renovation, remodeling, or repair project, which includes work covered by this part, shall inform all trades on the work site about PACM, ACM, asbestos material and suspect miscellaneous ACM...Bids may be advertised and contracts awarded for demolition, remodeling, renovation, or repair work, but no work on the current intermediate portion of the project shall commence on the demolition, renovation, remodeling or repair work by any owner or agent prior to completion of all necessary asbestos abatement work for the current intermediate portion of the entire project, in conformance with all standards set forth in this Part."

Prior to conducting demolition or construction work at the building, all ACM affected/impacted by such activities shall be removed utilizing a licensed asbestos abatement contractor and NYSDOL/EPA/NYC certified personnel prior to construction/demolition activities. All work conducted should be in accordance with all legal requirements, including but not limited to U.S. Environmental Protection Agency (EPA) National Emissions Standards for Hazardous Air Pollutants (NESHAP) [40 CFR Part 61], New York State Industrial Code Rule 56 Asbestos Regulations (ICR 56) and Chapter 1 of Title 15 of the Rules of the City of New York Regulations, as applicable. Advance notification of the asbestos project to the USEPA, NYSDOL, and NYCDEP may be required.

All suspect building materials not sampled during this survey should be considered ACM until these materials are sampled and analyzed for ACM in the laboratory. Concealed ACM: In addition to the ACMs identified at the site, there is a possibility that concealed ACM may exist at the subject facility. As such, if any concealed suspect ACM is encountered during future construction related activities, the work should immediately stop. Prior to resuming the work, the suspect ACM should either be 1) Sampled by an appropriately-certified asbestos professional and submitted to an Approved NYSDOH ELAP laboratory for asbestos analysis or 2) Presumed to be ACM (PACM) and removed by a licensed asbestos abatement contractor for disposal in accordance with all applicable regulations.

VI. DISCLAIMERS

It should be noted that the information contained within this report is based solely upon site observations and the results of laboratory analysis for samples collected by **QuES&T**. These observations and results are time dependent, subject to changing site conditions and revisions to Federal, State and Local regulations. **QuES&T** warrants that these findings have been promulgated after being prepared in general accordance with generally accepted practices in the abatement industries. **QuES&T** also recognizes that inspection laboratory data is not usually sufficient to make all abatement and management decisions.

Due to the potential for concealed Asbestos-containing Materials (ACM) or other regulated materials, this report should not be construed to represent all ACM or regulated materials within the site(s). All quantities of ACM or other regulated materials identified, and all dimensions listed within this report are approximate and should be verified On-site.

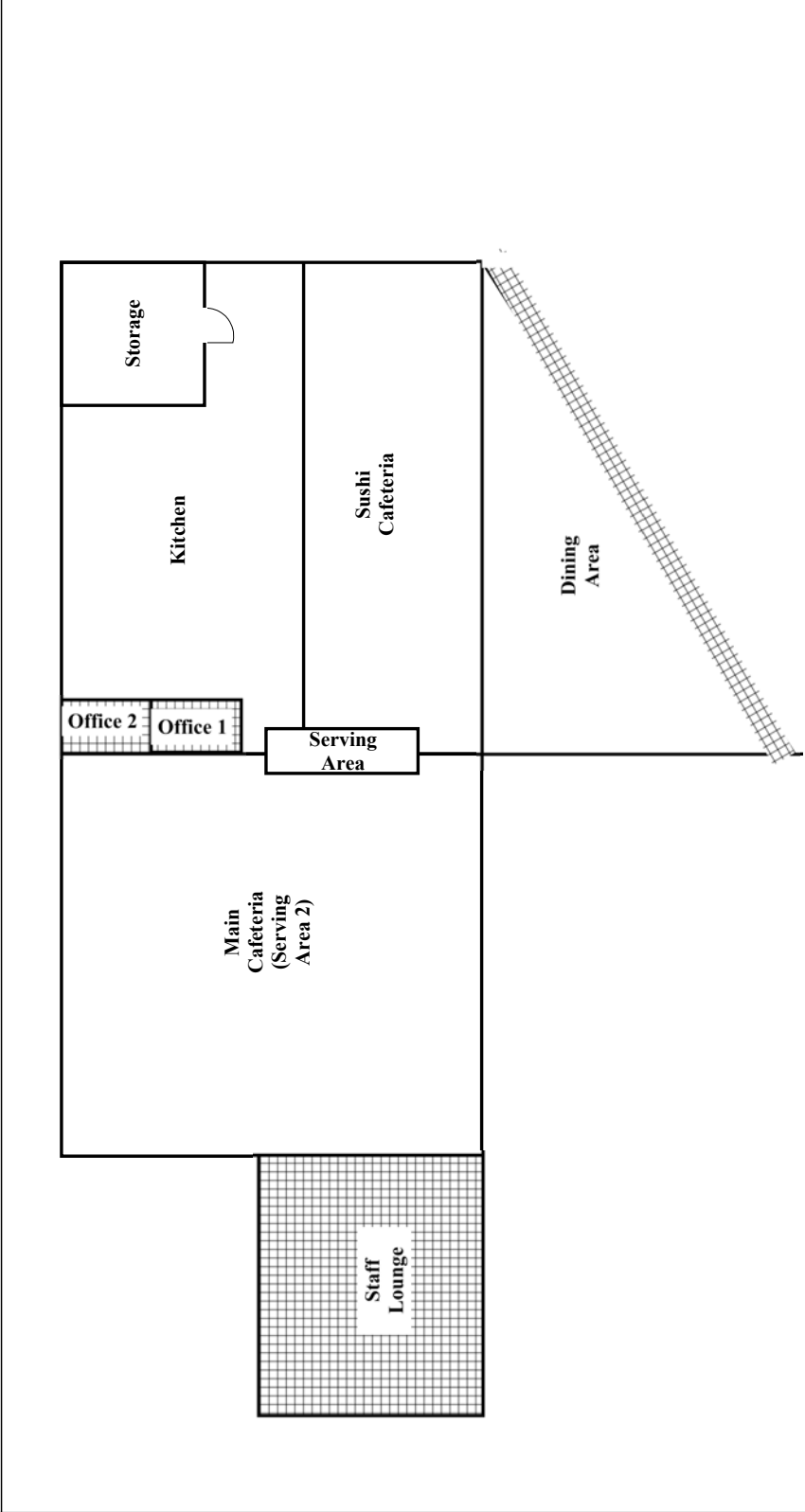
This inspection report is not intended to be used as the sole basis for soliciting pricing for asbestos abatement. An abatement plan, specification, drawing and/or Variances should be developed to identify scope, timing, phasing and remediation means & methods for any asbestos project. The Linear and/or Square Footages (LF / SF) listed within this Report are only approximates. Abatement Contractor(s) are required to visit the building(s) in order to take actual field measurements within each listed location.



Quality Environmental Solutions & Technologies, Inc.

Appendix A: DRAWINGS & FLOOR PLANS

SUNY Purchase - Main Floor

[illegible]

Firstt Floor Key Plan - ACM Locations

****Drawing Not to Scale****

This Drawing is not intended to be used as the sole basis for soliciting pricing for asbestos abatement. An abatement plan, specification, drawing and/or variances should be developed to identify scope, timing, phasing and remediation means & methods for any asbestos project.

z
△

ASB - 02

Date: _____
Version # _____

Issued For: Pre-Reno Asbestos Survey

Project NO: Q18-1530

Project Manager:
Larry Goldstein

Drawing Prepared By:
Tanay Ranadive

TESTO

Quality Environmental
Solutions & Technologies, Inc.
1376 Route 9
Wappingers Falls, NY 12590
Phone: (845) 298-6031
Fax: (845) 298-6251

SUNY Purchase Association
735 Anderson Hill Road
Purchase, NY 10577

SUNY Purchase
Cafe Building
735 Anderson Hill Road
Purchase, NY 10577



Quality Environmental Solutions & Technologies, Inc.

Appendix B: SAMPLE RESULTS



EMSL Analytical, Inc.

307 West 38th Street New York, NY 10018

Tel/Fax: (212) 290-0051 / (212) 290-0058

<http://www.EMSL.com> / manhattanlab@emsl.com

EMSL Order: 031801391

Customer ID: QUES51

Customer PO:

Project ID:

Attention: Quality Environmental Solution & Tech

1376 Route 9

Wappingers Falls, NY 12590

Phone: (845) 298-6031

Fax: (845) 298-6251

Received Date: 01/19/2018 11:22 AM

Analysis Date: 01/24/2018

Collected Date: 01/17/2018

Project: Q18-1530 / CAFE RENOVATION

Test Report:Asbestos Analysis of Bulk Material

		Non-Asbestos			
Test	Analyzed Date	Color	Fibrous	Non-Fibrous	Asbestos
Sample ID 1530-01 031801391-0001		Description	BASEMENT FAN ROOM ON METAL PIPE AT ELBOW - MUDDED JOINT PACKING		
		Homogeneity	Homogeneous		
PLM NYS 198.1 Friable	01/24/2018	Gray	30.00% Min. Wool	33.00% Ca Carbonate 37.00% Non-fibrous (other)	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 1530-02 031801391-0002		Description	BASEMENT STORAGE ROOM ON METAL PIPE AT ELBOW - MUDDED JOINT PACKING		
		Homogeneity	Homogeneous		
PLM NYS 198.1 Friable	01/24/2018	Gray	40.00% Min. Wool	25.00% Ca Carbonate 35.00% Non-fibrous (other)	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 1530-03 031801391-0003		Description	BASEMENT STORAGE ROOM ON METAL PIPE AT ELBOW - MUDDED JOINT PACKING		
		Homogeneity	Homogeneous		
PLM NYS 198.1 Friable	01/24/2018	Gray	15.00% Min. Wool	60.00% Gypsum 25.00% Non-fibrous (other)	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 1530-04 031801391-0004		Description	BASEMENT FAN ROOM ON METAL SUPPORT COLUMN - SPRAYED ON FIREPROOFING		
		Homogeneity	Homogeneous		
PLM NYS 198.1 Friable	01/24/2018	Tan	None	100.00% Non-fibrous (other) Vermiculite Present	
Surfacing Material containing vermiculite. NYS requires ELAP method 198.8.					
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 1530-05 031801391-0005		Description	BASEMENT STORAGE ROOM ON METAL SUPPORT COLUMN - SPRAYED ON FIREPROOFING		
		Homogeneity	Homogeneous		
PLM NYS 198.1 Friable	01/24/2018	Tan	None	100.00% Non-fibrous (other) Vermiculite Present	
Surfacing Material containing vermiculite. NYS requires ELAP method 198.8.					
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed

Initial Report From: 01/24/2018 11:36:14



EMSL Analytical, Inc.

307 West 38th Street New York, NY 10018

Tel/Fax: (212) 290-0051 / (212) 290-0058

<http://www.EMSL.com> / manhattanlab@emsl.com

EMSL Order: 031801391

Customer ID: QUES51

Customer PO:

Project ID:

Test Report:Asbestos Analysis of Bulk Material

		Analyzed	Non-Asbestos			
Test	Date	Color	Fibrous	Non-Fibrous	Asbestos	
Sample ID	1530-06		Description	BASEMENT FAN ROOM ON METAL SUPPORT COLUMN - SPRAYED ON FIREPROOFING		
	031801391-0006		Homogeneity	Homogeneous		
PLM NYS 198.1 Friable	01/24/2018	Tan	None	100.00% Non-fibrous (other) Vermiculite Present		
Surfacing Material containing vermiculite. NYS requires ELAP method 198.8.						
PLM NYS 198.6 VCM					Not Analyzed	
PLM NYS 198.6 NOB					Not Analyzed	
TEM NYS 198.4 NOB					Not Analyzed	
Sample ID	1530-07		Description	BASEMENT STORAGE ROOM ON METAL SUPPORT COLUMN - SPRAYED ON FIREPROOFING		
	031801391-0007		Homogeneity	Homogeneous		
PLM NYS 198.1 Friable	01/24/2018	Gray	40.00% Min. Wool	22.00% Ca Carbonate 38.00% Non-fibrous (other)	None Detected	
PLM NYS 198.6 VCM					Not Analyzed	
PLM NYS 198.6 NOB					Not Analyzed	
TEM NYS 198.4 NOB					Not Analyzed	
Sample ID	1530-08		Description	BASEMENT STORAGE ROOM ON METAL SUPPORT COLUMN - SPRAYED ON FIREPROOFING		
	031801391-0008		Homogeneity	Homogeneous		
PLM NYS 198.1 Friable	01/24/2018	Gray	40.00% Min. Wool	30.00% Ca Carbonate 30.00% Non-fibrous (other)	None Detected	
PLM NYS 198.6 VCM					Not Analyzed	
PLM NYS 198.6 NOB					Not Analyzed	
TEM NYS 198.4 NOB					Not Analyzed	
Sample ID	1530-09		Description	BASEMENT STORAGE ROOM ON METAL SUPPORT COLUMN - SPRAYED ON FIREPROOFING		
	031801391-0009		Homogeneity	Homogeneous		
PLM NYS 198.1 Friable	01/24/2018	Gray	35.00% Min. Wool	30.00% Ca Carbonate 35.00% Non-fibrous (other)	None Detected	
PLM NYS 198.6 VCM					Not Analyzed	
PLM NYS 198.6 NOB					Not Analyzed	
TEM NYS 198.4 NOB					Not Analyzed	
Sample ID	1530-10		Description	FIRST FLOOR KITCHEN STORAGE ROOM ON METAL SUPPORT COLUMNS - SPRAYED ON FIREPROOFING		
	031801391-0010		Homogeneity	Homogeneous		
PLM NYS 198.1 Friable	01/24/2018	Gray	42.00% Min. Wool	35.00% Ca Carbonate 23.00% Non-fibrous (other)	None Detected	
PLM NYS 198.6 VCM					Not Analyzed	
PLM NYS 198.6 NOB					Not Analyzed	
TEM NYS 198.4 NOB					Not Analyzed	

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EMSL Order: 031801391

Customer ID: QUES51

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Test Report:Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos		Asbestos
			Fibrous	Non-Fibrous	
Sample ID 1530-11 031801391-0011		Description Homogeneity	FIRST FLOOR KITCHEN STORAGE ROOM ON METAL SUPPORT COLUMNS - SPRAYED ON FIREPROOFING Homogeneous		
PLM NYS 198.1 Friable	01/24/2018	Gray	38.00% Min. Wool	30.00% Ca Carbonate 32.00% Non-fibrous (other)	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 1530-12 031801391-0012		Description Homogeneity	FIRST FLOOR KITCHEN STORAGE ROOM ON METAL SUPPORT COLUMNS - SPRAYED ON FIREPROOFING Homogeneous		
PLM NYS 198.1 Friable	01/24/2018	Gray	75.00% Min. Wool	20.00% Gypsum 5.00% Non-fibrous (other)	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 1530-13 031801391-0013		Description Homogeneity	BASEMENT STORAGE ROOM PARTITION WALL ON SHEETROCK - JOINT COMPOUND Homogeneous		
PLM NYS 198.1 Friable	01/24/2018	Gray		53.00% Ca Carbonate 47.00% Non-fibrous (other)	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 1530-14 031801391-0014		Description Homogeneity	BASEMENT STORAGE ROOM PARTITION WALL ON SHEETROCK - JOINT COMPOUND Homogeneous		
PLM NYS 198.1 Friable	01/24/2018	White		60.00% Ca Carbonate 40.00% Non-fibrous (other)	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 1530-15 031801391-0015		Description Homogeneity	BASEMENT HALLWAY OUTSIDE STORAGE ROOM PARTITION WALL ON SHEETROCK - JOINT COMPOUND Homogeneous		
PLM NYS 198.1 Friable	01/24/2018	White		55.00% Ca Carbonate 45.00% Non-fibrous (other)	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 1530-16 031801391-0016		Description Homogeneity	FIRST FLOOR CAFÉ SERVING AREA WALL ON SHEETROCK - JOINT COMPOUND Homogeneous		
PLM NYS 198.1 Friable	01/24/2018	White		57.00% Ca Carbonate 43.00% Non-fibrous (other)	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed

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Test Report:Asbestos Analysis of Bulk Material

		Non-Asbestos			
Test	Analyzed Date	Color	Fibrous	Non-Fibrous	Asbestos
Sample ID	1530-17	Description	FIRST FLOOR CAFÉ DINING ROOM WALL ON SHEETROCK - JOINT COMPOUND		
	031801391-0017	Homogeneity	Homogeneous		
PLM NYS 198.1 Friable	01/24/2018	Tan	None	48.00% Ca Carbonate 6.00% Mica 44.04% Non-fibrous (other)	1.96% Chrysotile
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID	1530-18	Description	FIRST FLOOR CAFÉ STAFF LOUNGE WALL ON SHEETROCK - JOINT COMPOUND		
	031801391-0018	Homogeneity	Homogeneous		
PLM NYS 198.1 Friable	01/24/2018	Gray/ White	None	40.00% Ca Carbonate 58.74% Non-fibrous (other)	1.26% Chrysotile
Result includes a small amount of inseparable attached material					
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID	1530-19	Description	FIRST FLOOR CAFÉ STAFF LOUNGE WALL ON SHEETROCK - JOINT COMPOUND		
	031801391-0019	Homogeneity	Homogeneous		
PLM NYS 198.1 Friable	01/24/2018	Tan	None	46.00% Ca Carbonate 5.00% Mica 46.86% Non-fibrous (other)	2.14% Chrysotile
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID	1530-20	Description	FIRST FLOOR CAFÉ KITCHEN OFFICE WALL ON SHEETROCK - JOINT COMPOUND		
	031801391-0020	Homogeneity	Homogeneous		
PLM NYS 198.1 Friable	01/24/2018	Tan	None	15.00% Mica 83.06% Non-fibrous (other)	1.94% Chrysotile
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID	1530-21	Description	FIRST FLOOR CAFÉ MAIN SERVING AREA WALL ON SHEETROCK - JOINT COMPOUND		
	031801391-0021	Homogeneity	Homogeneous		
PLM NYS 198.1 Friable	01/24/2018	White		57.00% Ca Carbonate 43.00% Non-fibrous (other)	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed

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Test Report:Asbestos Analysis of Bulk Material

		Non-Asbestos			
Test	Analyzed Date	Color	Fibrous	Non-Fibrous	Asbestos
Sample ID	1530-22	Description	BASEMENT CAFÉ FAN ROOM SOFFIT ON SHEETROCK - JOINT COMPOUND		
	031801391-0022	Homogeneity	Homogeneous		
PLM NYS 198.1 Friable	01/24/2018	Tan	None	58.00% Ca Carbonate 6.00% Mica 33.84% Non-fibrous (other)	2.16% Chrysotile
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID	1530-23	Description	BASEMENT STORAGE ROOM CLOSET B WALL ON SHEETROCK - JOINT COMPOUND		
	031801391-0023	Homogeneity	Homogeneous		
PLM NYS 198.1 Friable	01/24/2018	Tan	None	55.00% Ca Carbonate 15.00% Mica 27.78% Non-fibrous (other)	2.22% Chrysotile
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID	1530-24	Description	BASEMENT STORAGE ROOM CLOSET B WALL ON SHEETROCK - JOINT COMPOUND		
	031801391-0024	Homogeneity	Homogeneous		
PLM NYS 198.1 Friable	01/24/2018	Tan	None	45.00% Ca Carbonate 15.00% Mica 37.62% Non-fibrous (other)	2.38% Chrysotile
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID	1530-25	Description	BASEMENT STORAGE ROOM CLOSET A WALL - SHEETROCK		
	031801391-0025	Homogeneity	Homogeneous		
PLM NYS 198.1 Friable	01/24/2018	Gray	4.00% Cellulose	78.00% Gypsum 18.00% Non-fibrous (other)	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID	1530-26	Description	BASEMENT STORAGE ROOM CLOSET B WALL - SHEETROCK		
	031801391-0026	Homogeneity	Homogeneous		
PLM NYS 198.1 Friable	01/24/2018	Gray	5.00% Cellulose	77.00% Gypsum 18.00% Non-fibrous (other)	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID	1530-27	Description	FIRST FLOOR CAFÉ DINING ROOM SOFFIT - SHEETROCK		
	031801391-0027	Homogeneity	Homogeneous		
PLM NYS 198.1 Friable	01/24/2018	Gray	4.00% Cellulose	80.00% Gypsum 16.00% Non-fibrous (other)	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed

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Test Report:Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos		Asbestos
			Fibrous	Non-Fibrous	
Sample ID 1530-28 031801391-0028		Description FIRST FLOOR CAFÉ MAIN SERVING AREA WALL - SHEETROCK			
		Homogeneity Homogeneous			
PLM NYS 198.1 Friable	01/24/2018	Gray	15.00% Cellulose	65.00% Gypsum 20.00% Non-fibrous (other)	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 1530-29 031801391-0029		Description BASEMENT FAN ROOM AROUND DUCT - CANVAS WRAP			
		Homogeneity Homogeneous			
PLM NYS 198.1 Friable	01/24/2018	Gray	60.00% Cellulose	40.00% Non-fibrous (other)	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 1530-30 031801391-0030		Description BASEMENT FAN ROOM AROUND DUCT - CANVAS WRAP			
		Homogeneity Homogeneous			
PLM NYS 198.1 Friable	01/24/2018	Gray	92.00% Cellulose	8.00% Non-fibrous (other)	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 1530-31-Quarry Tile 031801391-0031		Description FIRST FLOOR SERVING AREA FLOOR - QUARRY TILE & MUDSET (SEPARATE LAYERS)			
		Homogeneity Homogeneous			
PLM NYS 198.1 Friable	01/24/2018	Red		90.00% Non-fibrous (other) 10.00% Quartz	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 1530-31-Mudset 031801391-0031A		Description FIRST FLOOR SERVING AREA FLOOR - QUARRY TILE & MUDSET (SEPARATE LAYERS)			
		Homogeneity Homogeneous			
PLM NYS 198.1 Friable	01/24/2018	Gray		10.00% Ca Carbonate 78.00% Non-fibrous (other) 12.00% Quartz	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 1530-32-Quarry Tile 031801391-0032		Description FIRST FLOOR SERVING AREA FLOOR - QUARRY TILE & MUDSET (SEPARATE LAYERS)			
		Homogeneity Homogeneous			
PLM NYS 198.1 Friable	01/24/2018	Red		85.00% Non-fibrous (other) 15.00% Quartz	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed

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Test Report:Asbestos Analysis of Bulk Material

		Non-Asbestos			
Test	Analyzed Date	Color	Fibrous	Non-Fibrous	Asbestos
Sample ID	1530-32-Mudset 031801391-0032A	Description Homogeneity	FIRST FLOOR SERVING AREA FLOOR - QUARRY TILE & MUDSET (SEPARATE LAYERS) Homogeneous		
PLM NYS 198.1 Friable	01/24/2018	Gray		30.00% Gypsum 25.00% Non-fibrous (other) 45.00% Quartz	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID	1530-33 031801391-0033	Description Homogeneity	FIRST FLOOR CAFÉ SERVING AREA BETWEEN QUARRY TILE - GROUT Homogeneous		
PLM NYS 198.1 Friable	01/24/2018	Gray		34.00% Ca Carbonate 40.00% Non-fibrous (other) 26.00% Quartz	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID	1530-34 031801391-0034	Description Homogeneity	FIRST FLOOR CAFÉ SERVING AREA BETWEEN QUARRY TILE - GROUT Homogeneous		
PLM NYS 198.1 Friable	01/24/2018	Gray		35.00% Gypsum 25.00% Non-fibrous (other) 40.00% Quartz	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID	1530-35 031801391-0035	Description Homogeneity	BASEMENT STORAGE ROOM CLOSET B WALL ON SHEETROCK - FIBERBOARD Homogeneous		
PLM NYS 198.1 Friable	01/24/2018	Brown	85.00% Cellulose	15.00% Non-fibrous (other)	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID	1530-36 031801391-0036	Description Homogeneity	BASEMENT STORAGE ROOM CLOSET B CEILING - FIBERBOARD Homogeneous		
PLM NYS 198.1 Friable	01/24/2018	Brown	96.00% Cellulose	4.00% Non-fibrous (other)	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID	1530-37 031801391-0037	Description Homogeneity	FIRST FLOOR CAFÉ MAIN SERVING AREA FLOOR LARGE TILE - CERAMIC TILE Homogeneous		
PLM NYS 198.1 Friable	01/24/2018	Gray		95.00% Non-fibrous (other) 5.00% Quartz	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed

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Test Report:Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos		Asbestos
			Fibrous	Non-Fibrous	
Sample ID 1530-38 031801391-0038		Description Homogeneity	FIRST FLOOR CAFÉ MAIN SERVING AREA FLOOR LARGE TILE - CERAMIC TILE Homogeneous		
PLM NYS 198.1 Friable	01/24/2018	Tan		85.00% Non-fibrous (other) 15.00% Quartz	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 1530-39 031801391-0039		Description Homogeneity	FIRST FLOOR CAFÉ MAIN SERVING AREA FLOOR SMALL TILE - CERAMIC TILE Homogeneous		
PLM NYS 198.1 Friable	01/24/2018	Blue		98.00% Non-fibrous (other) 2.00% Quartz	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 1530-40 031801391-0040		Description Homogeneity	FIRST FLOOR CAFÉ MAIN SERVING AREA FLOOR SMALL TILE - CERAMIC TILE Homogeneous		
PLM NYS 198.1 Friable	01/24/2018	Blue		75.00% Non-fibrous (other) 25.00% Quartz	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 1530-41 031801391-0041		Description Homogeneity	BASEMENT STORAGE ROOM FLOOR - CEMENTITIOUS SLAB Homogeneous		
PLM NYS 198.1 Friable	01/24/2018	Gray		35.00% Gypsum 25.00% Non-fibrous (other) 40.00% Quartz	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 1530-42 031801391-0042		Description Homogeneity	FIRST FLOOR CAFÉ KITCHEN FLOOR UNDER EPOXY FLOORING - CEMENTITIOUS SLAB Homogeneous		
PLM NYS 198.1 Friable	01/24/2018	Gray		30.00% Ca Carbonate 48.00% Non-fibrous (other) 22.00% Quartz	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed

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Test Report:Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos		Asbestos
			Fibrous	Non-Fibrous	
Sample ID 1530-43 031801391-0043		Description	FIRST FLOOR CAFÉ KITCHEN WALL - CEMENTITIOUS BLOCK		
		Homogeneity	Homogeneous		
PLM NYS 198.1 Friable	01/24/2018	Gray		40.00% Gypsum 25.00% Non-fibrous (other) 35.00% Quartz	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 1530-44 031801391-0044		Description	BASEMENT STORAGE ROOM WALL - CEMENTITIOUS BLOCK		
		Homogeneity	Homogeneous		
PLM NYS 198.1 Friable	01/24/2018	Gray		25.00% Ca Carbonate 39.00% Non-fibrous (other) 36.00% Quartz	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 1530-45 031801391-0045		Description	BASEMENT FAN ROOM WALL BETWEEN CEMENTITIOUS BLOCK - MORTAR		
		Homogeneity	Homogeneous		
PLM NYS 198.1 Friable	01/24/2018	Gray		25.00% Ca Carbonate 35.00% Non-fibrous (other) 40.00% Quartz	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 1530-46 031801391-0046		Description	BASEMENT FAN ROOM WALL BETWEEN CEMENTITIOUS BLOCK - MORTAR		
		Homogeneity	Homogeneous		
PLM NYS 198.1 Friable	01/24/2018	Gray		30.00% Ca Carbonate 30.00% Non-fibrous (other) 40.00% Quartz	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 1530-47 031801391-0047		Description	FIRST FLOOR CAFÉ DINING AREA WALL BETWEEN BRICK - MORTAR		
		Homogeneity	Homogeneous		
PLM NYS 198.1 Friable	01/24/2018	Gray		25.00% Ca Carbonate 37.00% Non-fibrous (other) 38.00% Quartz	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed

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Test Report:Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos		Asbestos
			Fibrous	Non-Fibrous	
Sample ID 1530-48 031801391-0048		Description Homogeneity	FIRST FLOOR CAFÉ DINING AREA WALL BETWEEN BRICK - MORTAR Homogeneous		
PLM NYS 198.1 Friable	01/24/2018	Red		90.00% Non-fibrous (other) 10.00% Quartz	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 1530-49 031801391-0049		Description Homogeneity	FIRST FLOOR CAFÉ DINING AREA WALL - BRICK Homogeneous		
PLM NYS 198.1 Friable	01/24/2018	Gray/ Red		86.00% Non-fibrous (other) 14.00% Quartz	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 1530-50 031801391-0050		Description Homogeneity	FIRST FLOOR CAFÉ DINING AREA WALL - BRICK Homogeneous		
PLM NYS 198.1 Friable	01/24/2018	Gray		75.00% Non-fibrous (other) 25.00% Quartz	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 1530-51 031801391-0051		Description Homogeneity	FIRST FLOOR KITCHEN SUSPENDED CEILING SHEETROCK - CEILING TILE Homogeneous		
PLM NYS 198.1 Friable	01/24/2018	Gray		80.00% Gypsum 20.00% Non-fibrous (other)	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 1530-52 031801391-0052		Description Homogeneity	FIRST FLOOR KITCHEN SUSPENDED CEILING SHEETROCK - CEILING TILE Homogeneous		
PLM NYS 198.1 Friable	01/24/2018	Brown/ White	15.00% Cellulose 3.00% Glass	60.00% Gypsum 22.00% Non-fibrous (other)	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 1530-53 031801391-0053		Description Homogeneity	FIRST FLOOR CAFÉ DINING AREA UNDER CERAMIC TILE ON CEMENTITIOUS SLAB - MUDSET Homogeneous		
PLM NYS 198.1 Friable	01/24/2018	Gray		28.00% Ca Carbonate 37.00% Gypsum 35.00% Non-fibrous (other)	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed

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<http://www.EMSL.com> / manhattanlab@emsl.com

EMSL Order: 031801391

Customer ID: QUES51

Customer PO:

Project ID:

Test Report:Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos		Asbestos
			Fibrous	Non-Fibrous	
Sample ID 1530-54 031801391-0054		Description Homogeneity	FIRST FLOOR CAFÉ DINING AREA UNDER CERAMIC TILE ON CEMENTITIOUS SLAB - MUDSET Homogeneous		
PLM NYS 198.1 Friable	01/24/2018	Gray		40.00% Gypsum 25.00% Non-fibrous (other) 35.00% Quartz	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 1530-55 031801391-0055		Description Homogeneity	FIRST FLOOR CAFÉ DINING AREA BETWEEN CERAMIC TILE - GROUT Homogeneous		
PLM NYS 198.1 Friable	01/24/2018	Gray		28.00% Ca Carbonate 40.00% Gypsum 32.00% Non-fibrous (other)	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 1530-56 031801391-0056		Description Homogeneity	FIRST FLOOR CAFÉ DINING AREA BETWEEN CERAMIC TILE - GROUT Homogeneous		
PLM NYS 198.1 Friable	01/24/2018	Gray		35.00% Gypsum 25.00% Non-fibrous (other) 40.00% Quartz	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed

Initial Report From: 01/24/2018 11:36:14



EMSL Analytical, Inc.

307 West 38th Street New York, NY 10018

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<http://www.EMSL.com> / manhattanlab@emsl.com

EMSL Order: 031801391

Customer ID: QUES51

Customer PO:

Project ID:

Test Report: Asbestos Analysis of Bulk Material

The samples in this report were submitted to EMSL for analysis by Asbestos Analysis of Bulk Materials via NYS ELAP Approved Methods. The reference number for these samples is the EMSL Order ID above. Please use this reference number when calling about these samples.

Report Comments:

Sample Receipt Date: 1/19/2018

Sample Receipt Time: 11:22 AM

Analysis Completed Date: 1/24/2018

Analysis Completed Time: 4:10 AM

Analyst(s):

Deen Liang PLM NYS 198.1 Friable (38)

Emily Myint PLM NYS 198.1 Friable (20)

Samples reviewed and approved by:

James Hall, Laboratory Manager
or Other Approved Signatory

NOB = Non Friable Organically Bound N/A = Not Applicable VCM = Vermiculite Containing Material

-In New York State, TEM is currently the only method that can be used to determine if NOB materials can be considered or treated as non-asbestos containing.

All samples examined for the presence of vermiculite when analyzed via NYS 198.1.

-NYS Guidelines for Vermiculite containing samples are available at http://www.wadsworth.org/labcert/elapcert/forms/VermiculiteInterimGuidance_Rev070913.pdf EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples were received in good condition unless otherwise noted.

This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government. This report may contain data that is not covered by the NVLAP accreditation.

Samples analyzed by EMSL Analytical, Inc. New York, NY NYS ELAP 11506

Initial Report From: 01/24/2018 11:36:14

QUALITY ENVIRONMENTAL SOLUTIONS & TECHNOLOGIES, INC.

BULK SAMPLE FORM

031801391

CLIENT: SUNY Purchase AssociationSAMPLED BY: J. Klemm, S. TalsmaADDRESS: 735 Anderson Hill RoadDATE SAMPLED: 17-Jan-18Purchase, NY 10577CONTACT: Patrick SavolskiANALYSIS METHOD: PLMPROJECT ID: Café Renovation

TURN-AROUND TIME: _____ HOURS

5 DAYSPROJECT #: Q18-1530

OTHER

SAMPLE # LAB#	LOCATION	SAMPLE DESCRIPTION	COMMENTS
1530-01	Basement, Fan Room, on Metal Pipe, at Elbow	Mudded Joint Packing	Stop
1530-02	Basement, Storage Room, on Metal Pipe, at Elbow	Mudded Joint Packing	At First
1530-03	Basement, Storage Room, on Metal Pipe, at Elbow	Mudded Joint Packing	Positive
1530-04	Basement, Fan Room, on Metal Support Column	Sprayed-on Fireproofing	Stop
1530-05	Basement, Storage Room, on Metal Support Column	Sprayed-on Fireproofing	At First
1530-06	Basement, Fan Room, on Metal Support Column	Sprayed-on Fireproofing	Positive
1530-07	Basement, Storage Room, on Metal Support Column	Sprayed-on Fireproofing	Stop
1530-08	Basement, Storage Room, on Metal Support Column	Sprayed-on Fireproofing	At First
1530-09	Basement, Storage Room, on Metal Support Column	Sprayed-on Fireproofing	Positive
1530-10	First Floor, Kitchen Storage Room, on Metal Support Columns	Sprayed-on Fireproofing	Stop

CHAIN OF CUSTODY (SEE LAST PAGE)

SUBMITTED BY: _____

DATE: 1-18-18

RECEIVED BY: _____

DATE: 1/19/18 11:22 AMEmily Mont 1-24-18 11:35APAGE 1 OF 6oc 1/24/18
GA

QUALITY ENVIRONMENTAL SOLUTIONS & TECHNOLOGIES, INC.

BULK SAMPLE FORM

CLIENT: SUNY Purchase Association SAMPLED BY: J. Klemm, S. Talsma
 ADDRESS: 735 Anderson Hill Road DATE SAMPLED: 17-Jan-18
Purchase, NY 10577
 CONTACT: Patrick Savolski ANALYSIS METHOD: PLM
 PROJECT ID: Café Renovation TURN-AROUND TIME: _____ HOURS
 _____ 5 DAYS
 PROJECT #: Q18-1530 OTHER

SAMPLE # LAB#	LOCATION	SAMPLE DESCRIPTION	COMMENTS
1530-11	First Floor, Kitchen Storage Room, on Metal Support Columns	Sprayed-on Fireproofing	At First Positive
1530-12	First Floor, Kitchen Storage Room, on Metal Support Columns	Sprayed-on Fireproofing	
1530-13	Basement, Storage Room, Partition Wall, on Sheetrock	Joint Compound	18 JAN 19 AM 11:22
1530-14	Basement, Storage Room, Partition Wall, on Sheetrock	Joint Compound	
1530-15	Basement, Hallway Outside Storage Room, Partition Wall, on Sheetrock	Joint Compound	
1530-16	First Floor, Café, Serving Area, Wall, on Sheetrock	Joint Compound	
1530-17	First Floor, Café, Dining Room, Wall, on Sheetrock	Joint Compound	
1530-18	First Floor, Café, Staff Lounge, Wall, on Sheetrock	Joint Compound	
1530-19	First Floor, Café, Staff Lounge, Wall, on Sheetrock	Joint Compound	
1530-20	First Floor, Café, Kitchen, Office, Wall, on Sheetrock	Joint Compound	

CHAIN OF CUSTODY (SEE LAST PAGE)

SUBMITTED BY: [Signature]DATE: 1-18-18RECEIVED BY: [Signature]DATE: 1/19/18 11:20 AM

Enisho Niguel 1-24-18 11:35A

PAGE 2 OF 6

or 1/29/18
GOSH

QUALITY ENVIRONMENTAL SOLUTIONS & TECHNOLOGIES, INC.

BULK SAMPLE FORMCLIENT: SUNY Purchase AssociationSAMPLED BY: J. Klemm, S. TalsmaADDRESS: 735 Anderson Hill RoadDATE SAMPLED: 17-Jan-18Purchase, NY 10577CONTACT: Patrick SavolskiANALYSIS METHOD: PLMPROJECT ID: Café Renovation

TURN-AROUND TIME: _____ HOURS

5 DAYSPROJECT #: Q18-1530

OTHER

SAMPLE # LAB#	LOCATION	SAMPLE DESCRIPTION	COMMENTS
1530-21	First Floor, Café, Main Serving Area, Wall, on Sheetrock	Joint Compound	18 JAN 9 AM 11:22 Stop At First Positive
1530-22	Basement, Café, Fan Room, Soffit, on Sheetrock	Joint Compound	
1530-23	Basement, Storage Room, Closet B, Wall, on Sheetrock	Joint Compound	
1530-24	Basement, Storage Room, Closet B, Wall, on Sheetrock	Joint Compound	
1530-25	Basement, Storage Room, Closet A, Wall	Sheetrock	
1530-26	Basement, Storage Room, Closet B, Wall	Sheetrock	
1530-27	First Floor, Café, Dining Room, Soffit	Sheetrock	
1530-28	First Floor, Café, Main Serving Area, Wall	Sheetrock	
1530-29	Basement, Fan Room, Around Duct	Canvas Wrap	
1530-30	Basement, Fan Room, Around Duct	Canvas Wrap	

CHAIN OF CUSTODY (SEE LAST PAGE)

SUBMITTED BY: [Signature]DATE: 1-18-18RECEIVED BY: [Signature]DATE: 1/19/18 11:22 AMPAGE 3 OF 6Emily Myles 1-24-18 11:35 AM1/24/18 6:05 PM

QUALITY ENVIRONMENTAL SOLUTIONS & TECHNOLOGIES, INC.

BULK SAMPLE FORMCLIENT: SUNY Purchase AssociationSAMPLED BY: J. Klemm, S. TalsmaADDRESS: 735 Anderson Hill RoadDATE SAMPLED: 17-Jan-18Purchase, NY 10577CONTACT: Patrick SavolskiANALYSIS METHOD: PLMPROJECT ID: Café Renovation

TURN-AROUND TIME: _____ HOURS

5 DAYSPROJECT #: Q18-1530

OTHER

SAMPLE # LAB#	LOCATION	SAMPLE DESCRIPTION	COMMENTS
1530-31	First Floor, Serving Area, Floor	Quarry Tile & Mudset (Separate Layers)	18 JAN 19 AM 11:22
1530-32	First Floor, Serving Area, Floor	Quarry Tile & Mudset (Separate Layers)	
1530-33	First Floor, Café, Serving Area, Between Quarry Tile	Grout	
1530-34	First Floor, Café, Serving Area, Between Quarry Tile	Grout	
1530-35	Basement, Storage Room, Closet B, Wall, on Sheetrock	Fiberboard	
1530-36	Basement, Storage Room, Closet B, Ceiling	Fiberboard	
1530-37	First Floor, Café, Main Serving Area, Floor, Large Tile	Ceramic Tile	
1530-38	First Floor, Café, Dining Area, Floor, Large Tile	Ceramic Tile	
1530-39	First Floor, Café, Main Serving Area, Floor, Small Tile	Ceramic Tile	
1530-40	First Floor, Café, Dining Area, Floor, Small Tile	Ceramic Tile	

CHAIN OF CUSTODY (SEE LAST PAGE)

SUBMITTED BY: _____

DATE: 1-18-18

RECEIVED BY: _____

DATE: 1/19/18 11:22 AMEmily Myant 1.24.18 11:35 AMPAGE 4 OF 6ac 1/24/18
6952

QUALITY ENVIRONMENTAL SOLUTIONS & TECHNOLOGIES, INC.

BULK SAMPLE FORMCLIENT: SUNY Purchase AssociationSAMPLED BY: J. Klemm, S. TalsmaADDRESS: 735 Anderson Hill RoadDATE SAMPLED: 17-Jan-18Purchase, NY 10577CONTACT: Patrick SavolskiANALYSIS METHOD: PLMPROJECT ID: Café Renovation

TURN-AROUND TIME: _____ HOURS

5 DAYSPROJECT #: Q18-1530

OTHER

SAMPLE # LAB#	LOCATION	SAMPLE DESCRIPTION	COMMENTS
1530-41	Basement, Storage Room, Floor	Cementitious Slab	18 JAN 19 AM 11:22
1530-42	First Floor, Café, Kitchen, Floor, Under Epoxy Flooring	Cementitious Slab	
1530-43	First Floor, Café, Kitchen, Wall	Cementitious Block	
1530-44	Basement, Storage Room, Wall	Cementitious Block	
1530-45	Basement, Fan Room, Wall, Between Cementitious Block	Mortar	
1530-46	First Floor, Café, Kitchen, Wall, Between Cementitious Block	Mortar	
1530-47	First Floor, Café, Dining Area, Wall, Between Brick	Mortar	
1530-48	First Floor, Café, Dining Area, Wall, Between Brick	Mortar	
1530-49	First Floor, Café, Dining Area, Wall	Brick	
1530-50	First Floor, Café, Dining Area, Wall	Brick	

CHAIN OF CUSTODY (SEE LAST PAGE)

SUBMITTED BY: _____

DATE: 1-18-18

RECEIVED BY: _____

DATE: 1/19/18 11:22 AMEmily August 1.24.18 11:35 AMPAGE 5 OF 62/1/2018
6092m

QUALITY ENVIRONMENTAL SOLUTIONS & TECHNOLOGIES, INC.

BULK SAMPLE FORMCLIENT: SUNY Purchase AssociationSAMPLED BY: J. Klemm, S. TalsmaADDRESS: 735 Anderson Hill RoadDATE SAMPLED: 17-Jan-18Purchase, NY 10577CONTACT: Patrick SavolskiANALYSIS METHOD: PLMPROJECT ID: Café Renovation

TURN-AROUND TIME: _____ HOURS

5 DAYSPROJECT #: Q18-1530

OTHER

SAMPLE # LAB#	LOCATION	SAMPLE DESCRIPTION	COMMENTS
1530-51	First Floor, Kitchen, Suspended Ceiling, Sheetrock	Ceiling Tile	18 JAN 19 AM 11:22
1530-52	First Floor, Kitchen, Suspended Ceiling, Sheetrock	Ceiling Tile	
1530-53	First Floor, Café, Dining Area, Floor, Under Ceramic Tile, on Cementitious Slab	Mudset	
1530-54	First Floor, Café, Main Serving Area, Floor, Under Ceramic Tile, on Cementitious Slab	Mudset	
1530-55	First Floor, Café, Dining Area, Floor, Between Ceramic Tile	Grout	
1530-56	First Floor, Café, Main Serving Area, Floor, Between Ceramic Tile	Grout	

CHAIN OF CUSTODY (SEE LAST PAGE)

SUBMITTED BY: [Signature]DATE: 1-18-18RECEIVED BY: [Signature]DATE: 1/19/18 11:22 AMEmily Munt 1-24-18 11:35 AMPAGE 6 OF 6or 1/24/18
603A



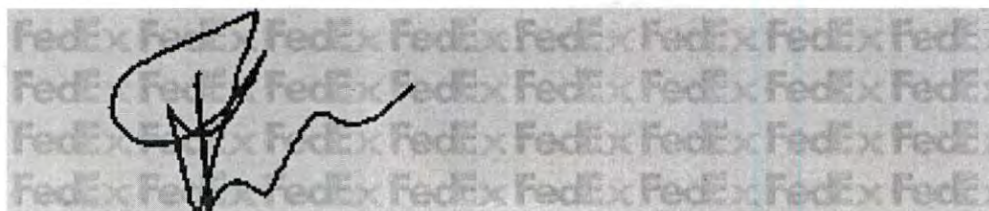
January 19, 2018

Dear Customer:

The following is the proof-of-delivery for tracking number **795415506770**.

Delivery Information:

Status:	Delivered	Delivered to:	Receptionist/Front Desk
Signed for by:	M.MARCUS	Delivery location:	307 WEST 38TH ST RM 901 New York, NY 10018
Service type:	FedEx Priority Overnight	Delivery date:	Jan 19, 2018 10:53
Special Handling:	Deliver Weekday		



Shipping Information:

Tracking number:	795415506770	Ship date:	Jan 18, 2018
		Weight:	1.0 lbs/0.5 kg

Recipient:
Sample Receiving
EMSL Analytical, Inc.
307 West 38th Street
New York, NY 10018 US

Reference
RMA

Shipper:
Contact Name:
Quality Environmental Solution & Te
1376 Route 9
Wappingers Falls, NY 12590 US
ARL-WEB(A)
QUES51

Thank you for choosing FedEx.



EMSL Analytical, Inc.

307 West 38th Street New York, NY 10018

Tel/Fax: (212) 290-0051 / (212) 290-0058

<http://www.EMSL.com> / manhattanlab@emsl.com

EMSL Order: 031801394

Customer ID: QUES51

Customer PO:

Project ID:

Attention: Quality Environmental Solution & Tech

1376 Route 9

Wappingers Falls, NY 12590

Phone: (845) 298-6031

Fax: (845) 298-6251

Received Date: 01/19/2018 11:24 AM

Analysis Date: 01/22/2018 - 01/24/2018

Collected Date: 01/17/2018

Project: Q18-1530 / CAFE RENOVATION

Test Report:Asbestos Analysis of Bulk Material

		Non-Asbestos			
Test	Analyzed Date	Color	Fibrous	Non-Fibrous	Asbestos
Sample ID	1530-57	Description	FIRST FLOOR CAFÉ STAFF LOUNGE SUSPENDED CEILING 2' X 2' DOT SPECK - CEILING TILE		
	031801394-0001	Homogeneity	Heterogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/22/2018	White		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	01/24/2018	White		100.00% Other	None Detected
Sample ID	1530-58	Description	FIRST FLOOR CAFÉ STAFF LOUNGE SUSPENDED CEILING 2' X 2' DOT SPECK - CEILING TILE		
	031801394-0002	Homogeneity	Heterogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/22/2018	White		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	01/24/2018	White		100.00% Other	None Detected
Sample ID	1530-59	Description	FIRST FLOOR CAFÉ STAFF LOUNGE SUSPENDED CEILING 2' X 4' DOT CANYON - CEILING TILE		
	031801394-0003	Homogeneity	Heterogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/22/2018	White		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	01/24/2018	White	1.40% Fibrous (other)	98.60% Other	None Detected
Sample ID	1530-60	Description	FIRST FLOOR CAFÉ STAFF LOUNGE SUSPENDED CEILING 2' X 4' DOT CANYON - CEILING TILE		
	031801394-0004	Homogeneity	Heterogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/22/2018	White		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	01/24/2018	White		100.00% Other	None Detected
Sample ID	1530-61	Description	FIRST FLOOR CAFÉ DINING ROOM CEILING 1' X 1' SPLINED CANYONED - CEILING TILE		
	031801394-0005	Homogeneity	Heterogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/22/2018	White		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	01/24/2018	White		100.00% Other	None Detected

Initial report from: 01/24/2018 07:22:05



EMSL Analytical, Inc.

307 West 38th Street New York, NY 10018

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<http://www.EMSL.com> / manhattanlab@emsl.com

EMSL Order: 031801394

Customer ID: QUES51

Customer PO:

Project ID:

Test Report:Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos		Asbestos
			Fibrous	Non-Fibrous	
Sample ID 1530-62 031801394-0006		Description Homogeneity	FIRST FLOOR CAFÉ DINING ROOM CEILING 1' X 1' SPLINED Heterogeneous	CANYONED - CEILING TILE	
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/22/2018	White		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	01/24/2018	White		100.00% Other	None Detected
Sample ID 1530-63 031801394-0007		Description Homogeneity	BASEMENT STORAGE ROOM CLOSET A WALL ON CEMENTITIOUS BLOCK RESIDUAL Heterogeneous	BLACK - GLUE DAB	
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/22/2018	Black	None	95.90% Other	4.10% Chrysotile
TEM NYS 198.4 NOB	01/22/2018				Positive Stop (Not Analyzed)
Sample ID 1530-64 031801394-0008		Description Homogeneity	BASEMENT STORAGE ROOM CLOSET A WALL ON CEMENTITIOUS BLOCK RESIDUAL Heterogeneous	BLACK - GLUE DAB	
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/22/2018				Positive Stop (Not Analyzed)
TEM NYS 198.4 NOB	01/22/2018				Positive Stop (Not Analyzed)
Sample ID 1530-65 031801394-0009		Description Homogeneity	BASEMENT STORAGE ROOM CLOSET A WALL ON CEMENTITIOUS BLOCK RESIDUAL Heterogeneous	BLACK - GLUE DAB	
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/22/2018	Brown		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	01/24/2018	Brown		100.00% Other	None Detected
Sample ID 1530-66 031801394-0010		Description Homogeneity	BASEMENT STORAGE ROOM CLOSET A WALL ON CEMENTITIOUS BLOCK RESIDUAL Heterogeneous	BLACK - GLUE DAB	
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/22/2018	Brown		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	01/24/2018	Brown		100.00% Other	None Detected
Sample ID 1530-67 031801394-0011		Description Homogeneity	BASEMENT STORAGE ROOM CLOSET B WALL ON CEMENTITIOUS BLOCK RESIDUAL Heterogeneous	BROWN - GLUE DAB	
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/22/2018	Brown		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	01/24/2018	Brown		100.00% Other	None Detected

Initial report from: 01/24/2018 07:22:05



EMSL Analytical, Inc.

307 West 38th Street New York, NY 10018

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<http://www.EMSL.com / manhattanlab@emsl.com>

EMSL Order: 031801394

Customer ID: QUES51

Customer PO:

Project ID:

Test Report:Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos		
			Fibrous	Non-Fibrous	Asbestos
Sample ID 1530-68 031801394-0012		Description Homogeneity	BASEMENT STORAGE ROOM CLOSET B WALL ON CEMENTITIOUS BLOCK RESIDUAL BROWN - GLUE DAB Heterogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/22/2018	Brown		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	01/24/2018	Brown	None	97.40% Other	2.60% Chrysotile
Sample ID 1530-69 031801394-0013		Description Homogeneity	BASEMENT STORAGE ROOM CLOSET A WALL ON CEMENTITIOUS BLOCK RESIDUAL GRAY - GLUE DAB Heterogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/22/2018	Gray		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	01/24/2018	Gray		100.00% Other	None Detected
Sample ID 1530-70 031801394-0014		Description Homogeneity	BASEMENT STORAGE ROOM CLOSET A WALL ON CEMENTITIOUS BLOCK RESIDUAL GRAY - GLUE DAB Heterogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/22/2018	Gray		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	01/24/2018	Gray		100.00% Other	None Detected
Sample ID 1530-71 031801394-0015		Description Homogeneity	BASEMENT STORAGE ROOM CLOSET A WALL ON SHEETROCK RESIDUAL - ADHESIVE Heterogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/22/2018	Yellow		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	01/24/2018	Yellow		100.00% Other	None Detected
Sample ID 1530-72 031801394-0016		Description Homogeneity	BASEMENT STORAGE ROOM CLOSET A WALL ON SHEETROCK RESIDUAL - ADHESIVE Heterogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/22/2018	Yellow		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	01/24/2018	Yellow		100.00% Other	None Detected
Sample ID 1530-73-Cove Base 031801394-0017		Description Homogeneity	FIRST FLOOR CAFÉ KITCHEN STORAGE ROOM WALL ON CEMENTITIOUS BLOCK - COVE BASE MOLDING & ADHESIVE (SEPARATE LAYERS) Heterogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/22/2018	Gray		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	01/24/2018	Gray		100.00% Other	None Detected

Initial report from: 01/24/2018 07:22:05



EMSL Analytical, Inc.

307 West 38th Street New York, NY 10018

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<http://www.EMSL.com / manhattanlab@emsl.com>

EMSL Order: 031801394

Customer ID: QUES51

Customer PO:

Project ID:

Test Report:Asbestos Analysis of Bulk Material

		Non-Asbestos			
Test	Analyzed Date	Color	Fibrous	Non-Fibrous	Asbestos
Sample ID	1530-73-Mastic	Description	FIRST FLOOR CAFÉ KITCHEN STORAGE ROOM WALL ON CEMENTITIOUS BLOCK - COVE BASE MOLDING & ADHESIVE (SEPARATE LAYERS)		
	031801394-0017A	Homogeneity	Heterogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/22/2018	Yellow		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	01/24/2018	Yellow		100.00% Other	None Detected
Sample ID	1530-74-Cove Base	Description	FIRST FLOOR CAFÉ KITCHEN STORAGE ROOM WALL ON CEMENTITIOUS BLOCK - COVE BASE MOLDING & ADHESIVE (SEPARATE LAYERS)		
	031801394-0018	Homogeneity	Heterogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/22/2018	Gray		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	01/24/2018	Gray		100.00% Other	None Detected
Sample ID	1530-74-Mastic	Description	FIRST FLOOR CAFÉ KITCHEN STORAGE ROOM WALL ON CEMENTITIOUS BLOCK - COVE BASE MOLDING & ADHESIVE (SEPARATE LAYERS)		
	031801394-0018A	Homogeneity	Heterogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/22/2018	Yellow		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	01/24/2018	Yellow		100.00% Other	None Detected
Sample ID	1530-75-Cove Base	Description	FIRST FLOOR CAFÉ STAFF LOUNGE WALL ON SHEETROCK - COVE BASE MOLDING & ADHESIVE (SEPARATE LAYERS)		
	031801394-0019	Homogeneity	Heterogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/22/2018	Black		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	01/24/2018	Black		100.00% Other	None Detected
Sample ID	1530-75-Mastic	Description	FIRST FLOOR CAFÉ STAFF LOUNGE WALL ON SHEETROCK - COVE BASE MOLDING & ADHESIVE (SEPARATE LAYERS)		
	031801394-0019A	Homogeneity	Heterogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/22/2018	Yellow		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	01/24/2018	Yellow		100.00% Other	None Detected
Sample ID	1530-76-Cove Base	Description	FIRST FLOOR CAFÉ STAFF LOUNGE WALL ON SHEETROCK - COVE BASE MOLDING & ADHESIVE (SEPARATE LAYERS)		
	031801394-0020	Homogeneity	Heterogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/22/2018	Black		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	01/24/2018	Black	None	100.00% Other	<1.00% Chrysotile

Initial report from: 01/24/2018 07:22:05



EMSL Analytical, Inc.

307 West 38th Street New York, NY 10018

Tel/Fax: (212) 290-0051 / (212) 290-0058

<http://www.EMSL.com> / manhattanlab@emsl.com

EMSL Order: 031801394

Customer ID: QUES51

Customer PO:

Project ID:

Test Report: Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos		Asbestos
			Fibrous	Non-Fibrous	
Sample ID 1530-76-Mastic 031801394-0020A		Description Homogeneity	FIRST FLOOR CAFÉ STAFF LOUNGE WALL ON SHEETROCK - COVE BASE MOLDING & ADHESIVE (SEPARATE LAYERS) Heterogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/22/2018	Yellow		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	01/24/2018	Yellow		100.00% Other	None Detected
Sample ID 1530-77 031801394-0021		Description Homogeneity	FIRST FLOOR CAFÉ SERVING AREA ABOVE SUSPENDED CEILING ON METAL DUCTWORK AT SEAMS - SEALANT Heterogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/22/2018	Gray		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	01/24/2018	Gray		100.00% Other	None Detected
Sample ID 1530-78 031801394-0022		Description Homogeneity	FIRST FLOOR CAFÉ SERVING AREA ABOVE SUSPENDED CEILING ON METAL DUCTWORK AT SEAMS - SEALANT Heterogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/22/2018	Gray		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	01/24/2018	Gray		100.00% Other	None Detected
Sample ID 1530-79 031801394-0023		Description Homogeneity	FIRST FLOOR CAFÉ FLOOR 1' X 1' ON LEVELING COMPOUND - FLOOR TILE Heterogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/22/2018	White		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	01/24/2018	White		100.00% Other	None Detected
Sample ID 1530-80 031801394-0024		Description Homogeneity	FIRST FLOOR CAFÉ FLOOR 1' X 1' ON LEVELING COMPOUND - FLOOR TILE Heterogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/22/2018	White		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	01/24/2018	White		100.00% Other	None Detected
Sample ID 1530-81-Leveling Compound 031801394-0025		Description Homogeneity	FIRST FLOOR CAFÉ FLOOR UNDER 1' X 1' FLOOR TILE ON CEMENTITIOUS SLAB - LEVELING COMPOUND & MASTIC (SEPARATE LAYERS) Heterogeneous		
PLM NYS 198.1 Friable	01/24/2018	Brown		35.00% Gypsum 60.00% Non-fibrous (other) 5.00% Quartz	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed

Initial report from: 01/24/2018 07:22:05



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307 West 38th Street New York, NY 10018

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EMSL Order: 031801394

Customer ID: QUES51

Customer PO:

Project ID:

Test Report:Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos		Asbestos
			Fibrous	Non-Fibrous	
Sample ID 1530-81-Mastic 031801394-0025A		Description Homogeneity	FIRST FLOOR CAFÉ FLOOR UNDER 1' X 1' FLOOR TILE ON CEMENTITIOUS SLAB - LEVELING COMPOUND & MASTIC (SEPARATE LAYERS) Heterogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/22/2018	Black		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	01/24/2018	Black		100.00% Other	None Detected
Sample ID 1530-82-Leveling Compound 031801394-0026		Description Homogeneity	FIRST FLOOR CAFÉ FLOOR UNDER 1' X 1' FLOOR TILE ON CEMENTITIOUS SLAB - LEVELING COMPOUND & MASTIC (SEPARATE LAYERS) Heterogeneous		
PLM NYS 198.1 Friable	01/24/2018	Brown		40.00% Gypsum 55.00% Non-fibrous (other) 5.00% Quartz	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 1530-82-Mastic 031801394-0026A		Description Homogeneity	FIRST FLOOR CAFÉ FLOOR UNDER 1' X 1' FLOOR TILE ON CEMENTITIOUS SLAB - LEVELING COMPOUND & MASTIC (SEPARATE LAYERS) Heterogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/22/2018	Black		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	01/24/2018	Black		100.00% Other	None Detected
Sample ID 1530-83 031801394-0027		Description Homogeneity	FIRST FLOOR CAFÉ KTICHEN FLOOR ON CEMENTITIOUS SLAB - EPOXY FLOORING Heterogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/22/2018	Red		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	01/24/2018	Red		100.00% Other	None Detected
Sample ID 1530-84 031801394-0028		Description Homogeneity	FIRST FLOOR CAFÉ KTICHEN FLOOR ON CEMENTITIOUS SLAB - EPOXY FLOORING Heterogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/22/2018	Red		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	01/24/2018	Red		100.00% Other	None Detected
Sample ID 1530-85 031801394-0029		Description Homogeneity	EXTERIOR CAFÉ FAÇADE WINDOW SYSTEM BETWEEN METAL FRAME AND BRICK - CAULK Heterogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/22/2018	Black		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	01/24/2018	Black	None	100.00% Other	<1.00% Chrysotile

Initial report from: 01/24/2018 07:22:05



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EMSL Order: 031801394

Customer ID: QUES51

Customer PO:

Project ID:

Test Report:Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos		
			Fibrous	Non-Fibrous	Asbestos
Sample ID 1530-86 031801394-0030		Description Homogeneity	EXTERIOR CAFÉ FAÇADE WINDOW SYSTEM BETWEEN METAL FRAME AND BRICK - CAULK Heterogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/22/2018	Black		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	01/24/2018	Black		100.00% Other	None Detected
Sample ID 1530-87 031801394-0031		Description Homogeneity	EXTERIOR CAFÉ FAÇADE WINDOW SYSTEM GLASS BETWEEN METAL CASE - CAULK Heterogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/22/2018	Black		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	01/24/2018	Black		100.00% Other	None Detected
Sample ID 1530-88 031801394-0032		Description Homogeneity	EXTERIOR CAFÉ FAÇADE WINDOW SYSTEM GLASS BETWEEN METAL CASE - CAULK Heterogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/22/2018	Black		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	01/24/2018	Black		100.00% Other	None Detected
Sample ID 1530-89 031801394-0033		Description Homogeneity	EXTERIOR CAFÉ ON FOUNDATION - WATERPROOFING TAR Heterogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/22/2018	Black	None	92.00% Other	8.00% Chrysotile
TEM NYS 198.4 NOB	01/22/2018				Positive Stop (Not Analyzed)
Sample ID 1530-90 031801394-0034		Description Homogeneity	EXTERIOR CAFÉ ON FOUNDATION - WATERPROOFING TAR Heterogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/22/2018				Positive Stop (Not Analyzed)
TEM NYS 198.4 NOB	01/22/2018				Positive Stop (Not Analyzed)
Sample ID 1530-91 031801394-0035		Description Homogeneity	EXTERIOR CAFÉ UNDER WINDOW SYSTEM ON FOUNDATION - WEATHER STRIP Heterogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/22/2018	Black		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	01/24/2018	Black		100.00% Other	None Detected

Initial report from: 01/24/2018 07:22:05



EMSL Analytical, Inc.

307 West 38th Street New York, NY 10018

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EMSL Order: 031801394

Customer ID: QUES51

Customer PO:

Project ID:

Test Report:Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos		Asbestos
			Fibrous	Non-Fibrous	
Sample ID 1530-92 031801394-0036		Description Homogeneity	EXTERIOR CAFÉ UNDER WINDOW SYSTEM ON FOUNDATION - WEATHER STRIP Heterogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	01/22/2018	Black		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	01/24/2018	Black		100.00% Other	None Detected

Initial report from: 01/24/2018 07:22:05



EMSL Analytical, Inc.

307 West 38th Street New York, NY 10018

Tel/Fax: (212) 290-0051 / (212) 290-0058

<http://www.EMSL.com> / manhattanlab@emsl.com

EMSL Order: 031801394

Customer ID: QUES51

Customer PO:

Project ID:

Test Report: Asbestos Analysis of Bulk Material

The samples in this report were submitted to EMSL for analysis by Asbestos Analysis of Bulk Materials via NYS ELAP Approved Methods. The reference number for these samples is the EMSL Order ID above. Please use this reference number when calling about these samples.

Report Comments:

Sample Receipt Date: 1/19/2018

Sample Receipt Time: 11:24 AM

Analysis Completed Date: 1/22/2018

Analysis Completed Time: 4:02 PM

Analyst(s):

Yolanda Chow PLM NYS 198.1 Friable (2)

Kamel Alawawda PLM NYS 198.6 NOB (38)

Muhsin Parson TEM NYS 198.4 NOB (36)

Samples reviewed and approved by:

James Hall, Laboratory Manager
or Other Approved Signatory

NOB = Non Friable Organically Bound N/A = Not Applicable VCM = Vermiculite Containing Material

-In New York State, TEM is currently the only method that can be used to determine if NOB materials can be considered or treated as non -asbestos containing.

All samples examined for the presence of vermiculite when analyzed via NYS 198.1.

-NYS Guidelines for Vermiculite containing samples are available at http://www.wadsworth.org/labcert/elapcert/forms/VermiculiteInterimGuidance_Rev070913.pdf EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples were received in good condition unless otherwise noted.

This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government. This report may contain data that is not covered by the NVLAP accreditation.

Samples analyzed by EMSL Analytical, Inc. New York, NY NYS ELAP 11506

Initial report from: 01/24/2018 07:22:05

QUALITY ENVIRONMENTAL SOLUTIONS & TECHNOLOGIES, INC.

BULK SAMPLE FORM

031801394

CLIENT: SUNY Purchase AssociationSAMPLED BY: J. Klemm, S. TalsmaADDRESS: 735 Anderson Hill RoadDATE SAMPLED: 17-Jan-18Purchase, NY 10577CONTACT: Patrick SavolskiANALYSIS METHOD: PLM/NOB/QTEM PROJECT ID: Café Renovation

TURN-AROUND TIME: _____ HOURS

5 DAYSPROJECT #: Q18-1530

OTHER

SAMPLE # LAB#	LOCATION	SAMPLE DESCRIPTION	COMMENTS
1530-57	First Floor, Café, Staff Lounge, Suspended Ceiling, 2' x 2', Dot Speck	Ceiling Tile	Stop At First Positive
1530-58	First Floor, Café, Staff Lounge, Suspended Ceiling, 2' x 2', Dot Speck	Ceiling Tile	
1530-59	First Floor, Café, Staff Lounge, Suspended Ceiling, 2' x 4', Dot Canyon	Ceiling Tile	Stop At First Positive
1530-60	First Floor, Café, Staff Lounge, Suspended Ceiling, 2' x 4', Dot Canyon	Ceiling Tile	
1530-61	First Floor, Café, Dining Room, Ceiling, 1' x 1', Splined, Canyon	Ceiling Tile	Stop At First Positive
1530-62	First Floor, Café, Dining Room, Ceiling, 1' x 1', Splined, Canyon	Ceiling Tile	
1530-63	Basement, Storage Room, Closet A, Wall, on Cementitious Block, Residual, Black	Glue Dab	Stop At First Positive
1530-64	Basement, Storage Room, Closet A, Wall, on Cementitious Block, Residual, Black	Glue Dab	
1530-65	Basement, Storage Room, Closet A, Wall, on Cementitious Block, Residual, Brown	Glue Dab	Stop At First Positive
1530-66	Basement, Storage Room, Closet A, Wall, on Cementitious Block, Residual, Brown	Glue Dab	

CHAIN OF CUSTODY (SEE LAST PAGE)

SUBMITTED BY: DATE: 1/18/2018RECEIVED BY: DATE: 1/19/18 11:24 AMPAGE 1 OF 4

5:26 PM

QUALITY ENVIRONMENTAL SOLUTIONS & TECHNOLOGIES, INC.

BULK SAMPLE FORM

CLIENT: SUNY Purchase Association SAMPLED BY: J. Klemm, S. Talsma
 ADDRESS: 735 Anderson Hill Road DATE SAMPLED: 17-Jan-18
Purchase, NY 10577
 CONTACT: Patrick Savolski ANALYSIS METHOD: PLM/NOB/QTEM
 PROJECT ID: Café Renovation TURN-AROUND TIME: _____ HOURS
5 DAYS
 PROJECT #: Q18-1530 OTHER

SAMPLE # LAB#	LOCATION	SAMPLE DESCRIPTION	COMMENTS
1530-67	Basement, Storage Room, Closet B, Wall, on Cementitious Block, Residual, Brown	Glue Dab	Stop At First
1530-68	Basement, Storage Room, Closet B, Wall, on Cementitious Block, Residual, Brown	Glue Dab	Positive
1530-69	Basement, Storage Room, Closet A, Wall, on Cementitious Block, Residual, Gray	Glue Dab	Stop At First
1530-70	Basement, Storage Room, Closet A, Wall, on Cementitious Block, Residual, Gray	Glue Dab	Positive
1530-71	Basement, Storage Room, Closet A, Wall, on Sheetrock, Residual	Adhesive	Stop At First
1530-72	Basement, Storage Room, Closet A, Wall, on Sheetrock, Residual	Adhesive	Positive
1530-73	First Floor, Café, Kitchen Storage Room, Wall, on Cementitious Block	Cove Base Molding & Adhesive (Separate Layers)	Stop At First
1530-74	First Floor, Café, Kitchen Storage Room, Wall, on Cementitious Block	Cove Base Molding & Adhesive (Separate Layers)	Positive
1530-75	First Floor, Café, Staff Lounge, Wall, on Sheetrock	Cove Base Molding & Adhesive (Separate Layers)	Stop At First
1530-76	First Floor, Café, Staff Lounge, Wall, on Sheetrock	Cove Base Molding & Adhesive (Separate Layers)	Positive

CHAIN OF CUSTODY (SEE LAST PAGE)

SUBMITTED BY: _____

DATE: 1/18/2018

RECEIVED BY: _____

DATE: 1/19/18 11:24 AMPAGE 2 OF 4

QUALITY ENVIRONMENTAL SOLUTIONS & TECHNOLOGIES, INC.

BULK SAMPLE FORM

CLIENT: SUNY Purchase Association

ADDRESS: 735 Anderson Hill Road
Purchase, NY 10577

CONTACT: Patrick Savolski

PROJECT ID: Café Renovation

PROJECT #: Q18-1530

SAMPLED BY: J. Klemm, S. Talsma

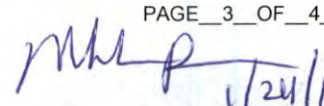
DATE SAMPLED: 17-Jan-18

ANALYSIS METHOD: PLM/NOB/QTEM

TURN-AROUND TIME: _____ HOURS
5 DAYS
 OTHER

SAMPLE # LAB#	LOCATION	SAMPLE DESCRIPTION	COMMENTS
1530-77	First Floor, Café, Serving Area, Above Suspended Ceiling, on Metal Ductwork, at Seams	Sealant	Stop At First Positive
1530-78	First Floor, Café, Serving Area, Above Suspended Ceiling, on Metal Ductwork, at Seams	Sealant	
1530-79	First Floor, Café, Floor, 1' x 1', on Leveling Compound	Floor Tile	Stop At First Positive
1530-80	First Floor, Café, Floor, 1' x 1', on Leveling Compound	Floor Tile	
1530-81	First Floor, Café, Floor, Under 1' x 1' Floor Tile, on Cementitious Slab	Leveling Compound & Mastic (Separate Layers)	Stop At First Positive
1530-82	First Floor, Café, Floor, Under 1' x 1' Floor Tile, on Cementitious Slab	Leveling Compound & Mastic (Separate Layers)	
1530-83	First Floor, Café, Kitchen, Floor, on Cementitious Slab	Epoxy Flooring	Stop At First Positive
1530-84	First Floor, Café, Kitchen, Floor, on Cementitious Slab	Epoxy Flooring	
1530-85	Exterior, Café, Façade, Window System, Between Metal Frame and Brick	Caulk	Stop At First Positive
1530-86	Exterior, Café, Façade, Window System, Between Metal Frame and Brick	Caulk	

CHAIN OF CUSTODY (SEE LAST PAGE)

SUBMITTED BY: DATE: 1/18/2018RECEIVED BY: DATE: 1/19/18 11:24 AMPAGE 3 OF 4

1/24/18 5:20 AM

QUALITY ENVIRONMENTAL SOLUTIONS & TECHNOLOGIES, INC.

BULK SAMPLE FORM

CLIENT: SUNY Purchase Association
 ADDRESS: 735 Anderson Hill Road
Purchase, NY 10577
 CONTACT: Patrick Savolski
 PROJECT ID: Café Renovation
 PROJECT #: Q18-1530

SAMPLED BY: J. Klemm, S. Talsma
 DATE SAMPLED: 17-Jan-18
 ANALYSIS METHOD: PLM/NOB/QTEM
 TURN-AROUND TIME: _____ HOURS
5 DAYS
 OTHER

SAMPLE # LAB#	LOCATION	SAMPLE DESCRIPTION	COMMENTS
1530-87	Exterior, Café, Window System, Glass to Metal Case	Caulk	Stop
1530-88	Exterior, Café, Window System, Glass to Metal Case	Caulk	At First Positive
1530-89	Exterior, Café, on Foundation	Waterproofing Tar	Stop
1530-90	Exterior, Café, on Foundation	Waterproofing Tar	At First Positive
1530-91	Exterior, Café, Under Window System, on Foundation	Weather Strip	Stop
1530-92	Exterior, Café, Under Window System, on Foundation	Weather Strip	At First Positive
			18 JAN 19 AM 11:21

CHAIN OF CUSTODY (SEE LAST PAGE)

SUBMITTED BY: 

DATE: 1/18/2018

RECEIVED BY: 

DATE: 1/19/18 11:24 AM

PAGE 4 OF 4

MLP 1/24/18 5:26 AM



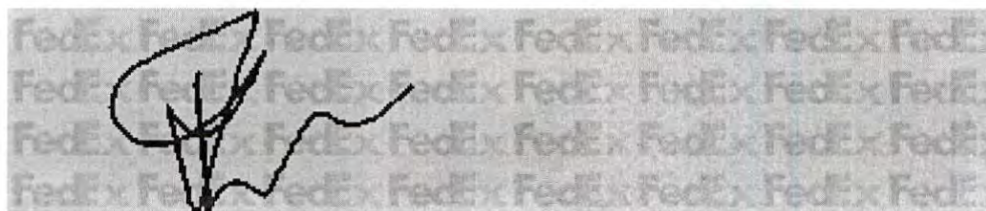
January 19, 2018

Dear Customer:

The following is the proof-of-delivery for tracking number **795415506770**.

Delivery Information:

Status:	Delivered	Delivered to:	Receptionist/Front Desk
Signed for by:	M.MARCUS	Delivery location:	307 WEST 38TH ST RM 901 New York, NY 10018
Service type:	FedEx Priority Overnight	Delivery date:	Jan 19, 2018 10:53
Special Handling:	Deliver Weekday		



Shipping Information:

Tracking number:	795415506770	Ship date:	Jan 18, 2018
		Weight:	1.0 lbs/0.5 kg

Recipient:
Sample Receiving
EMSL Analytical, Inc.
307 West 38th Street
New York, NY 10018 US

Reference
RMA

Shipper:
Contact Name:
Quality Environmental Solution & Te
1376 Route 9
Wappingers Falls, NY 12590 US
ARL-WEB(A)
QUES51

Thank you for choosing FedEx.



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307 West 38th Street, New York, NY 10018
Phone/Fax: (212)290-0051 / (212)290-0058
<http://www.EMSL.com> manhattanlab@emsl.com

EMSL Order #: **031801391**
Customer ID: **QUES51**
Customer PO: **Not Available**

Attn: **Quality Environmental Solution & Tech**
1376 Route 9
Wappingers Falls, NY 12590

Phone: **845-298-6031**
Fax: **845-298-6251**

Project: **Q18-1530 / CAFE RENOVATION**

Date Collected: **01/17/2018**
Date Received: **01/19/2018**
Date Analyzed: **01/29/2018**

Report Date: 01/29/2018

Revision: R0

Asbestos Analysis of NYS ELAP Method 198.8
PLM Analysis for Asbestos in Bulk Surfacing Materials Containing Vermiculite

Lab Number	Client Sample Identification	Appearance	Percentage Matrix Material	Percentage non-Asbestos Fibers	Chrysotile Percentage	Amphibole Percentage	Total Percentage
031801391-0004	1530-04	Tan Non-Fibrous Homogeneous	100	0.0	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
031801391-0005	1530-05	Brown Non-Fibrous Homogeneous	100	0.0	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
031801391-0006	1530-06	Tan Non-Fibrous Homogeneous	100	0.0	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected

Report Date
01/29/2018

Report Revision
R0

Revision Comments
Initial Report

James Hall, Laboratory Manager
or other approved signatory

**EMSL Analytical, Inc.**

307 West 38th Street, New York, NY 10018

Phone/Fax: (212)290-0051 / (212)290-0058

<http://www.EMSL.com> manhattanlab@emsl.comEMSL Order #: **031801391**Customer ID: **QUES51**Customer PO: **Not Available****Asbestos Analysis of NYS ELAP Method 198.8
PLM Analysis for Asbestos in Bulk Surfacing Materials Containing Vermiculite****Bench Sheet**EMSL Sample ID **031801391-0004**Crucible ID:

	Analyst	Date
Gravimetric Prep	TT	1/25/2018
Chrysotile Analysis	JC	1/28/2018
Centrifugation Date	JC	1/28/2018
Amphibole Analysis	DC	1/29/2018

Stereoscopic			
Color	Tan	Stereoscopic % Asbestos	0
Texture	Non-Fibrous		
Homogeneity	Homogeneous	Vermiculite Detected	Yes

Initial Weights*	
Weight of Crucible	1.8252
Weight of Crucible and Sub Sample	5.1700
Weight of Sub-Sample	3.3448

Non-Asbestos Fiber	Optical Property	Visual %	Calc %
			0
			0

Ashing		Chrysotile Identification Optical Properties								Temperature (C°)	23.3
Weight of Crucible & Ash	4.6424	RI	IRI	Morphology	Sign	Pleochorism	Birefringence	Fiber Color	Extinction		
Weight of Ash	2.8172										1
Weight Loss During Ashing	0.5276										1
Weight Percent Organic and Water	15.7737										1
Acid Treatment/ Flotation		Amphibole Identification Optical Properties								Temperature (C°)	23.7
Weight of Dish for Floats	8.2814	RI	IRI	Morphology	Sign	Pleochorism	Birefringence	Fiber Color	Extinction		
Weight of Dish & Floats	8.4913										1
Weight of Floats	0.2099										
Weight Percent Floats	6.2754										
Weight of Dish & Filter for Residue	8.5806										
Weight of Dish & Filter & Residue	9.5990										
Weight of Residue	1.0184										
Weight Loss During Acid/Flotation Treatment	1.5889										
Weight Percent Acid-Soluble/Float Materials	47.5036										
Weight Percent Residue	30.4473										

PLM Examination of Residue (Chrysotile)	Analyzed	PTCT	Chrysotile	Non-Empty	PTCT	Chrysotile	Non-Empty	Trace Detected?
Number of Occupied Points	400	Slide 1:	0	50	Slide 5:	0	50	<input type="checkbox"/> None
Number of Chrysotile Points	0	Slide 2:	0	50	Slide 6:	0	50	Check box if yes
Percent Chrysotile by PTCT	0.00	Slide 3:	0	50	Slide 7:	0	50	
(if greater than 1% no further analysis needed)	0.0000	Slide 4:	0	50	Slide 8:	0	50	

Heavy Liquid Centrifugation	
Weight of Dish & Filter & Balance of Residue (Post Chrysotile Analysis)	9.5540
Weight of Balance of Residue	0.9734
Weight of Dish & Filter for Centrifugate	8.3637
Weight of Dish & Filter & Centrifugate	8.4902
Weight of Centrifugate	0.1265
Weight Percent Centrifugate	3.9568

PLM Examination of Centrifugate (Amphibole)	Analyzed	PTCT	Amphibole	Non-Empty	PTCT	Amphibole	Non-Empty	Trace Detected?
Number of Occupied Points	400	Slide 1:	0	50	Slide 5:	0	50	<input type="checkbox"/> None
Number of Amphibole Points	0	Slide 2:	0	50	Slide 6:	0	50	Check box if yes
Percent Amphibole by PTCT	0.00	Slide 3:	0	50	Slide 7:	0	50	
Percent Amphibole in Sample	0.0000	Slide 4:	0	50	Slide 8:	0	50	

Percent of Total Asbestos in Sample	0.0000
-------------------------------------	--------

* All Weights in grams

**EMSL Analytical, Inc.**

307 West 38th Street, New York, NY 10018

Phone/Fax: (212)290-0051 / (212)290-0058

<http://www.EMSL.com> manhattanlab@emsl.com

EMSL Order #: 031801391

Customer ID: QUES51

Customer PO: Not Available

**Asbestos Analysis of NYS ELAP Method 198.8
PLM Analysis for Asbestos in Bulk Surfacing Materials Containing Vermiculite****Bench Sheet**

EMSL Sample ID 031801391-0005

Crucible ID:

	Analyst	Date
Gravimetric Prep	TT	1/25/2018
Chrysotile Analysis	JC	1/28/2018
Centrifugation Date	JC	1/28/2018
Amphibole Analysis	DC	1/29/2018

Stereoscopic			
Color	Brown	Stereoscopic % Asbestos	0
Texture	Non-Fibrous		
Homogeneity	Homogeneous	Vermiculite Detected	Yes

Initial Weights*	
Weight of Crucible	1.8211
Weight of Crucible and Sub Sample	5.2488
Weight of Sub-Sample	3.4277
Ashing	
Weight of Crucible & Ash	4.7171
Weight of Ash	2.8960
Weight Loss During Ashing	0.5317
Weight Percent Organic and Water	15.5119
Acid Treatment/ Flotation	
Weight of Dish for Floats	8.1815
Weight of Dish & Floats	8.3226
Weight of Floats	0.1411
Weight Percent Floats	4.1165
Weight of Dish & Filter for Residue	8.8226
Weight of Dish & Filter & Residue	9.9239
Weight of Residue	1.1013
Weight Loss During Acid/Flotation Treatment	1.6536
Weight Percent Acid-Soluble/Float Materials	48.2423
Weight Percent Residue	32.1294

Non-Asbestos Fiber	Optical Property	Visual %	Calc %
			0
			0

		Chrysotile Identification Optical Properties							Temperature (C°)	23.3
Weight of Crucible & Ash	4.7171	⊥ RI	IIRI	Morphology	Sign	Pleochorism	Birefringence	Fiber Color	Extinction	
Weight of Ash	2.8960								1	
Weight Loss During Ashing	0.5317								1	
Weight Percent Organic and Water	15.5119								1	
Acid Treatment/ Flotation									1	
Weight of Dish for Floats	8.1815								1	
Weight of Dish & Floats	8.3226									
Weight of Floats	0.1411	Amphibole Identification Optical Properties							Temperature (C°)	23.7
Weight Percent Floats	4.1165	⊥ RI	IIRI	Morphology	Sign	Pleochorism	Birefringence	Fiber Color	Extinction	
Weight of Dish & Filter for Residue	8.8226									
Weight of Dish & Filter & Residue	9.9239									
Weight of Residue	1.1013									
Weight Loss During Acid/Flotation Treatment	1.6536									

PLM Examination of Residue (Chrysotile)	Analyzed	PTCT	Chrysotile	Non-Empty	PTCT	Chrysotile	Non-Empty	Trace Detected?
Number of Occupied Points	400	Slide 1:	0	50	Slide 5:	0	50	<input type="checkbox"/> None Check box if yes
Number of Chrysotile Points	0	Slide 2:	0	50	Slide 6:	0	50	
Percent Chrysotile by PTCT	0.00	Slide 3:	0	50	Slide 7:	0	50	
(if greater than 1% no further analysis needed)	0.0000	Slide 4:	0	50	Slide 8:	0	50	

Heavy Liquid Centrifugation	
Weight of Dish & Filter & Balance of Residue (Post Chrysotile Analysis)	9.8766
Weight of Balance of Residue	1.0540
Weight of Dish & Filter for Centrifugate	8.3607
Weight of Dish & Filter & Centrifugate	8.5036
Weight of Centrifugate	0.1429
Weight Percent Centrifugate	4.3561

PLM Examination of Centrifugate (Amphibole)	Analyzed	PTCT	Amphibole	Non-Empty	PTCT	Amphibole	Non-Empty	Trace Detected?
Number of Occupied Points	400	Slide 1:	0	50	Slide 5:	0	50	<input type="checkbox"/> None Check box if yes
Number of Amphibole Points	0	Slide 2:	0	50	Slide 6:	0	50	
Percent Amphibole by PTCT	0.00	Slide 3:	0	50	Slide 7:	0	50	
Percent Amphibole in Sample	0.0000	Slide 4:	0	50	Slide 8:	0	50	

Percent of Total Asbestos in Sample	0.0000
-------------------------------------	--------

* All Weights in grams

**EMSL Analytical, Inc.**

307 West 38th Street, New York, NY 10018

Phone/Fax: (212)290-0051 / (212)290-0058

<http://www.EMSL.com> manhattanlab@emsl.comEMSL Order #: **031801391**Customer ID: **QUES51**Customer PO: **Not Available****Asbestos Analysis of NYS ELAP Method 198.8
PLM Analysis for Asbestos in Bulk Surfacing Materials Containing Vermiculite****Bench Sheet**EMSL Sample ID **031801391-0006**Crucible ID:

	Analyst	Date
Gravimetric Prep	TT	1/25/2018
Chrysotile Analysis	JC	1/28/2018
Centrifugation Date	JC	1/28/2018
Amphibole Analysis	DC	1/29/2018

Stereoscopic			
Color	Tan	Stereoscopic % Asbestos	0
Texture	Non-Fibrous		
Homogeneity	Homogeneous	Vermiculite Detected	Yes

Initial Weights*	
Weight of Crucible	1.8220
Weight of Crucible and Sub Sample	5.2069
Weight of Sub-Sample	3.3849
Ashing	
Weight of Crucible & Ash	4.6656
Weight of Ash	2.8436
Weight Loss During Ashing	0.5413
Weight Percent Organic and Water	15.9916
Acid Treatment/ Flotation	
Weight of Dish for Floats	8.6936
Weight of Dish & Floats	8.7142
Weight of Floats	0.0206
Weight Percent Floats	0.6086
Weight of Dish & Filter for Residue	8.5828
Weight of Dish & Filter & Residue	9.7789
Weight of Residue	1.1961
Weight Loss During Acid/Flotation Treatment	1.6269
Weight Percent Acid-Soluble/Float Materials	48.0635
Weight Percent Residue	35.3363

Non-Asbestos Fiber	Optical Property	Visual %	Calc %
			0
			0

		Chrysotile Identification Optical Properties							Temperature (C°)	23.3
Weight of Crucible & Ash	4.6656	⊥ RI	RI	Morphology	Sign	Pleochorism	Birefringence	Fiber Color	Extinction	
Weight of Ash	2.8436								1	
Weight Loss During Ashing	0.5413								1	
Weight Percent Organic and Water	15.9916								1	
Acid Treatment/ Flotation									1	
Weight of Dish for Floats	8.6936								1	
Weight of Dish & Floats	8.7142									
Weight of Floats	0.0206	Amphibole Identification Optical Properties							Temperature (C°)	23.7
Weight Percent Floats	0.6086	⊥ RI	RI	Morphology	Sign	Pleochorism	Birefringence	Fiber Color	Extinction	
Weight of Dish & Filter for Residue	8.5828									
Weight of Dish & Filter & Residue	9.7789									
Weight of Residue	1.1961									
Weight Loss During Acid/Flotation Treatment	1.6269									

PLM Examination of Residue (Chrysotile)	Analyzed	PTCT	Chrysotile	Non-Empty	PTCT:	Chrysotile	Non-Empty	Trace Detected?
Number of Occupied Points	400	Slide 1:	0	50	Slide 5:	0	50	<input type="checkbox"/> None
Number of Chrysotile Points	0	Slide 2:	0	50	Slide 6:	0	50	<i>Check box if yes</i>
Percent Chrysotile by PTCT	0.00	Slide 3:	0	50	Slide 7:	0	50	
(if greater than 1% no further analysis needed)	0.0000	Slide 4:	0	50	Slide 8:	0	50	

Heavy Liquid Centrifugation	
Weight of Dish & Filter & Balance of Residue (Post Chrysotile Analysis)	9.7093
Weight of Balance of Residue	1.1265
Weight of Dish & Filter for Centrifugate	8.6447
Weight of Dish & Filter & Centrifugate	8.8530
Weight of Centrifugate	0.2083
Weight Percent Centrifugate	6.5340

PLM Examination of Centrifugate (Amphibole)	Analyzed	PTCT	Amphibole	Non-Empty	PTCT:	Amphibole	Non-Empty	Trace Detected?
Number of Occupied Points	400	Slide 1:	0	50	Slide 5:	0	50	<input type="checkbox"/> None
Number of Amphibole Points	0	Slide 2:	0	50	Slide 6:	0	50	<i>Check box if yes</i>
Percent Amphibole by PTCT	0.00	Slide 3:	0	50	Slide 7:	0	50	
Percent Amphibole in Sample	0.0000	Slide 4:	0	50	Slide 8:	0	50	

Percent of Total Asbestos in Sample	0.0000
-------------------------------------	--------

* All Weights in grams



EMSL Analytical, Inc.
307 West 38th Street, New York, NY 10018
Phone/Fax: (212)290-0051 / (212)290-0058
<http://www.EMSL.com> manhattanlab@emsl.com

EMSL Order #: **031801391**
Customer ID: **QUES51**
Customer PO: **Not Available**

Attn: **Quality Environmental Solution & Tech**
1376 Route 9
Wappingers Falls, NY 12590

Phone: **845-298-6031**
Fax: **845-298-6251**

Project: **Q18-1530 / CAFE RENOVATION**

Date Collected: **01/17/2018**
Date Received: **01/19/2018**
Date Analyzed: **01/29/2018**

Report Date
01/29/2018

Report Revision
R0

Revision Comments
Initial Report

James Hall, Laboratory Manager
or other approved signatory

Additional Comments: NYS ELAP ID #11506

About us



EMSL Analytical, Inc. offers a full line of analytical solutions for over 30 years across North America. For more information about our nationally accredited locations, vast line of testing services, and our food safety solutions please visit www.EMSL.com or call (800) 220-3675.



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QUALITY ENVIRONMENTAL SOLUTIONS & TECHNOLOGIES, INC.

BULK SAMPLE FORM

031801391

CLIENT: SUNY Purchase AssociationSAMPLED BY: J. Klemm, S. TalsmaADDRESS: 735 Anderson Hill RoadDATE SAMPLED: 17-Jan-18Purchase, NY 10577CONTACT: Patrick SavolskiANALYSIS METHOD: PLM KXPROJECT ID: Café Renovation

TURN-AROUND TIME: _____ HOURS

5 DAYSPROJECT #: Q18-1530

OTHER

SAMPLE # LAB#	LOCATION	SAMPLE DESCRIPTION	COMMENTS
1530-01	Basement, Fan Room, on Metal Pipe, at Elbow	Mudded Joint Packing	Stop
1530-02	Basement, Storage Room, on Metal Pipe, at Elbow	Mudded Joint Packing	At First
1530-03	Basement, Storage Room, on Metal Pipe, at Elbow	Mudded Joint Packing	Positive
1530-04	Basement, Fan Room, on Metal Support Column	Sprayed-on Fireproofing	Stop
1530-05	Basement, Storage Room, on Metal Support Column	Sprayed-on Fireproofing	At First
1530-06	Basement, Fan Room, on Metal Support Column	Sprayed-on Fireproofing	Positive
1530-07	Basement, Storage Room, on Metal Support Column	Sprayed-on Fireproofing	Stop
1530-08	Basement, Storage Room, on Metal Support Column	Sprayed-on Fireproofing	At First
1530-09	Basement, Storage Room, on Metal Support Column	Sprayed-on Fireproofing	Positive
1530-10	First Floor, Kitchen Storage Room, on Metal Support Columns	Sprayed-on Fireproofing	Stop

CHAIN OF CUSTODY (SEE LAST PAGE)

SUBMITTED BY: _____

DATE: 1-18-18

RECEIVED BY: _____

DATE: 1/19/18 11:22 AMEmily Mont 1-24-18 11:35APAGE 1 OF 6oc 1/24/18
GA

QUALITY ENVIRONMENTAL SOLUTIONS & TECHNOLOGIES, INC.

BULK SAMPLE FORM

CLIENT: SUNY Purchase Association

ADDRESS: 735 Anderson Hill Road
Purchase, NY 10577

CONTACT: Patrick Savolski

PROJECT ID: Café Renovation

PROJECT #: Q18-1530

SAMPLED BY: J. Klemm, S. Talsma

DATE SAMPLED: 17-Jan-18

ANALYSIS METHOD: PLM

TURN-AROUND TIME: _____ HOURS
5 DAYS
 OTHER

SAMPLE # LAB#	LOCATION	SAMPLE DESCRIPTION	COMMENTS
1530-11	First Floor, Kitchen Storage Room, on Metal Support Columns	Sprayed-on Fireproofing	At First Positive
1530-12	First Floor, Kitchen Storage Room, on Metal Support Columns	Sprayed-on Fireproofing	
1530-13	Basement, Storage Room, Partition Wall, on Sheetrock	Joint Compound	18 JAN 19 AM 11:22
1530-14	Basement, Storage Room, Partition Wall, on Sheetrock	Joint Compound	
1530-15	Basement, Hallway Outside Storage Room, Partition Wall, on Sheetrock	Joint Compound	
1530-16	First Floor, Café, Serving Area, Wall, on Sheetrock	Joint Compound	
1530-17	First Floor, Café, Dining Room, Wall, on Sheetrock	Joint Compound	
1530-18	First Floor, Café, Staff Lounge, Wall, on Sheetrock	Joint Compound	
1530-19	First Floor, Café, Staff Lounge, Wall, on Sheetrock	Joint Compound	
1530-20	First Floor, Café, Kitchen, Office, Wall, on Sheetrock	Joint Compound	

CHAIN OF CUSTODY (SEE LAST PAGE)

SUBMITTED BY: [Signature]DATE: 1-18-18RECEIVED BY: [Signature]DATE: 1/19/18 11:20 AM

Enisho Niguel 1-24-18 11:35 AM

PAGE 2 OF 6

or 1/29/18 6:05 PM

QUALITY ENVIRONMENTAL SOLUTIONS & TECHNOLOGIES, INC.

BULK SAMPLE FORMCLIENT: SUNY Purchase AssociationSAMPLED BY: J. Klemm, S. TalsmaADDRESS: 735 Anderson Hill RoadDATE SAMPLED: 17-Jan-18Purchase, NY 10577CONTACT: Patrick SavolskiANALYSIS METHOD: PLMPROJECT ID: Café Renovation

TURN-AROUND TIME: _____ HOURS

5 DAYSPROJECT #: Q18-1530

OTHER

SAMPLE # LAB#	LOCATION	SAMPLE DESCRIPTION	COMMENTS
1530-21	First Floor, Café, Main Serving Area, Wall, on Sheetrock	Joint Compound	18 JAN 9 AM 11:22 Stop At First Positive
1530-22	Basement, Café, Fan Room, Soffit, on Sheetrock	Joint Compound	
1530-23	Basement, Storage Room, Closet B, Wall, on Sheetrock	Joint Compound	
1530-24	Basement, Storage Room, Closet B, Wall, on Sheetrock	Joint Compound	
1530-25	Basement, Storage Room, Closet A, Wall	Sheetrock	
1530-26	Basement, Storage Room, Closet B, Wall	Sheetrock	
1530-27	First Floor, Café, Dining Room, Soffit	Sheetrock	
1530-28	First Floor, Café, Main Serving Area, Wall	Sheetrock	
1530-29	Basement, Fan Room, Around Duct	Canvas Wrap	
1530-30	Basement, Fan Room, Around Duct	Canvas Wrap	

CHAIN OF CUSTODY (SEE LAST PAGE)

SUBMITTED BY: [Signature]DATE: 1-18-18RECEIVED BY: [Signature]DATE: 1/19/18 11:22 AMPAGE 3 OF 6Emily Myles 1-24-18 11:35 AM1/24/18
6054

QUALITY ENVIRONMENTAL SOLUTIONS & TECHNOLOGIES, INC.

BULK SAMPLE FORMCLIENT: SUNY Purchase AssociationSAMPLED BY: J. Klemm, S. TalsmaADDRESS: 735 Anderson Hill RoadDATE SAMPLED: 17-Jan-18Purchase, NY 10577CONTACT: Patrick SavolskiANALYSIS METHOD: PLMPROJECT ID: Café Renovation

TURN-AROUND TIME: _____ HOURS

5 DAYSPROJECT #: Q18-1530

OTHER

SAMPLE # LAB#	LOCATION	SAMPLE DESCRIPTION	COMMENTS
1530-31	First Floor, Serving Area, Floor	Quarry Tile & Mudset (Separate Layers)	18 JAN 19 AM 11:22
1530-32	First Floor, Serving Area, Floor	Quarry Tile & Mudset (Separate Layers)	
1530-33	First Floor, Café, Serving Area, Between Quarry Tile	Grout	
1530-34	First Floor, Café, Serving Area, Between Quarry Tile	Grout	
1530-35	Basement, Storage Room, Closet B, Wall, on Sheetrock	Fiberboard	
1530-36	Basement, Storage Room, Closet B, Ceiling	Fiberboard	
1530-37	First Floor, Café, Main Serving Area, Floor, Large Tile	Ceramic Tile	
1530-38	First Floor, Café, Dining Area, Floor, Large Tile	Ceramic Tile	
1530-39	First Floor, Café, Main Serving Area, Floor, Small Tile	Ceramic Tile	
1530-40	First Floor, Café, Dining Area, Floor, Small Tile	Ceramic Tile	

CHAIN OF CUSTODY (SEE LAST PAGE)

SUBMITTED BY: _____

DATE: 1-18-18

RECEIVED BY: _____

DATE: 1/19/18 11:22 AMEmily Myant 1.24.18 11:35 AMPAGE 4 OF 6ac 1/24/18
6952

QUALITY ENVIRONMENTAL SOLUTIONS & TECHNOLOGIES, INC.

BULK SAMPLE FORMCLIENT: SUNY Purchase AssociationSAMPLED BY: J. Klemm, S. TalsmaADDRESS: 735 Anderson Hill RoadDATE SAMPLED: 17-Jan-18Purchase, NY 10577CONTACT: Patrick SavolskiANALYSIS METHOD: PLMPROJECT ID: Café Renovation

TURN-AROUND TIME: _____ HOURS

5 DAYSPROJECT #: Q18-1530

OTHER

SAMPLE # LAB#	LOCATION	SAMPLE DESCRIPTION	COMMENTS
1530-41	Basement, Storage Room, Floor	Cementitious Slab	18 JAN 19 AM 11:22
1530-42	First Floor, Café, Kitchen, Floor, Under Epoxy Flooring	Cementitious Slab	
1530-43	First Floor, Café, Kitchen, Wall	Cementitious Block	
1530-44	Basement, Storage Room, Wall	Cementitious Block	
1530-45	Basement, Fan Room, Wall, Between Cementitious Block	Mortar	
1530-46	First Floor, Café, Kitchen, Wall, Between Cementitious Block	Mortar	
1530-47	First Floor, Café, Dining Area, Wall, Between Brick	Mortar	
1530-48	First Floor, Café, Dining Area, Wall, Between Brick	Mortar	
1530-49	First Floor, Café, Dining Area, Wall	Brick	
1530-50	First Floor, Café, Dining Area, Wall	Brick	

CHAIN OF CUSTODY (SEE LAST PAGE)

SUBMITTED BY: _____

DATE: 1-18-18

RECEIVED BY: _____

DATE: 1/19/18 11:22 AMEmily August 1.24.18 11:35 AMPAGE 5 OF 62/1/2018
6092m

QUALITY ENVIRONMENTAL SOLUTIONS & TECHNOLOGIES, INC.

BULK SAMPLE FORMCLIENT: SUNY Purchase AssociationSAMPLED BY: J. Klemm, S. TalsmaADDRESS: 735 Anderson Hill RoadDATE SAMPLED: 17-Jan-18Purchase, NY 10577CONTACT: Patrick SavolskiANALYSIS METHOD: PLMPROJECT ID: Café Renovation

TURN-AROUND TIME: _____ HOURS

5 DAYSPROJECT #: Q18-1530

OTHER

SAMPLE # LAB#	LOCATION	SAMPLE DESCRIPTION	COMMENTS
1530-51	First Floor, Kitchen, Suspended Ceiling, Sheetrock	Ceiling Tile	18 JAN 19 AM 11:22
1530-52	First Floor, Kitchen, Suspended Ceiling, Sheetrock	Ceiling Tile	
1530-53	First Floor, Café, Dining Area, Floor, Under Ceramic Tile, on Cementitious Slab	Mudset	
1530-54	First Floor, Café, Main Serving Area, Floor, Under Ceramic Tile, on Cementitious Slab	Mudset	
1530-55	First Floor, Café, Dining Area, Floor, Between Ceramic Tile	Grout	
1530-56	First Floor, Café, Main Serving Area, Floor, Between Ceramic Tile	Grout	

CHAIN OF CUSTODY (SEE LAST PAGE)

SUBMITTED BY: [Signature]DATE: 1-18-18RECEIVED BY: [Signature]DATE: 1/19/18 11:22 AMEmily Munt 1-24-18 11:35 AMPAGE 6 OF 6or 1/24/18 6:00 PM



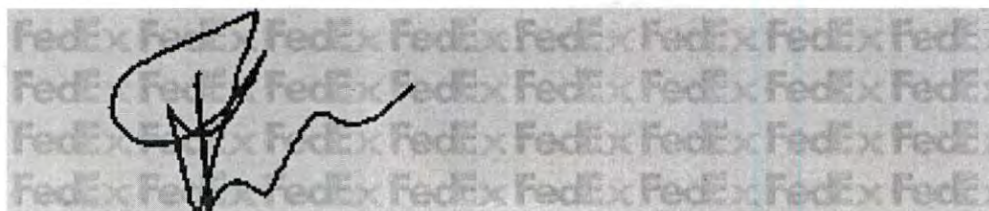
January 19, 2018

Dear Customer:

The following is the proof-of-delivery for tracking number **795415506770**.

Delivery Information:

Status:	Delivered	Delivered to:	Receptionist/Front Desk
Signed for by:	M.MARCUS	Delivery location:	307 WEST 38TH ST RM 901 New York, NY 10018
Service type:	FedEx Priority Overnight	Delivery date:	Jan 19, 2018 10:53
Special Handling:	Deliver Weekday		



Shipping Information:

Tracking number:	795415506770	Ship date:	Jan 18, 2018
		Weight:	1.0 lbs/0.5 kg

Recipient:

Sample Receiving
EMSL Analytical, Inc.
307 West 38th Street
New York, NY 10018 US

Reference

RMA

Shipper:

Contact Name:
Quality Environmental Solution & Te
1376 Route 9
Wappingers Falls, NY 12590 US

ARL-WEB(A)

QUES51

Thank you for choosing FedEx.



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307 West 38th Street New York, NY 10018

Tel/Fax: (212) 290-0051 / (212) 290-0058

<http://www.EMSL.com> / manhattanlab@emsl.com

EMSL Order: 031802743

Customer ID: QUES51

Customer PO:

Project ID:

Attention: Quality Environmental Solution & Tech
1376 Route 9
Wappingers Falls, NY 12590

Phone: (845) 298-6031

Fax: (845) 298-6251

Received Date: 02/05/2018 10:03 AM

Analysis Date: 02/07/2018

Collected Date: 02/02/2018

Project: Q18-1530/ 735 ANDERSON HILL ROAD, SUNY PURCHASE, NY 10577/ CAFE RENOV.

Test Report:Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos		Asbestos
			Fibrous	Non-Fibrous	
Sample ID 1530-01 031802743-0001		Description	MAIN AREA, WALL, ON SHEETROCK - JOINT COMPOUND		
		Homogeneity	Heterogeneous		
PLM NYS 198.1 Friable	02/07/2018	White/ Green		55.00% Ca Carbonate 3.00% Mica 42.00% Non-fibrous (other)	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 1530-02 031802743-0002		Description	MAIN AREA, WALL, ON SHEETROCK - JOINT COMPOUND		
		Homogeneity	Heterogeneous		
PLM NYS 198.1 Friable	02/07/2018	Gray/ White		50.00% Ca Carbonate 5.00% Mica 45.00% Non-fibrous (other)	None Detected
Inseparable paint / coating layer included in analysis					
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 1530-03 031802743-0003		Description	MAIN AREA, WALL, ON SHEETROCK - JOINT COMPOUND		
		Homogeneity	Homogeneous		
PLM NYS 198.1 Friable	02/07/2018	White		60.00% Ca Carbonate 5.00% Mica 35.00% Non-fibrous (other)	None Detected
Inseparable paint / coating layer included in analysis					
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed

Initial Report From: 02/07/2018 13:03:19



EMSL Analytical, Inc.

307 West 38th Street New York, NY 10018

Tel/Fax: (212) 290-0051 / (212) 290-0058

<http://www.EMSL.com> / manhattanlab@emsl.com

EMSL Order: 031802743

Customer ID: QUES51

Customer PO:

Project ID:

Test Report: Asbestos Analysis of Bulk Material

The samples in this report were submitted to EMSL for analysis by Asbestos Analysis of Bulk Materials via NYS ELAP Approved Methods. The reference number for these samples is the EMSL Order ID above. Please use this reference number when calling about these samples.

Report Comments:

Sample Receipt Date: 2/5/2018

Sample Receipt Time: 10:03 AM

Analysis Completed Date: 2/7/2018

Analysis Completed Time: 12:32 PM

Analyst(s):

Emily Myint PLM NYS 198.1 Friable (1)

Jon Williams PLM NYS 198.1 Friable (2)

Samples reviewed and approved by:

James Hall, Laboratory Manager
or Other Approved Signatory

NOB = Non Friable Organically Bound N/A = Not Applicable VCM = Vermiculite Containing Material

-In New York State, TEM is currently the only method that can be used to determine if NOB materials can be considered or treated as non-asbestos containing.

All samples examined for the presence of vermiculite when analyzed via NYS 198.1.

-NYS Guidelines for Vermiculite containing samples are available at http://www.wadsworth.org/labcert/elapcert/forms/VermiculiteInterimGuidance_Rev070913.pdf EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples were received in good condition unless otherwise noted.

This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government. This report may contain data that is not covered by the NVLAP accreditation.

Samples analyzed by EMSL Analytical, Inc. New York, NY NYS ELAP 11506

Initial Report From: 02/07/2018 13:03:19

QUALITY ENVIRONMENTAL SOLUTIONS & TECHNOLOGIES, INC.

BULK SAMPLE FORM

CLIENT: SUNY Purchase Association

ADDRESS: 735 Anderson Hill Road
Purchase, NY 10577

CONTACT: Patrick Savolski

PROJECT ID: Café Renovation

PROJECT #: Q18-1530

SAMPLED BY: J. Klemm, L. Goldstein

DATE SAMPLED: 2-Feb-18

ANALYSIS METHOD: PLM

TURN-AROUND TIME: _____ HOURS
5 DAYS
 OTHER

031802743

SAMPLE # LAB#	LOCATION	SAMPLE DESCRIPTION	COMMENTS
1530-01	Main Area, Wall, on Sheetrock	Joint Compound	18 FEB -5 AM 10:03 1230 ✓
1530-02	Main Area, Wall, on Sheetrock	Joint Compound	
1530-03	Main Area, Wall, on Sheetrock	Joint Compound	

CHAIN OF CUSTODY (SEE LAST PAGE)

SUBMITTED BY: [Signature]DATE: 2-2-18RECEIVED BY: [Signature]DATE: 2/25/18 @ 1003AMPAGE 1 OF 1

Emily Mark 2.7.18 13:02

Revised chain of Custody
031802743

Holowitz, David

From: Silverman, Josh
Sent: Wednesday, February 07, 2018 11:32 AM
To: EMSL Lab - Manhattan; Manhattan Login; Hall, James
Subject: RE: 031802743 for QUES51

Importance: High

This is OK'd. Please charge 2 day TAT and have it done by 3pm today



Josh Silverman | Sales Account Representative

EMSL Analytical, Inc. | 200 Route 130 North | Cinnaminson, NJ 08077

Phone: 856-303-2531 Cell: 609-519-0143 | Fax: 856-786-5974 | Toll Free: 800-220-3675

Some of the resources EMSL Analytical, Inc. offers to our clients:

[LABConnect](#) | [Order Products](#) | [Client Corner](#) | [Training](#) | [Additional Resources](#) | [Sampling Videos](#)

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From: Silverman, Josh
Sent: Wednesday, February 07, 2018 11:07 AM
To: EMSL Lab - Manhattan; Manhattan Login; Hall, James
Subject: RE: 031802743 for QUES51
Importance: High

No, they need done today, which would make it 2 day TAT. He needs them in the next couple hours.

031802743	February 05, 2018 10:03 AM	Q18-1530/ 735 ANDERSON HILL ROAD, URCHASE, NY 10577/ CAFE RENOV.	PLM NYS 198.1 Friable (3)	N/A	Pending Due 02/10	Pending		Pend
------------------	----------------------------	--	---------------------------	-----	--------------------------	----------------	--	-------------

and change from SUNY URCHASE. Should read SUNY PURCHASE

please email the results to lgoldstein@qualityenv.com



Josh Silverman | Sales Account Representative

EMSL Analytical, Inc. | 200 Route 130 North | Cinnaminson, NJ 08077

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David Holowitz 2/7/18 11:27 AM
 Page 2 Of 4

031802743

Revised Chain of Custody

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From: Holowitz, David **On Behalf Of** EMSL Lab - Manhattan
Sent: Wednesday, February 07, 2018 10:58 AM
To: Silverman, Josh; Manhattan Login; EMSL Lab - Manhattan; Hall, James
Subject: RE: 031802743 for QUES51

Should we change the turnaround to 3 Hours from the original 5 Day?



David Holowitz | Admin/ Data Entry

EMSL Analytical, Inc. | 307 West 38th Street | New York, NY 10018

Phone: 212-290-0051 | Fax: 212-290-0058 | Toll Free: 866-448-3675

Lab Hours: 24 Hours 7 Days a week

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From: Silverman, Josh
Sent: Wednesday, February 07, 2018 10:55 AM
To: Manhattan Login; EMSL Lab - Manhattan; Hall, James
Subject: 031802743 for QUES51
Importance: High

Larry Goldstein at QUES51 just called in: 031802743 says SUNY URCHASE. Should read SUNY PURCHASE. He needs today, please change TAT to finish today



Josh Silverman | Sales Account Representative

EMSL Analytical, Inc. | 200 Route 130 North | Cinnaminson, NJ 08077

Phone: 856-303-2531 Cell: 609-519-0143 | Fax: 856-786-5974 | Toll Free: 800-220-3675

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2/7/18 11:32 AM

FedEx® Tracking

795423611369

Ship date:

Fri 2/02/2018

Wappingers Falls, NY US

**Delivered**

Signed for by: G.BATSON

Actual delivery:

Mon 2/05/2018 9:34 am

NEW YORK, NY US



▲ Date/Time	Activity	Location
■ 2/05/2018 - Monday		
9:34 am	Delivered	New York, NY
7:28 am	On FedEx vehicle for delivery	NEW YORK, NY
7:20 am	At local FedEx facility	NEW YORK, NY
■ 2/04/2018 - Sunday		
1:36 am	Departed FedEx location	NEWARK, NJ
■ 2/02/2018 - Friday		
10:58 pm	Arrived at FedEx location	NEWARK, NJ
9:20 pm	Left FedEx origin facility	NEWBURGH, NY
6:37 pm	Picked up	NEWBURGH, NY
12:48 pm	Shipment information sent to FedEx	

Shipment Facts

Tracking Number	795423611369	Service	FedEx Priority Overnight
Weight	1 lbs / 0.45 kgs	Dimensions	11x9x4 in.
Delivered To	Receptionist/Front Desk	Total pieces	1
Total shipment weight	1 lbs / 0.45 kgs	Terms	Shipper
RMA	QUES51	Shipper reference	ARL-WEB(A)
Packaging	Your Packaging	Special handling section	Deliver Weekday
Standard transit	2/05/2018 by 10:30 am		

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Quality Environmental Solutions & Technologies, Inc.

Appendix C: PERSONNEL LICENSES & CERTIFICATIONS

New York State – Department of Labor

Division of Safety and Health
License and Certificate Unit
State Campus, Building 12
Albany, NY 12240

ASBESTOS HANDLING LICENSE

Quality Environmental Solutions & Technologies, Inc.

1376 Route 9

Wappinger Falls, NY 12590

FILE NUMBER: 99-0018

LICENSE NUMBER: 29085

LICENSE CLASS: RESTRICTED

DATE OF ISSUE: 01/18/2018

EXPIRATION DATE: 01/31/2019

Duly Authorized Representative – Lawrence J Holzapfel:

This license has been issued in accordance with applicable provisions of Article 30 of the Labor Law of New York State and of the New York State Codes, Rules and Regulations (12 NYCRR Part 56). It is subject to suspension or revocation for a (1) serious violation of state, federal or local laws with regard to the conduct of an asbestos project, or (2) demonstrated lack of responsibility in the conduct of any job involving asbestos or asbestos material.

This license is valid only for the contractor named above and this license or a photocopy must be prominently displayed at the asbestos project worksite. This license verifies that all persons employed by the licensee on an asbestos project in New York State have been issued an Asbestos Certificate, appropriate for the type of work they perform, by the New York State Department of Labor.



Eileen M. Franko, Director
For the Commissioner of Labor



NEW YORK STATE MINORITY- AND WOMEN-OWNED BUSINESS ENTERPRISE ("MWBE") CERTIFICATION

Empire State Development's Division of Minority and Women's Business
Development grants a

Minority Business Enterprise (MBE)

pursuant to New York State Executive Law, Article 15-A to:

Quality Environmental Solutions & Technologies Inc.

Certification Awarded on: August 11, 2015

Expiration Date: August 11, 2018

File ID#: 49952



NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2018
Issued April 01, 2017

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MR. PAUL STASCAVAGE
EAS INC - EASTERN ANALYTICAL SERVICES INC
4 WESTCHESTER PLAZA
ELMSFORD, NY 10523-1610

NY Lab Id No: 10851

is hereby APPROVED as an Environmental Laboratory for the category
ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved subcategories and/or analytes are listed below:

Miscellaneous

Asbestos in Friable Material	Item 198.1 of Manual EPA 600/M4/82/020
Asbestos in Non-Friable Material-PLM	Item 198.6 of Manual (NOB by PLM)
Asbestos in Non-Friable Material-TEM	Item 198.4 of Manual
Asbestos-Vermiculite-Containing Material	Item 198.8 of Manual
Lead in Dust Wipes	EPA 7000B
Lead in Paint	EPA 7000B
Sample Preparation Methods	EPA 3050B

Serial No.: 55796

Property of the New York State Department of Health. Certificates are valid only at the address shown, must be conspicuously posted, and are printed on secure paper. Continued accreditation depends on successful ongoing participation in the Program. Consumers are urged to call (518) 485-5570 to verify the laboratory's accreditation status.

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2018
Issued April 01, 2017

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MR. PAUL STASCAVAGE
EAS INC - EASTERN ANALYTICAL SERVICES INC
4 WESTCHESTER PLAZA
ELMSFORD, NY 10523-1610

NY Lab Id No: 10851

is hereby APPROVED as an Environmental Laboratory for the category
ENVIRONMENTAL ANALYSES AIR AND EMISSIONS
All approved subcategories and/or analytes are listed below:

Metals I

Lead, Total

NIOSH 7082

Miscellaneous

Asbestos

40 CFR 763 APX A No. III

YAMATE, AGARWAL GIBB

NIOSH 7402

Fibers


NIOSH 7400 A RULES


NEW YORK
state department of
HEALTH

Serial No.: 55798

Property of the New York State Department of Health. Certificates are valid only at the address shown, must be conspicuously posted, and are printed on secure paper. Continued accreditation depends on successful ongoing participation in the Program. Consumers are urged to call (518) 485-5570 to verify the laboratory's accreditation status.

STATE OF NEW YORK - DEPARTMENT OF LABOR
ASBESTOS CERTIFICATE

 **JAMES D KLEMM**
CLASS(EXPIRES)
C ATEC(06/18) D INSP(06/18)
H PM (06/18)


CERT# 13-11486
DMV# 949876493

MUST BE CARRIED ON ASBESTOS PROJECTS



EYES BLU
HAIR BRO
HGT 5' 10"

IF FOUND RETURN TO:
NYS DOL - L&C UNIT
ROOM 161A BUILDING 12
STATE OFFICE CAMPUS
ALBANY NY 12240



12-004336042

This card acknowledges that the recipient has successfully completed a
10-hour Occupational Safety and Health Training Course in
Construction Safety and Health

JAMES KLEMM

David Veit

06/05/2013

Trainer name – print or type)

(Course end date)

OSHA recommends Outreach Training Courses as an orientation to occupational safety and health for workers. Participation is voluntary. Workers must receive additional training on specific hazards of their job. This course completion card does not expire.

Use or distribution of this card for fraudulent purposes, including false claims of having received training, may result in prosecution under 18 U.S.C. 1001. Potential penalties include substantial criminal fines, imprisonment up to five years, or both.

For OSHA Outreach Training Program go to "Training" at www.osha.gov

Rev. 9/2009

STATE OF NEW YORK - DEPARTMENT OF LABOR
ASBESTOS CERTIFICATE



SHANNON D TALSMA
CLASS(EXPIRES)
C ATEC(10/18) D INSP(10/18)
H PM (10/18)

CERT# 16-07559
DMV# 963348232

MUST BE CARRIED ON ASBESTOS PROJECTS



01213 004427123 76

EYES GRN
HAIR BLN
HGT 6' 00"

IF FOUND RETURN TO:
NYSOL - L&C UNIT
ROOM 161A BUILDING 12
STATE OFFICE CAMPUS
ALBANY NY 12240



12-006010504

This card acknowledges that the recipient has successfully completed:

10-hour Construction Safety and Health

This card issued to:

Shannon D. Talsma

David Veit

04/22/2016

Trainer Name

Date of Issue



732.235.9450
aotc.sph.rutgers.edu

OSHA recommends Outreach Training Courses as an orientation to occupational safety and health for workers. Participation is voluntary. Workers must receive additional training on specific hazards of their job. This course completion card does not expire.

Use or distribution of this card for fraudulent purposes, including false claims of having received training, may result in prosecution under 18 U.S.C. 1001. Potential penalties include substantial criminal fines, imprisonment up to 5 years, or both.

To verify this training, scan the QR code with your mobile device.



Rev. 1/2016

QuES&T

Quality Environmental Solutions & Technologies, Inc.

February 7th, 2018

SUNY Purchase Association
735 Anderson Hill Road
Purchase, NY 10577

ATTN: Patrick Savolskis

Via E-mail: patrick.savolskis@purchase.edu

Re: SUNY Purchase Cafe Building Renovation
735 Anderson Hill Road, Purchase, NY 10577
Limited XRF Lead Survey
QuES&T Project #Q18-1530

Dear Mr. Savolskis,

Quality Environmental Solutions & Technologies, Inc. (**QuES&T**) was retained by SUNY Purchase Association to complete a limited Lead-Based Paint Survey, utilizing X-Ray Fluorescence Technology (XRF), throughout the interiors of the SUNY Purchase Campus Cafe North Building located at 735 Anderson Hill Road, Purchase, NY 10577. The survey was limited to specific accessible, representative building components & immovable objects, potentially affected by possible future renovation/repair/demolition activities.

Niton-certified XRF Technician Mr. James Klemm, of **QuES&T**, collected a total of forty four (**44**) samples (including calibrations) on January 16, 2018.

QuES & T

Quality Environmental Solutions & Technologies, Inc.

Based on review of the data generated by the Niton XLp-300A XRF Spectrum Analyzer, the following surfaces tested were identified as lead-based, as defined by HUD/EPA (equal to or in excess of 1.0 milligram per square centimeter):

Campus North Café Building - INTERIORS:

Location of Identified LBP	LBP Component	Substrate	Color	LBP Condition	Approx. Qty.
Campus Café North, Main Cafeteria	Ceiling, Support Frame	Metal	Red	Intact	1,600SF
Campus Café North, Kitchen Storage	Ceiling, Support Beam	Metal	Red	Intact	400 SF
Campus Café North, Kitchen	Ceiling, Support Beam	Metal	Red	Intact	1,500 SF
Campus Café North, Basement, Fan Room	Ceiling, Support Beam	Metal	Red	Intact	350 SF

- Additionally, it should be noted that a few components tested did in fact contain minimal lead levels, below the EPA threshold level of 1.0 mg/sq. cm. for classification as Lead-Based Paint (LBP) and are considered lead-containing coatings by the OSHA Regulation, "Lead Exposure in Construction" (29 CFR 1926.62). OSHA does not recognize a minimum limit for lead concentrations in paint for the purposes of disturbance. Monitoring of workers performing demolition/cleaning/disturbance of painted surfaces shall be completed to document personnel occupational exposure. Items containing any amount of lead concentration are considered lead-containing coatings per 29 CFR 1926.62, OSHA Lead Exposure in Construction.

QuES&T

Quality Environmental Solutions & Technologies, Inc.

It should be noted that the information contained within this report is based upon observation and test results provided by **QuES&T**. These observations and results are time dependent, subject to changing site conditions and revisions to Federal, State, and Local regulations. **QuES&T** warrants that these findings have been promulgated after being prepared in general accordance with generally accepted practices in the abatement industries. **QuES&T** also recognizes that raw testing data is not usually sufficient to make all abatement and management decisions. No other warranties are expressed or implied.

Should you wish to discuss this matter further or require additional information concerning this transmittal, feel free to contact us at (845) 298-6031. **QuES&T** greatly appreciates the opportunity to assist SUNY Purchase Association in the environmental services area and we look forward to working again with you in the future.

Sincerely,



James Klemm
Field & Technical Services
NYS/AHERA Inspector
Cert. 13-11486



Quality Environmental Solutions & Technologies, Inc.

Appendix A: ANALYTICAL DATA

Limited XRF Lead Survey

A	B	C	D	E	F	G	H	I	J	K	L	M
Sample	Building/Address	Interior/Exterior	Floor	Space/Room/Description	Object	Component	Substrate	Color	Condition	Result	Pb Concentration (mg/cm2)	Pb Error (mg/cm2)
1										Negative	0	0.02
2										<u>Positive</u>	<u>1.2</u>	<u>0.1</u>
3	NIST (<0.01)											
4	<u>NIST (1.04 +/- 0.06)</u>											
5	3 Campus Café North	Interior	1st	Dining Hall	Wall		Sheetrock	Gray	Intact	Negative	0	0.02
6	4 Campus Café North	Interior	1st	Dining Hall	Wall		Brick	Brown	Intact	Negative	0	0.02
7	5 Campus Café North	Interior	1st	Dining Hall	Window		Metal	Black	Intact	Negative	0	0.02
8	6 Campus Café North	Interior	1st	Dining Hall	Door		Metal	Black	Intact	Negative	0	0.02
9	7 Campus Café North	Interior	1st	Dining Hall	Door		Metal	Black	Intact	Negative	0	0.02
10	8 Campus Café North	Interior	1st	Dining Hall	Column		Concrete	Gray	Intact	Negative	0.04	0.05
11	9 Campus Café North	Interior	1st	Sushi Serving Area	Wall	Lower	Sheetrock	Gray	Intact	Negative	0	0.02
12	10 Campus Café North	Interior	1st	Sushi Serving Area	Wall	Mid-Rail	Wood	Gray	Intact	Negative	0	0.02
13	11 Campus Café North	Interior	1st	Sushi Serving Area	Wall	Covebase Molding	Quarry Tile	Blue	Intact	Negative	0.05	0.07
14	12 Campus Café North	Interior	1st	Sushi Serving Area	Wall	Upper	Sheetrock	Black	Intact	Negative	0	0.02
15	13 Campus Café North	Interior	1st	Sushi Serving Area	Ceiling	Support Beam	Metal	Black	Intact	Negative	0	0.02
16	14 Campus Café North	Interior	1st	Sushi Serving Area	Ceiling	Deck	Metal	Black	Intact	Negative	0	0.02
17	15 Campus Café North	Interior	1st	Sushi Serving Area	Wall	Electric Panel	Metal	Gray	Intact	Negative	0	0.02
18	16 Campus Café North	Interior	1st	Sushi Serving Area	Door		Metal	Gray	Intact	Negative	0	0.02
19	17 Campus Café North	Interior	1st	Sushi Serving Area	Door	Casing	Metal	Gray	Intact	Negative	0	0.02
20	18 Campus Café North	Interior	1st	Sushi Serving Area	Security Gate	Casing	Metal	Black	Intact	Negative	0	0.02
21	19 Campus Café North	Interior	1st	Serving Area 2	Wall		Sheetrock	Gray	Intact	Negative	0	0.02
22	20 Campus Café North	Interior	1st	Serving Area 2	Ceiling	Soffit	Sheetrock	Gray	Intact	Negative	0.06	0.18
23	21 Campus Café North	Interior	1st	Serving Area 2	Emergency Door		Metal	Gray	Intact	Negative	0.14	0.79
24	22 Campus Café North	Interior	1st	Serving Area 2	Emergency Door	Casing	Metal	Gray	Intact	Negative	0.03	0.16
25	23 Campus Café North	Interior	1st	Serving Area 2	Ceiling	Duct	Metal	Blue	Intact	Negative	0.03	0.16
26	<u>24 Campus Café North</u>	<u>Interior</u>	<u>1st</u>	<u>Serving Area 2</u>	<u>Ceiling</u>	<u>Support Frame</u>	<u>Metal</u>	<u>Red</u>	<u>Intact</u>	<u>Positive</u>	<u>3.3</u>	<u>1.4</u>
27	25 Campus Café North	Interior	1st	Serving Area 2	Ceiling	Deck	Metal	Blue	Intact	Negative	0.01	0.05
28	26 Campus Café North	Interior	1st	Kitchen	Wall		CMU	White	Intact	Negative	0	0.02
29	27 Campus Café North	Interior	1st	Kitchen	Door		Wood	Gray	Intact	Negative	0	0.02
30	28 Campus Café North	Interior	1st	Kitchen	Door	Casing	Metal	Gray	Intact	Negative	0.03	0.06
31	29 Campus Café North	Interior	1st	Storage	Floor		Concrete	Gray	Intact	Negative	0	0.02
32	30 Campus Café North	Interior	1st	Storage	Ceiling	Duct	Metal	Gray	Intact	Negative	0.05	0.23
33	<u>31 Campus Café North</u>	<u>Interior</u>	<u>1st</u>	<u>Storage</u>	<u>Ceiling</u>	<u>Support Beam</u>	<u>Metal</u>	<u>Red</u>	<u>Intact</u>	<u>Positive</u>	<u>2.1</u>	<u>0.9</u>
34	32 Campus Café North	Interior	1st	Storage	Ceiling	Pipe	Metal	Gray	Intact	Negative	0.09	0.22
35	33 Campus Café North	Interior	1st	Office	Wall		Sheetrock	White	Intact	Negative	0	0.02
36	34 Campus Café North	Interior	Basement	Fan Room	Wall		CMU	Blue	Intact	Negative	0	0.02
37	35 Campus Café North	Interior	Basement	Fan Room	Floor		Concrete	Gray	Intact	Negative	0	0.02
38	36 Campus Café North	Interior	Basement	Fan Room	Ceiling	Duct	Metal	Gray	Intact	Negative	0.01	0.06
39	<u>37 Campus Café North</u>	<u>Interior</u>	<u>Basement</u>	<u>Fan Room</u>	<u>Ceiling</u>	<u>Support Beam</u>	<u>Metal</u>	<u>Red</u>	<u>Intact</u>	<u>Positive</u>	<u>1.6</u>	<u>0.5</u>
40	38 Campus Café North	Interior	Basement	Fan Room	Door		Metal	Gray	Intact	Negative	0.02	0.04
41	39 Campus Café North	Interior	Basement	Fan Room	Door	Casing	Metal	Gray	Intact	Negative	0.04	0.07
42	40 Campus Café North	Interior	Basement	Storage Room	Wall		Sheetrock	Orange	Intact	Negative	0	0.02
43	41 Campus Café North	Interior	Basement	Storage Room	Floor		Concrete	Red	Intact	Negative	0.11	0.08
44	42 Campus Café North	Interior	Basement	Storage Room	Wall		CMU	Orange	Intact	Negative	0	0.02
45	43									Negative	0	0.02
46	<u>NIST (1.04 +/- 0.06)</u>									<u>Positive</u>	<u>1.1</u>	<u>0.1</u>



Quality Environmental Solutions & Technologies, Inc.

Appendix B:
RADIATION, XRF SPECTRUM ANALYZER
& PERSONNEL CERTIFICATIONS



NEW YORK STATE DEPARTMENT OF HEALTH

RADIOACTIVE MATERIALS LICENSE

Pursuant to the Public Health Law, Part 16 of the New York State Sanitary Code, Industrial Code Rule 38, and in reliance on statements and representations heretofore made by the licensee designated below, a license is hereby issued authorizing radioactive material(s) for the purpose(s), and at the place(s) designated below. The license is subject to all applicable rules, regulations, and orders now or hereafter in effect of all appropriate regulatory agencies and to any conditions specified below.

1. NAME OF LICENSEE FEIN 14-1800097 Quality Environmental Solutions and Technologies, Inc. Phone (845) 298-6031		3. LICENSE NUMBER C2939	
		4. EXPIRATION DATE June 15, 2026	
2. ADDRESS OF LICENSEE 1376 Route 9 Wappingers Falls, New York 12590		5a. REFERENCE DH 16-1 DH 16-97	b. AMENDMENT NO. 5
6. Radioactive Materials (elements in mass number)	7. Chemical and/or physical form	8. Maximum quantity licensee may possess at any one time	
A. Cadmium 109	A. Sealed source	A. 28 millicuries	

9. Authorized use.

- A. The licensee is authorized to use any sealed source or associated portable x-ray fluorescence device which has been manufactured and distributed in accordance with a specific license issued by an Agreement State or the United States Nuclear Regulatory Commission. Combinations of sources and devices must be compatible for use as stated in a Sealed Source and Device Registration Certificate (i.e., stated in the registration certificate for the source or device).
- B. No single source may exceed the maximum activity specified for that nuclide in the Sealed Source and Device Registration Certificate for any device in which the source is to be used.
- C. Only portable x-ray fluorescence devices which require continuous activation by the operator, and which incorporate a mechanism to automatically return the source to its shielded position (e.g., a "dead-man" switch) may be obtained and used under this license. Devices which rely upon positive action by the operator to shield the source, such as operation of a key switch, or which do not require continuous operator activation during exposure, are not authorized under this license.



NEW YORK STATE DEPARTMENT OF HEALTH
RADIOACTIVE MATERIALS LICENSE

3. License Number C2939

5a. Reference DHs 16-1 & 16-97

b. Amendment No. 5

10. A. The Radiation Safety Officer (RSO) for this License is **Rudy Lipinski**.
- B. Licensed material shall be used by, or under the supervision of, the Radiation Safety Officer, by licensee personnel trained and certified by the manufacturer. The licensee shall maintain a complete and accurate record of the qualifications of each person permitted to use radiation sources under this license.
11. Except as specifically provided otherwise in this License, the licensee shall conduct its program in accordance with the statements, representation and procedures contained in the documents, including any enclosures, listed below. The Department's Regulations shall govern, unless the statements, representation and procedures in the licensee's application and correspondence are more restrictive than the Regulations.
- A. License Renewal Application dated March 13, 2006, signed by Vincent R. Lander, with attachments.
- B. License Renewal Request dated March 8, 2016, signed by Suann Lander, with attachments.**
12. A. Licensed material shall be stored at the location indicated in Condition 2 and may be used at temporary job sites of the licensee anywhere within the State of New York, where the Department of Health exercises jurisdiction.
- B. Overnight storage at other locations shall be in accordance with statements referenced in Condition 11 of the license, provided that such storage may not be in a residence, or in an attached garage except within a vehicle. Any vehicle used for storage shall be driven only for purposes associated with use or transport of the contained radioactive material, by a person qualified to use the material, and no passengers shall be carried unless they are also involved in work under this license. Vehicular storage shall only be allowed if no other storage is possible and shall not exceed five (5) consecutive nights unless authorization to exceed this limit is obtained from the Department.
- C. Under no circumstances shall radioactive material authorized by this license be transferred to the custody of any person or firm other than the licensee, or be used or stored by another person or firm or its employees; unless that person or firm possesses a valid license to possess and use such radioactive material.
13. Sealed sources containing radioactive materials shall not be opened or removed from devices.
14. A. The licensee is not authorized to dismantle, repair or affect any changes in the source holders/devices.
- B. The licensee shall not alter labels attached to source holders or devices, and shall maintain labels in legible condition at all times.



NEW YORK STATE DEPARTMENT OF HEALTH
RADIOACTIVE MATERIALS LICENSE

3. License Number C2939

5a. Reference DHs 16-1 & 16-97

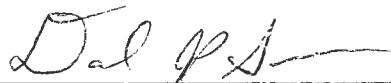
b. Amendment No. 5

15. The licensee shall instruct persons who engage in work under the license, in accordance with 10 NYCRR 16.13(c). Such instruction shall include the licensee's operating and emergency procedures, and other information contained in documents incorporated in Condition 11.
16. The licensee shall conduct a physical inventory every six (6) months to account for all devices received and possessed under the License. The records of the inventories shall be maintained for three (3) years from the date of the inventory for inspection by the Department, and shall include the quantities and kinds of licensed material, manufacturer's name and model number, location of devices, the date of the inventory, and the name of the person who performed it.
17.
 - A. The licensee shall maintain a utilization log containing the identification of devices used, dates removed and returned to storage, the location of use, and the identity of user.
 - B. The log shall be kept at the location of storage and shall contain sufficient detail to enable the licensee to inform the Department, at any time, of the exact location of each device.
18. Current copies of the following documents shall be maintained at temporary job sites for Department inspection:
 - A. The manufacturer's instruction manual and the licensee's operating and emergency procedures.
 - B. A copy of the results of the latest test for leakage and/or contamination performed on the sealed sources.
 - C. A copy of this license.
19. In the event that a theft, loss or other serious incident does occur, the Department shall be notified immediately by telephone and subsequent information acquired by the licensee shall be reported as it is received. All device users must carry the NYSDOH's current telephone number in their emergency procedures.
20. The licensee shall ensure that all persons authorized to use portable devices comply with safe use and maintenance procedures and that they do not leave a device unattended or unsecured at any time, even for a few minutes.

FOR THE NEW YORK STATE DEPARTMENT OF HEALTH

Date: **JUN 15 2016**

DJS/NAK:ks

By 
Daniel J. Samson, CHP, Chief
Radioactive Materials Section
Bureau of Environmental Radiation Protection

United States Environmental Protection Agency

This is to certify that



Quality Environmental Solutions & Technologies, Inc

has fulfilled the requirements of the Toxic Substances Control Act (TSCA) Section 402, and has received certification to conduct lead-based paint renovation, repair, and painting activities pursuant to 40 CFR Part 745.89

In the Jurisdiction of:

All EPA Administered States, Tribes, and Territories

This certification is valid from the date of issuance and expires December 01, 2021

NAT-119213-2

Certification #

December 01, 2016

Issued On



A handwritten signature in black ink that reads "Michelle Price".

Michelle Price, Chief

Lead, Heavy Metals, and Inorganics Branch



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

December 01, 2016

Lawrence Holzapfel
Quality Environmental Solutions & Technologies, Inc
1376 Route 9
Wappingers Falls, NY 12590

OFFICE OF CHEMICAL SAFETY
AND POLLUTION PREVENTION

Dear Lawrence Holzapfel:

Thank you for applying to the U.S. Environmental Protection Agency (EPA) for certification to conduct Renovation, Repair and Painting Activities in target housing and child-occupied facilities. I am pleased to inform you that, pursuant to 40 CFR Part 745, Subpart E, your renovation, repair and painting firm is certified. Your certificate is enclosed.

This certification **expires on December 01, 2021 and is valid in All EPA Administered States, Tribes, and Territories**. However, if a State in which you are certified obtains program authorization during the term of this certification, the scope of your certification will be diminished to exclude the affected area.

Your EPA firm certification is subject to the following restrictions:

- 1) Individual states and Indian tribes, whether authorized or not, are not required to accept EPA certification and may accept or reject it under its own authority. Please be aware that your EPA certification does not relieve you of any obligations you may have to any State or Indian tribe regarding renovation, repair and painting activities.
- 2) EPA certification is specific and limited as described above. If you wish to obtain certification in other lead-based paint disciplines, you must apply separately.
- 3) In advertising the EPA certification, firms must indicate clearly that the firm is certified only for purposes of Section 402 of TSCA. Failure to accurately state EPA certification conditions could result in EPA suspending or withdrawing certification.
- 4) EPA may conduct audits and/or inspections to ensure continued compliance with regulatory standards, and may revoke or suspend its certification if subsequent alterations or deviations result with the firm no longer meeting the standards found at 40 CFR Part 745, Subpart E.

If you have questions about the renovation, repair and painting rule or need assistance, please contact the Regional Lead Coordinator, Vickie Pane, of the EPA Region 2 staff at 732-321-6671. If you have any questions about your firm certification, please contact the National Lead Information Center at 1-800-424-LEAD and refer to **Application ID number C506794**. Congratulations, and thank you for your interest in being a certified renovation, repair and painting firm.

Sincerely,

A handwritten signature in cursive script, appearing to read "Michelle Price", is positioned above the typed name.

Michelle Price, Chief
Lead, Heavy Metals, and Inorganics Branch

Enclosures

United States Environmental Protection Agency

This is to certify that

Quality Environmental Solutions & Technologies, Inc

has fulfilled the requirements of the Toxic Substances Control Act (TSCA) Section 402, and has received certification to conduct lead-based paint activities pursuant to 40 CFR Part 745.226

In the Jurisdiction of:

All EPA Administered Lead-based Paint Activities Program States, Tribes and Territories

This certification is valid from the date of issuance and expires

December 15, 2019

LBP-119213-1

Certification #

December 01, 2016

Issued On



A handwritten signature in black ink, appearing to read "Michelle Price", is located in the bottom right area of the page.

Michelle Price, Chief

Lead, Heavy Metals, and Inorganics Branch



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

December 01, 2016

Lawrence Holzapfel
Quality Environmental Solutions & Technologies, Inc
1376 Route 9
Wappingers Falls, NY 12590

OFFICE OF CHEMICAL SAFETY
AND POLLUTION PREVENTION

Dear Lawrence Holzapfel:

Thank you for applying to the U.S. Environmental Protection Agency (EPA) for certification to conduct Lead-based Paint Activities in target housing and child-occupied facilities. I am pleased to inform you that, pursuant to 40 CFR Part 745, Subpart L, your lead-based paint activities firm is certified. Your certificate is enclosed.

This certification **expires on December 15, 2019 and is valid in All EPA Administered States, Tribes, and Territories**. However, if a State in which you are certified obtains program authorization during the term of this certification, the scope of your certification will be diminished to exclude the affected area.

Your EPA firm certification is subject to the following restrictions:

- 1) Individual states and Indian tribes, whether authorized or not, are not required to accept EPA certification and may accept or reject it under its own authority. Please be aware that your EPA certification does not relieve you of any obligations you may have to any State or Indian tribe regarding lead-based paint activities.
- 2) EPA certification is specific and limited as described above. If you wish to obtain certification in other lead-based paint disciplines, you must apply separately.
- 3) In advertising the EPA certification, firms must indicate clearly that the firm is certified only for purposes of Section 402 of TSCA. Failure to accurately state EPA certification conditions could result in EPA suspending or withdrawing certification.
- 4) EPA may conduct audits and/or inspections to ensure continued compliance with regulatory standards, and may revoke or suspend its certification if subsequent alterations or deviations result with the firm no longer meeting the standards found at 40 CFR Part 745, Subpart L.

If you have questions about the lead-based paint activities rule or need assistance, please contact the Regional Lead Coordinator, Vickie Pane, of the EPA Region 2 staff at 732-321-6671. If you have any questions about your firm certification, please contact the National Lead Information Center at 1-800-424-LEAD and refer to **Application ID number C506794**. Congratulations, and thank you for your interest in being a certified abatement firm.

Sincerely,

A handwritten signature in cursive script, appearing to read "Michelle Price", is positioned above the typed name.

Michelle Price, Chief
Lead, Heavy Metals, and Inorganics Branch

Enclosures

Certificate of Completion

This is to certify that

James Klemm

Has completed the

Radiation Safety for X-ray Tube Based Instruments

Online training course

On

3/9/2017

Supervisor signature



Erin Poitras, RSO Thermo Fisher Scientific
Portable Analytical Instruments



Certificate of Completion

This is to certify that

James Klemm

Has completed the

Sealed Source XRF - Radiation Safety

Online training course

On

3/9/2017

Supervisor signature



Erin Poitras, RSO Thermo Fisher Scientific
Portable Analytical Instruments



Certificate of Completion

This is to certify that

James Klemm

Has completed the

Transport of Li Ion Batteries

Online training course

On

3/9/2017



Supervisor signature



Erin Poitras, RSO Thermo Fisher Scientific
Portable Analytical Instruments



Certificate of Completion

This is to certify that

James Klemm

Has completed the

Transport of Radioactive Sealed Sources in XRF Analyzers

Online training course

On

3/9/2017

Supervisor signature



Erin Poitras, RSO Thermo Fisher Scientific
Portable Analytical Instruments



Certificate of Completion

This is to certify that

James Klemm

Has completed

US Regulations for Handheld XRF Analyzers with Radioactive Sealed Sources

3/9/2017



Supervisor signature



Erin Poitras, RSO Thermo Fisher Scientific
Portable Analytical Instruments



QuES&T

Quality Environmental Solutions & Technologies, Inc.

January 29, 2018

SUNY Purchase Association
735 Anderson Hill Road
Purchase, NY 10577

ATTN: Patrick Savolskis

Via Email: **Patrick.savolskis@purchase.edu**

Re: SUNY Purchase
Café Addition & Renovation
Limited PCB Bulk Sampling
QuES&T Project #Q18-1530

Dear Mr. Savolskis,

Quality Environmental Solutions & Technologies Inc. (**QuES&T**) performed collection of representative, homogenous exterior caulks for the presence of Polychlorinated Biphenyls (PCBs) throughout specific exterior renovation areas of the Café Building, located at SUNY Purchase, Purchase NY on January 17, 2018. Sampling was limited to specific accessible, representative building components and immovable objects potentially affected by scheduled interior and/or exterior renovation activities.

Mr. James Klemm, of **QuES&T**, performed collection of a total of one (1) bulk sample. Sampling was performed in compliance with protocols outlined by New York State Education Department (NYSED). Bulk samples were properly packaged and forwarded to York Analytical Laboratories, Inc., in Stratford, CT for analysis using method SW846-3550B/8082. Copies of the analytical results are contained within attached appendices for review.

A summation of sample(s) collected and associated results are as follows:

PCB Caulk Sampling Summary:

Sample #	Location / Description	Material Matrix	Color	Substrate	Applicable Regulatory Standards (Most Stringent)	Classification Result Upon Lab analysis
1530-PCB-01	Café, Façade, Window Frame, to Brick Façade	Caulk	Brown	Brick	USEPA 40 CFR 761	No Polychlorinated Biphenyls (PCBs) detected upon laboratory analysis.

It should be noted that the information contained within this report is based upon observation and test results provided by **QuES&T**. These observations and results are time dependent, subject to changing site conditions and revisions to Federal, State, and Local regulations. **QuES&T** warrants that these findings have been promulgated after being prepared in general accordance with generally accepted practices in the abatement industries. **QuES&T** also recognizes that raw testing data is not usually sufficient to make all abatement and management decisions. No other warranties are expressed or implied.

Should you wish to discuss this matter further or require additional information concerning this transmittal, feel free to contact us at (845) 298- 6031. **QuES&T** greatly appreciates the opportunity to assist SUNY Purchase Association in the environmental services area and we look forward to working again with you in the future.

Sincerely,



Tanay Ranadive
Field and Technical Services
NYS AHERA Inspector
Cert. #AH 15-10696
NYS Mold Assessor

Cc: lgoldstein@qualityenv.com
QuES&T File



Quality Environmental Solutions & Technologies, Inc.

Appendix A: ANALYTICAL DATA



Technical Report

prepared for:

QuES & T
1376 Rt. 9
Wappingers Falls NY, 12590
Attention: Larry Goldstein

Report Date: 01/26/2018
Client Project ID: Q18-1530
York Project (SDG) No.: 18A0606

CT Cert. No. PH-0723

New Jersey Cert. No. CT005 and NY037



New York Cert. Nos. 10854 and 12058

PA Cert. No. 68-04440

120 RESEARCH DRIVE
www.YORKLAB.com

STRATFORD, CT 06615
(203) 325-1371

132-02 89th AVENUE
FAX (203) 357-0166

RICHMOND HILL, NY 11418
ClientServices@yorklab.com

Report Date: 01/26/2018
Client Project ID: Q18-1530
York Project (SDG) No.: 18A0606

QuES & T
1376 Rt. 9
Wappingers Falls NY, 12590
Attention: Larry Goldstein

Purpose and Results

This report contains the analytical data for the sample(s) identified on the attached chain-of-custody received in our laboratory on January 19, 2018 and listed below. The project was identified as your project: **Q18-1530**.

The analyses were conducted utilizing appropriate EPA, Standard Methods, and ASTM methods as detailed in the data summary tables.

All samples were received in proper condition meeting the customary acceptance requirements for environmental samples except those indicated under the Sample and Analysis Qualifiers section of this report.

All analyses met the method and laboratory standard operating procedure requirements except as indicated by any data flags, the meaning of which are explained in the Sample and Data Qualifiers Relating to This Work Order section of this report and case narrative if applicable.

The results of the analyses, which are all reported on dry weight basis (soils) unless otherwise noted, are detailed in the following pages.

Please contact Client Services at 203.325.1371 with any questions regarding this report.

<u>York Sample ID</u>	<u>Client Sample ID</u>	<u>Matrix</u>	<u>Date Collected</u>	<u>Date Received</u>
18A0606-01	1530-PCB-01	Caulk	01/17/2018	01/19/2018

General Notes for York Project (SDG) No.: 18A0606

1. The RLs and MDLs (Reporting Limit and Method Detection Limit respectively) reported are adjusted for any dilution necessary due to the levels of target and/or non-target analytes and matrix interference. The RL(REPORTING LIMIT) is based upon the lowest standard utilized for the calibration where applicable.
2. Samples are retained for a period of thirty days after submittal of report, unless other arrangements are made.
3. York's liability for the above data is limited to the dollar value paid to York for the referenced project.
4. This report shall not be reproduced without the written approval of York Analytical Laboratories, Inc.
5. All analyses conducted met method or Laboratory SOP requirements. See the Sample and Data Qualifiers Section for further information.
6. It is noted that no analyses reported herein were subcontracted to another laboratory, unless noted in the report.
7. This report reflects results that relate only to the samples submitted on the attached chain-of-custody form(s) received by York.
8. Analyses conducted at York Analytical Laboratories, Inc. Stratford, CT are indicated by NY Cert. No. 10854; those conducted at York Analytical Laboratories, Inc., Richmond Hill, NY are indicated by NY Cert. No. 12058.

Approved By:



Benjamin Gulizia
Laboratory Director

Date: 01/26/2018





Sample Information

Client Sample ID: 1530-PCB-01

York Sample ID: 18A0606-01

York Project (SDG) No.

Client Project ID

Matrix

Collection Date/Time

Date Received

18A0606

Q18-1530

Caulk

January 17, 2018 3:00 pm

01/19/2018

Polychlorinated Biphenyls (PCB)

Log-in Notes:

Sample Notes:

Sample Prepared by Method: EPA 3550C

CAS No.	Parameter	Result	Flag	Units	Reported to LOQ	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
12674-11-2	Aroclor 1016	ND		mg/kg	0.500	1	EPA 8082A Certifications: NELAC-NY10854,CTDOH,NJDEP	01/23/2018 14:06	01/24/2018 17:51	LAB
11104-28-2	Aroclor 1221	ND		mg/kg	0.500	1	EPA 8082A Certifications: NELAC-NY10854,CTDOH,NJDEP	01/23/2018 14:06	01/24/2018 17:51	LAB
11141-16-5	Aroclor 1232	ND		mg/kg	0.500	1	EPA 8082A Certifications: NELAC-NY10854,CTDOH,NJDEP	01/23/2018 14:06	01/24/2018 17:51	LAB
53469-21-9	Aroclor 1242	ND		mg/kg	0.500	1	EPA 8082A Certifications: NELAC-NY10854,CTDOH,NJDEP	01/23/2018 14:06	01/24/2018 17:51	LAB
12672-29-6	Aroclor 1248	ND		mg/kg	0.500	1	EPA 8082A Certifications: NELAC-NY10854,CTDOH,NJDEP	01/23/2018 14:06	01/24/2018 17:51	LAB
11097-69-1	Aroclor 1254	ND		mg/kg	0.500	1	EPA 8082A Certifications: NELAC-NY10854,CTDOH,NJDEP	01/23/2018 14:06	01/24/2018 17:51	LAB
11096-82-5	Aroclor 1260	ND		mg/kg	0.500	1	EPA 8082A Certifications: NELAC-NY10854,CTDOH,NJDEP	01/23/2018 14:06	01/24/2018 17:51	LAB
1336-36-3	* Total PCBs	ND		mg/kg	0.500	1	EPA 8082A Certifications:	01/23/2018 14:06	01/24/2018 17:51	LAB
Surrogate Recoveries		Result	Acceptance Range							
877-09-8	Surrogate: Tetrachloro-m-xylene	77.0 %	30-140							
2051-24-3	Surrogate: Decachlorobiphenyl	83.0 %	30-140							



Sample and Data Qualifiers Relating to This Work Order

Definitions and Other Explanations

*	Analyte is not certified or the state of the samples origination does not offer certification for the Analyte.
ND	NOT DETECTED - the analyte is not detected at the Reported to level (LOQ/RL or LOD/MDL)
RL	REPORTING LIMIT - the minimum reportable value based upon the lowest point in the analyte calibration curve.
LOQ	LIMIT OF QUANTITATION - the minimum concentration of a target analyte that can be reported within a specified degree of confidence. This is the lowest point in an analyte calibration curve that has been subjected to all steps of the processing/analysis and verified to meet defined criteria. This is based upon NELAC 2009 Standards and applies to all analyses.
LOD	LIMIT OF DETECTION - a verified estimate of the minimum concentration of a substance in a given matrix that an analytical process can reliably detect. This is based upon NELAC 2009 Standards and applies to all analyses conducted under the auspices of EPA SW-846.
MDL	METHOD DETECTION LIMIT - a statistically derived estimate of the minimum amount of a substance an analytical system can reliably detect with a 99% confidence that the concentration of the substance is greater than zero. This is based upon 40 CFR Part 136 Appendix B and applies only to EPA 600 and 200 series methods.
Reported to	This indicates that the data for a particular analysis is reported to either the LOD/MDL, or the LOQ/RL. In cases where the "Reported to" is located above the LOD/MDL, any value between this and the LOQ represents an estimated value which is "J" flagged accordingly. This applies to volatile and semi-volatile target compounds only.
NR	Not reported
RPD	Relative Percent Difference
Wet	The data has been reported on an as-received (wet weight) basis
Low Bias	Low Bias flag indicates that the recovery of the flagged analyte is below the laboratory or regulatory lower control limit. The data user should take note that this analyte may be biased low but should evaluate multiple lines of evidence including the LCS and site-specific MS/MSD data to draw bias conclusions. In cases where no site-specific MS/MSD was requested, only the LCS data can be used to evaluate such bias.
High Bias	High Bias flag indicates that the recovery of the flagged analyte is above the laboratory or regulatory upper control limit. The data user should take note that this analyte may be biased high but should evaluate multiple lines of evidence including the LCS and site-specific MS/MSD data to draw bias conclusions. In cases where no site-specific MS/MSD was requested, only the LCS data can be used to evaluate such bias.
Non-Dir.	Non-dir. flag (Non-Directional Bias) indicates that the Relative Percent Difference (RPD) (a measure of precision) among the MS and MSD data is outside the laboratory or regulatory control limit. This alerts the data user where the MS and MSD are from site-specific samples that the RPD is high due to either non-homogeneous distribution of target analyte between the MS/MSD or indicates poor reproducibility for other reasons.

If EPA SW-846 method 8270 is included herein it is noted that the target compound N-nitrosodiphenylamine (NDPA) decomposes in the gas chromatographic inlet and cannot be separated from diphenylamine (DPA). These results could actually represent 100% DPA, 100% NDPA or some combination of the two. For this reason, York reports the combined result for n-nitrosodiphenylamine and diphenylamine for either of these compounds as a combined concentration as Diphenylamine.

If Total PCBs are detected and the target aroclors reported are "Not detected", the Total PCB value is reported due to the presence of either or both Aroclors 1262 and 1268 which are non-target aroclors for some regulatory lists.

2-chloroethylvinyl ether readily breaks down under acidic conditions. Samples that are acid preserved, including standards will exhibit breakdown. The data user should take note.

Certification for pH is no longer offered by NYDOH ELAP.

Semi-Volatile and Volatile analyses are reported down to the LOD/MDL, with values between the LOD/MDL and the LOQ being "J" flagged as estimated results.

For analyses by EPA SW-846-8270D, the Limit of Quantitation (LOQ) reported for benzidine is based upon the lowest standard used for calibration and is not a verified LOQ due to this compound's propensity for oxidative losses during extraction/concentration procedures and non-reproducible chromatographic performance.

BULK SAMPLE FORM

York Analytical Laboratories, Inc.

120 Research Drive
Stratford, CT 06615
ph. (203) 325-1371
fx. (203) 357-0166

Field Chain-of-Custody Record

Rec'd Chic 1-19-18 8:00

Company: QuES&TSampled By (Print): James Klemm1376 Route 9Sampled By (Sign.): [Signature]Wappingers Falls, NY 12590Results Send Via: lgoldstein@qualityenv.comProject #: Q18-1530Invoice to: Suann Lander (QuES&T)Project ID: SUNY Purchase AssociationCafé Renovation

SAMPLE #	LOCATION	SAMPLE DATE	MATRIX	ANALYSIS REQUESTED	CONTAINER
1530-PCB-01	Café, Façade, Window Frame to Brick Façade	1/17/2018	Caulk (Grey)	PCB	Glass 8 oz.

ANALYSIS TURNAROUND: 5-Day Turn-Around

by 1/19/18 1519 1.8

PAGE 1 OF 1



Quality Environmental Solutions & Technologies, Inc.

Appendix B: PERSONNEL CERTIFICATIONS



NEW YORK STATE MINORITY- AND WOMEN-OWNED BUSINESS ENTERPRISE ("MWBE") CERTIFICATION

Empire State Development's Division of Minority and Women's Business
Development grants a

Minority Business Enterprise (MBE)

pursuant to New York State Executive Law, Article 15-A to:

**Quality Environmental Solutions & Technologies
Inc.**

Certification Awarded on: August 11, 2015

Expiration Date: August 11, 2018

File ID#: 49952



NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2018
Issued April 01, 2017

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MR. ROBERT Q. BRADLEY
YORK ANALYTICAL LABORATORIES INC
120 RESEARCH DRIVE
STRATFORD, CT 06615

NY Lab Id No: 10854

*is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2003) for the category
ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved analytes are listed below:*

Acrylates

Acrolein (Propenal)	EPA 8260C
Acrylonitrile	EPA 8260C
Methyl methacrylate	EPA 8260C

Amines

1,2-Diphenylhydrazine	EPA 8270D
2-Nitroaniline	EPA 8270D
3-Nitroaniline	EPA 8270D
4-Chloroaniline	EPA 8270D
4-Nitroaniline	EPA 8270D
Aniline	EPA 8270D
Carbazole	EPA 8270D
Diphenylamine	EPA 8270D

Benzidines

3,3'-Dichlorobenzidine	EPA 8270D
Benzidine	EPA 8270D

Characteristic Testing

Corrosivity	EPA 9045D
Free Liquids	EPA 9095B
Ignitability	EPA 1010A
Synthetic Precipitation Leaching Proc.	EPA 1312
TCLP	EPA 1311

Chlorinated Hydrocarbon Pesticides

4,4'-DDD	EPA 8081B
4,4'-DDE	EPA 8081B

Chlorinated Hydrocarbon Pesticides

4,4'-DDT	EPA 8081B
Aldrin	EPA 8081B
alpha-BHC	EPA 8081B
alpha-Chlordane	EPA 8081B
Atrazine	EPA 8270D
beta-BHC	EPA 8081B
Chlordane Total	EPA 8081B
delta-BHC	EPA 8081B
Dieldrin	EPA 8081B
Endosulfan I	EPA 8081B
Endosulfan II	EPA 8081B
Endosulfan sulfate	EPA 8081B
Endrin	EPA 8081B
Endrin aldehyde	EPA 8081B
Endrin Ketone	EPA 8081B
gamma-Chlordane	EPA 8081B
Heptachlor	EPA 8081B
Heptachlor epoxide	EPA 8081B
Lindane	EPA 8081B
Methoxychlor	EPA 8081B
Mirex	EPA 8081B
Toxaphene	EPA 8081B

Chlorinated Hydrocarbons

1,2,3-Trichlorobenzene	EPA 8260C
1,2,4,5-Tetrachlorobenzene	EPA 8270D

Serial No.: 55801

Property of the New York State Department of Health. Certificates are valid only at the address shown, must be conspicuously posted, and are printed on secure paper. Continued accreditation depends on successful ongoing participation in the Program. Consumers are urged to call (518) 485-5570 to verify the laboratory's accreditation status.



NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2018
Issued April 01, 2017

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MR. ROBERT Q. BRADLEY
YORK ANALYTICAL LABORATORIES INC
120 RESEARCH DRIVE
STRATFORD, CT 06615

NY Lab Id No: 10854

*is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2003) for the category
ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved analytes are listed below:*

Chlorinated Hydrocarbons

1,2,4-Trichlorobenzene	EPA 8270D
2-Chloronaphthalene	EPA 8270D
Hexachlorobenzene	EPA 8270D
Hexachlorobutadiene	EPA 8270D
Hexachlorocyclopentadiene	EPA 8270D
Hexachloroethane	EPA 8270D

Chlorophenoxy Acid Pesticides

2,4,5-T	EPA 8151A
2,4,5-TP (Silvex)	EPA 8151A
2,4-D	EPA 8151A
Dicamba	EPA 8151A

Haloethers

2,2'-Oxybis(1-chloropropane)	EPA 8270D
4-Bromophenylphenyl ether	EPA 8270D
4-Chlorophenylphenyl ether	EPA 8270D
Bis(2-chloroethoxy)methane	EPA 8270D
Bis(2-chloroethyl)ether	EPA 8270D

Metals I

Barium, Total	EPA 6010C
	EPA 6020A
Cadmium, Total	EPA 6010C
	EPA 6020A
Calcium, Total	EPA 6010C
Chromium, Total	EPA 6010C

Metals I

Chromium, Total	EPA 6020A
Copper, Total	EPA 6010C
	EPA 6020A
Iron, Total	EPA 6010C
Lead, Total	EPA 6010C
	EPA 6020A
Magnesium, Total	EPA 6010C
Manganese, Total	EPA 6010C
	EPA 6020A
Nickel, Total	EPA 6010C
	EPA 6020A
Potassium, Total	EPA 6010C
Silver, Total	EPA 6010C
	EPA 6020A
Sodium, Total	EPA 6010C

Metals II

Aluminum, Total	EPA 6010C
	EPA 6020A
Antimony, Total	EPA 6010C
	EPA 6020A
Arsenic, Total	EPA 6010C
	EPA 6020A
Beryllium, Total	EPA 6010C
	EPA 6020A
Chromium VI	EPA 7196A

Serial No.: 55801

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Metals II

Mercury, Total	EPA 7471B
	EPA 7473
Selenium, Total	EPA 6010C
	EPA 6020A
Vanadium, Total	EPA 6010C
	EPA 6020A
Zinc, Total	EPA 6010C
	EPA 6020A

Metals III

Cobalt, Total	EPA 6010C
	EPA 6020A
Molybdenum, Total	EPA 6020A
Thallium, Total	EPA 6010C
	EPA 6020A
Tin, Total	EPA 6020A
Titanium, Total	EPA 6020A

Miscellaneous

Boron, Total	EPA 6020A
Cyanide, Total	EPA 9014
Extractable Organic Halides	EPA 9023

Nitroaromatics and Isophorone

2,4-Dinitrotoluene	EPA 8270D
2,6-Dinitrotoluene	EPA 8270D
Isophorone	EPA 8270D

Nitroaromatics and Isophorone

Nitrobenzene	EPA 8270D
Pyridine	EPA 8270D

Nitrosoamines

N-Nitrosodimethylamine	EPA 8270D
N-Nitrosodi-n-propylamine	EPA 8270D
N-Nitrosodiphenylamine	EPA 8270D

Organophosphate Pesticides

Parathion ethyl	EPA 8270D
-----------------	-----------

Petroleum Hydrocarbons

Diesel Range Organics	EPA 8015D
Gasoline Range Organics	EPA 8015D

Phthalate Esters

Benzyl butyl phthalate	EPA 8270D
Bis(2-ethylhexyl) phthalate	EPA 8270D
Diethyl phthalate	EPA 8270D
Dimethyl phthalate	EPA 8270D
Di-n-butyl phthalate	EPA 8270D
Di-n-octyl phthalate	EPA 8270D

Polychlorinated Biphenyls

PCB-1016	EPA 8082A
PCB-1221	EPA 8082A
PCB-1232	EPA 8082A
PCB-1242	EPA 8082A

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Polychlorinated Biphenyls

PCB-1248	EPA 8082A
PCB-1254	EPA 8082A
PCB-1260	EPA 8082A
PCB-1262	EPA 8082A
PCB-1268	EPA 8082A
PCBs in Oil	EPA 8082A

Polynuclear Aromatic Hydrocarbons

Acenaphthene	EPA 8270D
Acenaphthylene	EPA 8270D
Anthracene	EPA 8270D
Benzo(a)anthracene	EPA 8270D
Benzo(a)pyrene	EPA 8270D
Benzo(b)fluoranthene	EPA 8270D
Benzo(ghi)perylene	EPA 8270D
Benzo(k)fluoranthene	EPA 8270D
Chrysene	EPA 8270D
Dibenzo(a,h)anthracene	EPA 8270D
Fluoranthene	EPA 8270D
Fluorene	EPA 8270D
Indeno(1,2,3-cd)pyrene	EPA 8270D
Naphthalene	EPA 8270D
Phenanthrene	EPA 8270D
Pyrene	EPA 8270D

Priority Pollutant Phenols

2,3,4,6 Tetrachlorophenol	EPA 8270D
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Priority Pollutant Phenols

2,4,5-Trichlorophenol	EPA 8270D
2,4,6-Trichlorophenol	EPA 8270D
2,4-Dichlorophenol	EPA 8270D
2,4-Dimethylphenol	EPA 8270D
2,4-Dinitrophenol	EPA 8270D
2-Chlorophenol	EPA 8270D
2-Methyl-4,6-dinitrophenol	EPA 8270D
2-Methylphenol	EPA 8270D
2-Nitrophenol	EPA 8270D
4-Chloro-3-methylphenol	EPA 8270D
4-Methylphenol	EPA 8270D
4-Nitrophenol	EPA 8270D
Pentachlorophenol	EPA 8270D
Phenol	EPA 8270D

Semi-Volatile Organics

1,1'-Biphenyl	EPA 8270D
1,2-Dichlorobenzene, Semi-volatile	EPA 8270D
1,3-Dichlorobenzene, Semi-volatile	EPA 8270D
1,4-Dichlorobenzene, Semi-volatile	EPA 8270D
2-Methylnaphthalene	EPA 8270D
Acetophenone	EPA 8270D
Benzaldehyde	EPA 8270D
Benzoic Acid	EPA 8270D
Benzyl alcohol	EPA 8270D
Caprolactam	EPA 8270D

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All approved analytes are listed below:*

Semi-Volatile Organics

Dibenzofuran EPA 8270D

Volatile Aromatics

1,2,4-Trichlorobenzene, Volatile	EPA 8260C
1,2,4-Trimethylbenzene	EPA 8260C
1,2-Dichlorobenzene	EPA 8260C
1,3,5-Trimethylbenzene	EPA 8260C
1,3-Dichlorobenzene	EPA 8260C
1,4-Dichlorobenzene	EPA 8260C
2-Chlorotoluene	EPA 8260C
4-Chlorotoluene	EPA 8260C
Benzene	EPA 8260C
Bromobenzene	EPA 8260C
Chlorobenzene	EPA 8260C
Ethyl benzene	EPA 8260C
Isopropylbenzene	EPA 8260C
m/p-Xylenes	EPA 8260C
Naphthalene, Volatile	EPA 8260C
n-Butylbenzene	EPA 8260C
n-Propylbenzene	EPA 8260C
o-Xylene	EPA 8260C
p-Isopropyltoluene (P-Cymene)	EPA 8260C
sec-Butylbenzene	EPA 8260C
Styrene	EPA 8260C
tert-Butylbenzene	EPA 8260C
Toluene	EPA 8260C

Volatile Aromatics

Total Xylenes EPA 8260C

Volatile Halocarbons

1,1,1,2-Tetrachloroethane	EPA 8260C
1,1,1-Trichloroethane	EPA 8260C
1,1,2,2-Tetrachloroethane	EPA 8260C
1,1,2-Trichloro-1,2,2-Trifluoroethane	EPA 8260C
1,1,2-Trichloroethane	EPA 8260C
1,1-Dichloroethane	EPA 8260C
1,1-Dichloroethene	EPA 8260C
1,1-Dichloropropene	EPA 8260C
1,2,3-Trichloropropane	EPA 8260C
1,2-Dibromo-3-chloropropane	EPA 8260C
1,2-Dibromoethane	EPA 8260C
1,2-Dichloroethane	EPA 8260C
1,2-Dichloropropane	EPA 8260C
1,3-Dichloropropane	EPA 8260C
2,2-Dichloropropane	EPA 8260C
2-Chloroethylvinyl ether	EPA 8260C
Bromochloromethane	EPA 8260C
Bromodichloromethane	EPA 8260C
Bromoform	EPA 8260C
Bromomethane	EPA 8260C
Carbon tetrachloride	EPA 8260C
Chloroethane	EPA 8260C
Chloroform	EPA 8260C

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Volatile Halocarbons

Chloromethane	EPA 8260C
cis-1,2-Dichloroethene	EPA 8260C
cis-1,3-Dichloropropene	EPA 8260C
Dibromochloromethane	EPA 8260C
Dibromomethane	EPA 8260C
Dichlorodifluoromethane	EPA 8260C
Hexachlorobutadiene, Volatile	EPA 8260C
Methylene chloride	EPA 8260C
Tetrachloroethene	EPA 8260C
trans-1,2-Dichloroethene	EPA 8260C
trans-1,3-Dichloropropene	EPA 8260C
Trichloroethene	EPA 8260C
Trichlorofluoromethane	EPA 8260C
Vinyl chloride	EPA 8260C

Volatile Organics

1,4-Dioxane	EPA 8260C
2-Butanone (Methylethyl ketone)	EPA 8260C
2-Hexanone	EPA 8260C
Acetone	EPA 8260C
Carbon Disulfide	EPA 8260C
Cyclohexane	EPA 8260C
Methyl acetate	EPA 8260C
Methyl cyclohexane	EPA 8260C
Methyl tert-butyl ether	EPA 8260C
tert-butyl alcohol	EPA 8260C

Volatile Organics

Vinyl acetate

EPA 8260C

Sample Preparation Methods

EPA 5035A-L

EPA 5035A-H

EPA 3580A

EPA 3010A

EPA 3050B

EPA 3550C

EPA 3546

EPA 3545A

EPA 3060A

EPA 9010C

Serial No.: 55801

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ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved subcategories and/or analytes are listed below:

Miscellaneous

Lead in Dust Wipes	EPA 6010C
Lead in Paint	EPA 6010C

Sample Preparation Methods

EPA 3050B

Serial No.: 55802

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SECTION 003132 – GEOTECHNICAL DATA

PART 1 - GENERAL

1.1 SUMMARY

- A. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of Bidders' own investigations. They are made available for Bidders' convenience and information, but are not a warranty of existing conditions. This Document and its attachments are not part of the Contract Documents.

1.2 SUBSURFACE EXPLORATIONS

- A. Subsurface conditions at the site have been explored by the performance of test borings, test pits, and laboratory testing.
- B. Boring and test pit logs and laboratory test reports are attached at the end of this Section. The logs describe subsurface conditions encountered at the exploration locations at the time explorations were made.
- C. No warranty is made of the continuity of strata or material between the exploration locations. The stratification lines on the logs represent approximate boundaries between soil types. The actual transitions may be gradual.
- D. Water level readings may have been observed in the drill holes at times and under conditions as stated on the boring logs. Fluctuations in the level of the groundwater may occur due to variations in rainfall, temperature and other factors not evident at the time measurements were made.
- E. Subsurface exploration locations shown on the Drawings are approximate only and the Owner, Architect, Project Manager and/or design consultants make no representations regarding correctness of such information.

1.3 PROJECT CONDITIONS

- A. Existing Conditions: Data and information furnished or referenced in the Geotechnical Engineering Report is for the Contractors' information. The Owner, Architect, or **Construction Manager** shall not be responsible for any interpretation of, or conclusion drawn from the data or information, by the Contractor.
- B. Bidders shall make their own interpretations and conclusions of subsurface conditions that may affect methods or cost of construction. Bidders may conduct additional on-site subsurface investigations, at their own expense, in order to ascertain existing site conditions. Any such explorations must be coordinated and scheduled with the Owner and Project Manager. All disturbed areas must be restored to pre-investigative conditions.

1.4 GEOTECHNICAL DATA

- A. Geotechnical Report: The following Geotechnical Report is attached at the end of this Section.
 - 1. Geotechnical Engineering Report, Addition to Campus Center North, Purchase, New York; prepared by Terracon Consultants, Inc., dated March 10, 2017.

CHARTWELLS
735 ANDERSON HILL RD, PURCHASE, NY

SUNY PURCHASE HUB ADDITION AND RENOVATION
PHASE ZERO DESIGN PROJECT #1517347

- B. Soil Boring Data: Boring Location Plan, Test Boring Logs, and Test Pit Logs are attached at the end of this Section.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 003132

Geotechnical Engineering Report

Addition to Campus Center North

Purchase, New York

March 10, 2017

Terracon Project No. J2165193

Prepared for:

Doucet & Associates, Inc.
Easthampton, Massachusetts

Prepared by:

Terracon Consultants, Inc.
Rocky Hill, Connecticut

terracon.com

Terracon

Environmental



Facilities



Geotechnical



Materials

March 10, 2017



Doucet & Associates, Inc.
123 Union Street, Suite 302
Easthampton, MA 01027

Attn: Mr. Larry Rusiecki / Project Manager
P: (413) 203 2349 ext. 3055
F: (800) 587 2817
E: lrusiecki@doucetengineers.com

Re: Geotechnical Engineering Report
Addition to Campus Center North
Purchase, New York
Terracon Project No. J2165193

Dear Mr. Norton:


Terracon Consultants, Inc. (Terracon) is submitting, herewith, the results of our geotechnical evaluation for the above-referenced project. The purpose of this evaluation was to obtain information on subsurface conditions at the project site and, based on this information, to provide recommendations regarding the design and construction of foundations and site development for the proposed addition. These services were performed in general accordance with our Authorization to Proceed No. J2165193, signed December 11, 2016.

We appreciate the opportunity to be of service to you on this project. If you have questions concerning this report, or if we may be of further service, please contact us.

Since
Terracon Consultants, Inc.

A circular professional engineer seal for the State of New York. The outer ring contains the text "STATE OF NEW YORK" at the top and "REGISTERED PROFESSIONAL ENGINEER" at the bottom. The inner circle features a signature, the name "BRIAN D. OPREA", and the number "087424".

Brian D. Oprea
Project Geotechnical Engineer

A handwritten signature in blue ink, appearing to read "Stephen C. Lanne".

Stephen C. Lanne, P.E.
Senior Geotechnical Engineer

/jch/J2165193

Attachment

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APPENDIX A – FIELD EXPLORATION

Exhibit A-1	Site Location Map
Exhibit A-2	Exploration Location Diagram
Exhibit A-3	Field Exploration Description
Exhibits A-4, A-5, and A-6	Boring Logs B-1, B-2, and B-3

APPENDIX B – LABORATORY TESTING

Exhibit B-1	Laboratory Testing
Exhibit B-2 and B-3	Grain Size Distribution Test Results

APPENDIX C – SUPPORTING DOCUMENTS

Exhibit C-1	General Notes
Exhibit C-2	Unified Soil Classification System

EXECUTIVE SUMMARY

A geotechnical engineering report has been completed for the proposed addition to Campus Center North at the State University of New York (SUNY) located in Purchase, New York. Three test borings were advanced to depths ranging from about 17 to 25 feet below existing grade to provide geotechnical information.

Site subsurface conditions generally consist of uncontrolled fill over native silty sands with cobbles and boulders (glacial till). The following geotechnical considerations for project design and construction were identified and are discussed in the report.

- In our opinion, the on-site fill is unsuitable in its current condition for support of the foundations and floor slab of the proposed building addition. We therefore recommend that the majority of the fill be removed within the building footprint and replaced with compacted Structural Fill. Details regarding what should be removed and what may remain are discussed in the text of this report. Following the removal and replacement activities, the building may be supported on conventional foundations with a slab-on-grade deriving their support from the compacted Structural Fill.
- Based on the available data, it is our opinion that the on-site fill and glacial soils, following removal, are generally less desirable for reuse as Structural Fill. However, these materials may be selectively reused as Common Fill, provided they are placed at moisture contents suitable for compaction and that cobbles encountered during excavation are segregated from the fill and not reused.
- Site Class “C” may be used for seismic design considerations.
- Groundwater was not encountered at the time of the explorations.
- Close monitoring of the construction operations discussed herein will be critical in achieving the design subgrade support. We therefore recommend that Terracon be retained to monitor this portion of the work.

This summary should be used in conjunction with the entire report for design purposes. Details are not included or fully developed in this summary; the report must be read in its entirety for a comprehensive understanding of the information contained herein. The section titled **GENERAL COMMENTS** should be read for an understanding of the report limitations.

GEOTECHNICAL ENGINEERING REPORT ADDITION TO CAMPUS CENTER NORTH PURCHASE, NEW YORK

Terracon Project No. J2165193

March 10, 2017

1.0 INTRODUCTION

A geotechnical engineering evaluation has been completed for the proposed addition to Campus Center North at the State University of New York (SUNY) at Purchase, in the hamlet of Purchase, town of Harrison, New York, as shown on the Site Location Map (Exhibit A-1) in Appendix A. Three soil borings (B-1, B-2, and B-3) were drilled throughout the site to depths ranging from about 17 to 25 feet below existing ground surface. An Exploration Location Diagram (Exhibit A-2) and individual exploration logs are included in Appendix A.

The purpose of these services is to provide information and geotechnical engineering recommendations relative to:

- Subsurface soil conditions
- Groundwater conditions
- Earthwork
- Foundation design and construction
- Seismic considerations
- Slab design and construction

2.0 PROJECT INFORMATION

2.1 Project Description

Our understanding of the project is based upon review of the following:

- “*Construction Floor Plan*”, Drawing No. A101, by Phase Zero Design of Simsbury, Connecticut.
- “*Site Layout & Materials Plan*”, Drawing No. C-5, Dated November 11, 2016, by Phase Zero Design of Simsbury, Connecticut.

Item	Description
Site Layout	Appendix A, Exhibit A-2, Exploration Location Diagram.
Building	Single-story, approximately 1,400-square foot (sf) addition, with no below grade area, to the southwest of existing Campus Center North Dining hall.
Building Construction	Not provided, assumed to be brick exterior walls with interior steel framing, steel columns, concrete floor.

Geotechnical Engineering Report

Addition to Campus Center North ■ Purchase, New York

March 10, 2017 ■ Terracon Project No. J2165193



Item	Description
Finished Floor Elevation	Close to existing grade, approximately Elevation (El) 341 feet.
Estimated Maximum Loads	Walls: 1.2 to 3 kips per lineal foot Columns: 30 to 75 kips Slab: 150 pounds per square foot
Grading	Not provided, but assumed to be close to existing grade.

2.2 Site Location and Description

Item	Description
Location	Campus Center North, located on the east side of Lincoln Avenue, approximately 120 feet north of the North Arcade Overpass, within the SUNY Purchase Campus in the Hamlet of Purchase, Town of Harrison, New York.
Existing improvements	Brick pedestrian walk / landscaping.
Current ground cover	Brick pavers / topsoil.
Existing topography	Relatively level.

The 2013 USGS topographic quadrangle map for Glenville, Connecticut shows the 330-foot surface elevation contour (NAVD 1988) traversing the center portion of the site.

3.0 SUBSURFACE EXPLORATIONS AND CONDITIONS

3.1 Typical Profile

Based on the results of the explorations and observations at the time of drilling, subsurface conditions on the project site can be generalized as follows:

Stratum	Depth to Bottom of Stratum (feet)	Material Encountered ¹	Consistency / Relative Density
1 ²	16	Silty sand (SM), occasional cobbles, brown (Fill)	N/A
2	Not encountered	Silty sand (SM), with gravel, occasional cobbles and boulders, brown (Glacial Till)	Medium dense to very dense

1. Brick pavers (about 1 inch in thickness) underlain by Portland cement concrete (about 3 inches in thickness) was encountered at the surface of B-1. Topsoil (about 1 inch in thickness) underlain by subsoil (about 11 to 23 inches in thickness) was encountered at the ground surface at B-2 and B-3.
2. Encountered in B-1 only.

The *Surficial Geologic Map of New York – Lower Hudson Sheet (1989)* identifies native soils underlying the site as glacial till. However, fill likely associated with construction of the existing structure was encountered in B-1. The *Geologic Map of New York – Lower Hudson Sheet (1970)* indicates that bedrock, at depth, in the vicinity of the site as schist and amphibolite. Bedrock was not encountered in our borings.

Conditions encountered at each exploration location are summarized on the individual exploration logs in Appendix A of this report. Stratification boundaries on the exploration logs represent the approximate location of changes in soil types; *in situ*, the transition between materials may be gradual. Further details of the explorations can be found on the exploration logs.

3.2 Groundwater

Groundwater was not encountered at the time of the explorations. However, fluctuations in groundwater level may occur because of seasonal variations in the amount of rainfall, runoff, and other factors. Additionally, grade adjustments on and around the site, as well as surrounding drainage improvements, may affect the water table. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project.

4.0 RECOMMENDATIONS FOR DESIGN AND CONSTRUCTION

4.1 Geotechnical Considerations

Based on the results of our explorations, uncontrolled fill, likely related to the construction of Campus Center North, was encountered at B-1 to a depth of approximately 16 feet below existing grade. The on-site fill was not encountered at B-2 or B-3. We therefore anticipate the on-site fill is deepest adjacent to the exterior walls of the Campus Center North building, becoming shallower further away from the existing building. Based on our understanding that the proposed addition will be close to existing grade, we estimate that the depth of fill below the proposed bottom of footing elevation will be up to approximately 12.5 feet adjacent to the existing building.

In our opinion, the uncontrolled fill is unsuitable in its current condition for support of the foundations and floor slab of the proposed building due to the risk of unacceptable settlements occurring as a result of generally loose conditions and unknown variations in the nature and consistency of the material.

In general, there are three overall approaches to address the presence of unsuitable bearing materials such as uncontrolled fill: Removal and replacement of the fill, *in-situ* improvement of the fill, or deep foundations that bypass the fill. All three approaches would be technically feasible for this site. However, it is our opinion that *in-situ* ground improvements (such as rammed aggregate piers), or deep foundations (such as driven piles, drilled shafts, or helical anchors)

would not likely be cost effective due to the relatively small size of the addition (1,400 square feet). Furthermore, special care would be required with these types of foundation supports so that vibrations created during installation did not damage the existing building.

It is our opinion that removal and replacement of the fill will be more cost-effective than use of *in-situ* ground improvements or deep foundations. However, one has to consider the increase in lateral stresses against the existing foundation walls. We therefore recommend that the majority of the fill be removed within the building footprint and replaced with compacted Structural Fill. Foundations for the proposed addition should match the depth of the foundations of the existing building and then step up further away from the existing building. The slab-on-grade will derive support from the compacted Structural Fill.

It may be possible to reduce the amount of fill removal and replacement work by leaving approximately 1 to 2 feet of fill in place and then improving the fill that is left with suitable compaction equipment. The feasibility of leaving some of the fill in place would need to be evaluated by Terracon at the time of construction, and would depend on moisture levels in the fill at that time (if the fill is too wet, it wouldn't be possible to adequately compact it in place without excavating and drying). However, given the variability of the fill depths (which may make it difficult to deploy suitable compaction equipment in the excavation), and the potential delays to the removal process as the remaining materials are evaluated, the contractor may determine that it is more expedient to remove all the fill.

Last, in order to limit the potential for unnecessary excavation of suitable soils and to confirm that the necessary unsuitable materials have been removed, we recommend that Terracon be retained to observe the excavation and replacement activities.

4.2 Earthwork

4.2.1 Site Preparation

Brick pavers, topsoil, and any otherwise unsuitable materials should be removed prior to placing any new fill and prior to placement of concrete for foundations and floor slab. The existing fill should be overexcavated within the proposed addition's footprint and laterally outside the addition footprint to include the foundation bearing zone, which is defined as the volume below 2/3H:1V lines extending outward and downward from the lower edges of the footings. If it is desired to limit the amount of overexcavation and not remove all fill, the existing fill should be first removed to a depth at which there is believed to be no more than about 1 to 2 feet of existing fill remaining in place. Shallow test pits should be then be advanced in the presence of a Terracon representative to evaluate the thickness and nature of the remaining fill that will remain under the footings. If in our opinion, the remaining materials can be suitably compacted in place, the exposed subgrade should be thoroughly compacted with at least six passes of a minimum 5-ton (static weight) walk-behind roller or heavy-duty plate compactor. Unstable material at subgrade level should be removed and replaced with compacted Structural Fill. The excavation may then be backfilled in

accordance with our subsequent recommendations to attain design grade. If the remaining materials are judged to be too thick or unsuitable for in-place compaction, additional excavation would be required prior to placement of backfill.

Following the removal and replacement of fill in the building area, the soil subgrade in the surrounding sidewalk areas should be proofrolled with at least six passes of a minimum 5-ton (static weight) walk-behind roller or heavy-duty plate compactor. Unstable material at subgrade level should be removed and replaced with compacted Structural Fill. Fill may then be placed to attain the required grade.

4.2.2 Reuse of On-Site Materials

The on-site fill and glacial soils contain relatively high percentages of silt, which may make reuse less desirable, as these materials will be moisture sensitive and difficult to maintain at moisture levels suitable for compaction, particularly during periods of wet weather.

It is our opinion that the on-site fill and glacial soils are generally less desirable for reuse as Structural Fill. However, these materials may be selectively reused as Common Fill (i.e., in landscaping areas) provided they are placed at moisture contents suitable for compaction purposes and are compacted to the densities recommended below. Cobbles or boulders greater than 4 inches in maximum dimension, if encountered, should be culled/screened from the material prior to re-use.

4.2.3 Material Types

Fill and backfill should meet the following material property requirements:

Fill Type ¹	USCS Classification	Acceptable Location for Placement
Structural Fill ²	GW, GW-GM, SW, SW-SM, SP, GP	All locations and elevations. The on-site fill and glacial soils are not suitable for reuse as structural fill. Imported material should meet the gradation requirements in Note 2.
Slab Base/ Pavement Subbase	GW, GW-GM, SW, SW-SM, SP, GP	Select fill beneath slabs and pavements meeting the gradation requirements of NYSDOT 733-04 Subbase Course, Type 2.
Common Fill ³	Varies	Common fill may be used for general site grading. Common fill should not be used under settlement or frost-sensitive structures. The on-site fill and glacial soils may be selectively reused as common fill, provided they can be adequately compacted. These materials may be difficult to compact when wet or in damp conditions.
Crushed Stone	GP	For use on wet subgrades, as Structural Fill, and as drainage fill. Should be uniform ¾-inch angular crushed stone.
Lean Concrete	Not applicable	Can be used to level subgrades between foundations and native soils. Lean concrete should be flowable, self-

Fill Type ¹	USCS Classification	Acceptable Location for Placement
		compacting concrete with a compressive strength between 300 and 2,000 psi.

1. Compacted fill should consist of approved materials that are free of organic matter and debris. Frozen material should not be used. Fill should not be placed on a frozen subgrade.
2. Imported structural fill should meet the following gradation:

Percent Passing by Weight

Sieve Size	Structural Fill
6"	100
3"	70 – 100
2"	(100)*
¾"	45 – 95
No. 4	30 – 90
No. 10	25 – 80
No. 40	10 – 50
No. 200	0 – 12

* Maximum 2-inch particle size within 12 inches of the underside of footings or slabs

3. Common fill should have a maximum particle size of 6 inches and no more than 25 percent by weight passing the US No. 200 sieve.

4.2.4 Compaction Requirements

Item	Description
Fill Lift Thickness	8 inches or less in loose thickness
Compaction Requirements ¹	95 percent maximum modified Proctor dry density (ASTM D1557, Method C)
Moisture Content – Granular Material	Workable moisture levels

1. We recommend that Structural Fill be tested for moisture content and compaction during placement. Should the results of the in-place density tests indicate the specified moisture or compaction limits have not been met, the area represented by the test should be reworked and retested, as required, until the specified moisture and compaction requirements are achieved.

4.2.5 Utility Trench Backfill

Trench excavations should be made with sufficient working space to permit construction, including backfill placement and compaction. As utility trenches can provide a conduit for groundwater flow, trenches should be backfilled with material that approximately matches the permeability characteristics of the surrounding soil. Should higher permeability fill be used in trenches, consideration should be given to installing seepage collars and/or check dams to reduce the likelihood of migration of water through the trenches. Fill placed as backfill for utilities located below the slab should consist of compacted Structural Fill or suitable bedding material.

4.2.6 Grading and Drainage

Adequate drainage should be provided at the site to reduce the likelihood of an increase in moisture content of the foundation soils. Pavement or parking areas should be sloped away from the building to reduce the likelihood of water ponding near the structure.

4.2.6 Earthwork Construction Considerations

Unstable subgrade conditions could develop during general construction operations, particularly if the soils are wetted and/or subjected to repetitive construction traffic. Should unstable subgrade conditions develop, stabilization measures will need to be employed.

Construction traffic over the completed subgrade should be avoided to the extent practical. The site should also be graded to prevent ponding of surface water on the prepared subgrades or in excavations. If the subgrade should become frozen, wet, or disturbed, the affected material should be removed, or should be scarified, moisture conditioned, and recompact.

As a minimum, temporary excavations should be sloped or braced, as required by Occupational Safety and Health Administration (OSHA) regulations, to provide stability and safe working conditions. The contractor, by his contract, is usually responsible for designing and constructing stable, temporary excavations and should shore, slope or bench the sides of the excavations, as required, to maintain stability of both the excavation sides and bottom. All excavations should comply with applicable local, State, and federal safety regulations, including the current OSHA Excavation and Trench Safety Standards.

Terracon should be retained during the construction phase of the project to observe earthwork and to perform necessary tests and observations during subgrade preparation; proofrolling; placement and compaction of controlled compacted fills; backfilling of excavations in the completed subgrade; and just prior to construction of foundations.

4.3 Foundation Recommendations

Following removal and replacement of the existing uncontrolled fill as described in **Section 4.2.1**, above, the proposed addition may be supported on shallow spread footings. Design recommendations for shallow foundations are presented in the following table and paragraphs:

4.3.1 Footing Design Recommendations

Description	Value
Net Allowable Bearing Pressure ¹	
Compacted Structural Fill over Existing Fill	4,000 psf
Minimum Strip Footing Width	18 inches
Minimum Isolated Spread Footing Width	24 inches

Geotechnical Engineering Report

Addition to Campus Center North ■ Purchase, New York

March 10, 2017 ■ Terracon Project No. J2165193



Description	Value
Minimum Embedment Below Finished Grade for Frost Protection ²	42 inches (Town of Harrison)
Overexcavation ³	Up to about 12.5 feet.
Approximate Total Settlement ³	1 to 2 inches
Estimated Differential Settlement ⁴	~ ½ to ¾ of total settlement
Total unit weight (γ) Compacted Structural Fill over Existing Fill	125 pcf
Passive earth pressure coefficient, K_p ⁵	3.0 (ultimate)
Coefficient of sliding friction ⁶	0.5 (ultimate)

1. The recommended net allowable bearing pressure is the pressure in excess of the minimum surrounding overburden pressure at the footing base elevation.
2. For frost protection and to reduce effects of seasonal moisture variations in subgrade soils. For perimeter footings and footings beneath unheated areas. Alternatively, shallower foundations can be designed in accordance with American Society of Civil Engineers (ASCE) 32 – “*Design and Construction of Frost-Protected Shallow Foundations*.”
3. Represents depth of possible overexcavation below bottom of foundation to remove on-site fill.
4. Foundation settlement will depend upon the variations within the subsurface soil profile, the structural loading conditions, the embedment depth of the footing, the thickness of compacted fill, and the quality of the earthwork operations.
5. Passive pressure calculated with this parameter should be reduced by at least a factor of safety of 3, to reflect the amount of movement required to mobilize the passive resistance.
6. A factor of safety of at least 1.5 should be applied to the sliding resistance.

New building addition foundations should be designed to bear at the same elevation as the existing building foundations, then step up as the foundations extend away from the existing structure. Foundation steps should be located such that no additional load is applied to the existing foundations.

Site underground utilities, light standard foundations, drainage structures, and the like may be soil supported in a similar manner to building footings. Foundations for site appurtenances may be designed on the basis of a net allowable bearing pressure of 3,000 psf. However, the net allowable bearing pressure should be reduced to 2,000 psf, if the foundation dimensions are less than the recommended minimum.

The underside of interior footings not exposed to outside temperatures should be at least 18 inches below finished floor level and should not be placed on the on-site fill unless approved by Terracon, as mentioned in **Section 4.2.1**. If interior footings are to be exposed to freezing temperatures during construction, the underside of interior footings should be at least 42 inches below adjacent grade unless underlain by lean concrete to the frost depth of 42 inches. If

construction occurs during cold weather, the soil bearing surfaces in exposed footing excavations should be protected from frost.

4.3.2 Spread Footing Construction Considerations

The base of foundation excavations should be free of water, loose soil, and deleterious materials prior to placing concrete. Concrete should be placed soon after excavating to reduce bearing soil disturbance. Should the material at bearing level become wet, disturbed, or frozen, the affected material should be removed prior to placing concrete. Terracon should be retained to observe and test the foundation bearing materials.

Groundwater was not observed at the time of our explorations. Therefore, temporary dewatering is not expected to be required for foundation construction. However, the contractor should prevent groundwater, if encountered, and surface water runoff from collecting in the excavation. Subgrade soils that become unstable because of water and/or reworking by construction activity should be replaced with compacted Structural Fill, as necessary.

The predominant soil type at the recommended subgrade level will be the glacial, portions of which have an elevated silt content. Soils with a higher silt content will be sensitive to excess moisture and lose strength quickly during wet periods. Contractors experienced in earthwork construction in New England should be aware of the silty soil behavior and the effect that moisture and inclement weather can have on its workability. If a contractor bids construction knowing that earthwork must begin during the winter or wet months, the contractor should include a contingency in his bid to use off-site suitable fill, and to remove and dispose of on-site soils that become unsuitable.

4.4 Seismic Considerations

Description	Value
Code Used ¹	2010 Building Code of New York State (NYS Code)
Site Class ²	C
Maximum Considered Earthquake Ground Motions (5 percent damping) ³	0.060g (S_1 – 1.0 second spectral response acceleration)
	0.250g (S_s – 0.2 second spectral response acceleration)
Liquefaction Potential in Event of an Earthquake	Not susceptible

1. The NYS Code incorporates the Seismic Design Category approach from the 2015 International Building Code (IBC).

2. The IBC uses a site soil profile determination extending a depth of 100 feet for seismic site classification. The current scope requested does not include a 100-foot soil profile determination. However, we expect soils at least as dense as those encountered above 25 feet will extend to 100 feet.

3. Section 1613 of the 2015 IBC.

4.5 Slab-on-Grade

The slab-on-grade will derive support from the compacted Structural Fill. The potential for additional loads to the existing foundation wall from the proposed slab-on-grade should be evaluated by the Structural Engineer.

4.5.1 Slab-on-Grade Design Recommendations

Description	Value
Floor Slab Support ^{1,2}	6-inch thick layer compacted structural fill
Modulus of Subgrade Reaction	200 pounds per square inch per in (psi/in) for point loading

1. Floor slab should be structurally independent of building footings or walls to reduce the possibility of floor slab cracking caused by differential movements between the slab and foundation.
2. Material meeting the NYSDOT 733-04 Subbase Course, Type 2, should be used.

Where appropriate, control joints should be saw-cut in the slab to help control the location and extent of cracking. The slab designer should refer to the ACI Design Manual for additional recommendations.

The use of a vapor retarder should be considered beneath a concrete slab-on-grade that will be covered with wood, tile, carpet or other moisture sensitive or impervious coverings, or when the slab will support equipment sensitive to moisture. When conditions warrant the use of a vapor retarder, the slab designer should refer to ACI 302 and/or ACI 360 for procedures and cautions regarding the use and placement of a vapor retarder.

4.5.2 Slab-on-Grade Construction Considerations

The general slab subgrade preparation activities will be accomplished early in this project when the fill below the proposed building is excavated and replaced. However, as construction proceeds, the soil subgrade may be disturbed because of utility excavations, construction traffic, precipitation, etc. As a result, the floor slab subgrade may not be suitable for placement of the slab base and concrete, and corrective action will be required.

We recommend the soil area underlying the floor slab be rough graded and then thoroughly compacted with at least six passes of a minimum 5-ton (static weight) walk-behind roller or heavy-duty plate compactor prior to final grading and placement of slab base or Structural Fill. Alternately, in areas with limited access, a walk-behind compactor capable of imparting a similar amount of energy may be used. Particular attention should be paid to high traffic areas that were rutted and disturbed earlier and to areas where backfilled trenches are located. Areas with unsuitable conditions should be repaired by removing and replacing affected material with properly compacted Structural Fill. Floor slab subgrade areas should be moisture conditioned and properly compacted to the recommendations in this report, immediately prior to placement of the slab base and concrete.

5.0 GENERAL COMMENTS

Terracon should be retained to review the final design plans and specifications, so comments can be made regarding interpretation and implementation of our geotechnical recommendations in the design and specifications. Terracon also should be retained to provide observation and testing services during grading, excavation, foundation construction and other earth-related construction phases of the project.

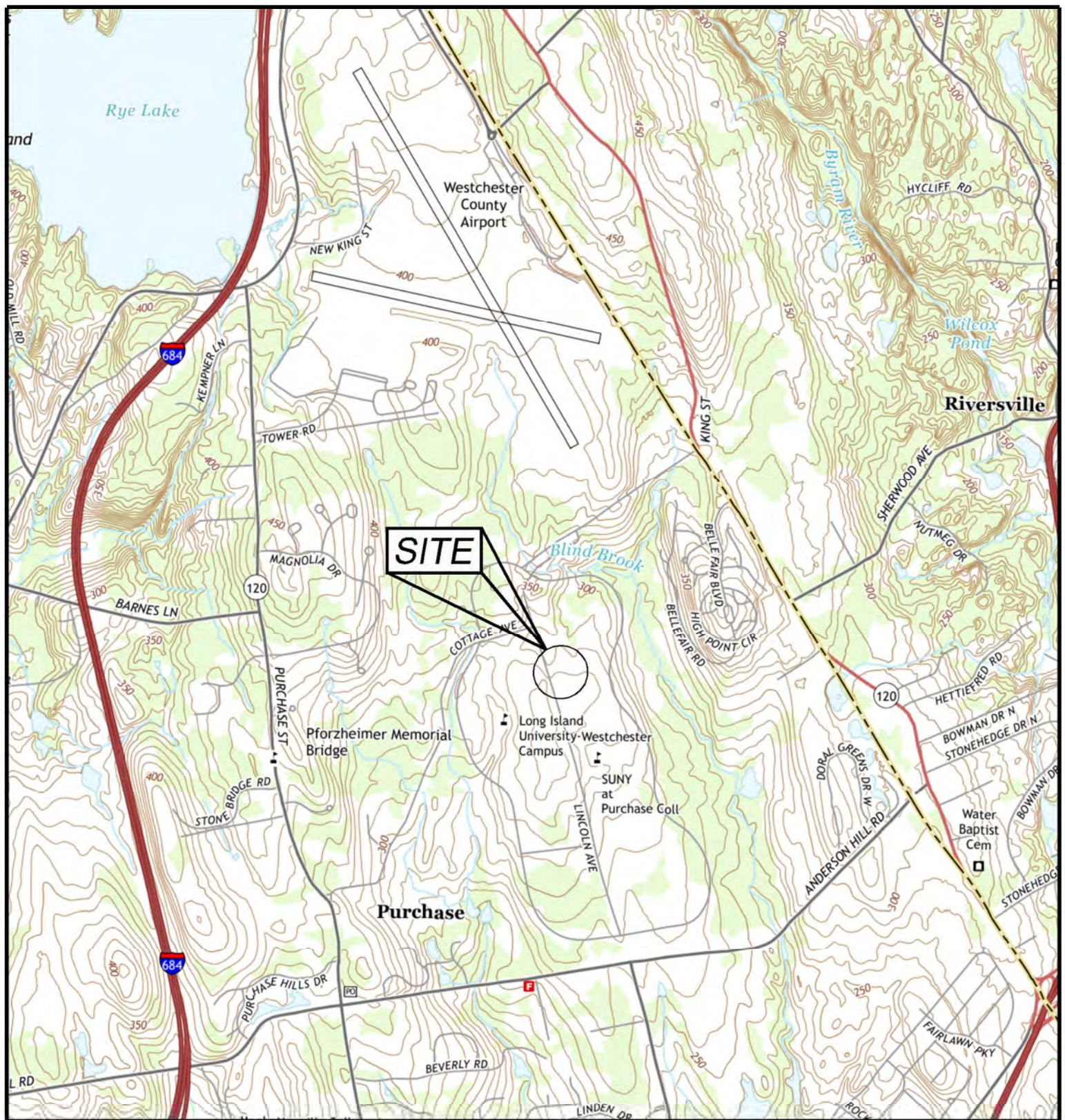
The analysis and recommendations presented in this report are based upon the data obtained from the explorations performed at the indicated locations and from other information discussed in this report. This report does not reflect variations that may occur between explorations, across the site, or due to the modifying effects of weather. The nature and extent of such variations may not become evident until during or after construction. If variations appear, we should be immediately notified, so that further evaluation and supplemental recommendations can be provided.

The scope of services for this project does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

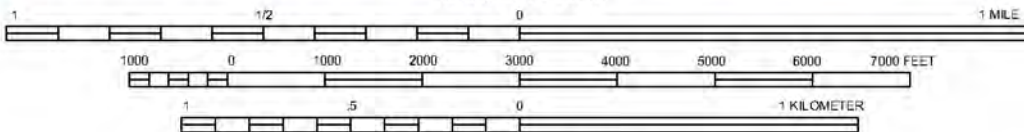
This report has been prepared for the exclusive use of our client for specific application to the project discussed and prepared in accordance with generally accepted geotechnical engineering practices. No warranties, either express or implied, are intended or made. Site safety, excavation support, and dewatering requirements are the responsibility of others. In the event that changes in the nature, design, or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless Terracon reviews the changes and either verifies or modifies the conclusions of this report in writing.

APPENDIX A

FIELD EXPLORATION



SCALE: 1:24 000



CONTOUR INTERVAL 10 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988



QUADRANGLE LOCATION

Project Mgr.	BDO
Drawn By:	JCH
Checked By:	BDO
Approved By:	SCL
Project No.	J2165193
Quadrangle:	CLARKVILLE, CT-3815
File No.	J2165193.dwg
Date:	March 2017

Terracon
Consulting Engineers and Scientists

201 Hammer Mill Road Rocky Hill, CT 06067
PH: (860) 721 1900 FAX: (860) 721 1939

SITE LOCATION MAP

ADDITION TO CAMPUS CENTER NORTH
LINCOLN AVENUE
PURCHASE, NEW YORK

EXHIBIT

A-1



APPROXIMATE SCALE IN FEET

LEGEND



B-1 TEST BORING LOCATION (TYP)



PROPOSED ADDITION

NOTES:

1. THIS DIAGRAM WAS PREPARED BASED ON THE "CONSTRUCTION FLOOR PLAN" BY PHASE ZERO DESIGN OF SIMSBURY, CONNECTICUT, DRAWING No. A101, DATED OCTOBER 28, 2016, AND AVAILABLE AERIAL PHOTOGRAPHY.
2. TERRACON MONITORED THE ADVANCEMENT OF TEST BORINGS B-1, B-2, AND B-3 ON JANUARY 12, 2017 WITH EQUIPMENT OWNED AND OPERATED BY GENERAL BORINGS, INC. OF PROSPECT, CONNECTICUT.
3. THE APPROXIMATE LOCATIONS OF THE EXPLORATIONS WERE TAPED FROM SITE FEATURES. THE LOCATIONS SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.
4. USE OF THIS DIAGRAM IS LIMITED TO THE ILLUSTRATION OF THE APPROXIMATE LOCATIONS OF THE EXPLORATIONS AND OTHER PERTINENT SITE FEATURES. ANY OTHER USE OF THIS DIAGRAM WITHOUT PERMISSION FROM TERRACON IS PROHIBITED.

Project Mgr: BDO
 Drawn By: JCH
 Checked By: BDO
 Approved By: SCL

Project No. J2165193
 Scale: 1" = 60'
 File No. J2165193.dwg
 Date: March 2017

Terracon
 Consulting Engineers and Scientists

201 Hammer Mill Road Rocky Hill, CT 06067
 PH. (860)721-1900 FAX. (860)721-1939

EXPLORATION LOCATION DIAGRAM

ADDITION TO CAMPUS CENTER NORTH

LINCOLN AVENUE
 PURCHASE, NEW YORK

EXHIBIT

A-2

Geotechnical Engineering Report

Advanced Auto Parts Store ■ Cromwell, Connecticut

March 10, 2017 ■ Terracon Project No. J2165190



Field Exploration Description

Terracon observed the advancement of three test borings (B-1, B-2, and B-3) throughout the site on January 12, 2017 using a backhoe-mounted Mobile B-51 rotary drill rig owned and operated by General Borings, Inc. of Prospect, Connecticut. The borings were advanced using 3¼-inch inside diameter continuous flight hollow-stem augers. B-1 was advanced through the brick pavers and underlying Portland cement concrete using an electric-powered drill with a 6-inch inside diameter core barrel. The exploration locations, which are shown on exhibit A-2, were located by taping from existing site features and estimating right angles. The locations of the explorations should be considered accurate only to the degree implied by the methods used to define them. Ground surface elevations were not provided prior to the preparation of this report.

In the split-barrel sampling procedure, which was used to take soil samples in the test borings, the number of blows required to advance a standard 2-inch O.D. split-barrel sampler typically the middle 12 inches of the total 24-inch penetration by means of a 140-pound safety hammer with a free fall of 30 inches is the Standard Penetration Test (SPT) resistance value "N". This "N" value is used to estimate the *in-situ* relative density of cohesionless soils and consistency of cohesive soils.

The soil samples were placed in labeled glass jars and transported to our laboratory for further review by a Terracon geotechnical engineer. Information provided on the boring logs attached to this report includes soil descriptions, relative density and/or consistency evaluations, boring depths, sampling intervals, and groundwater conditions. The borings were backfilled prior to the drill crew leaving the site.

Field logs of the borings, which included visual classifications of the materials encountered during drilling as well as interpretation of the subsurface conditions between samples, were prepared. The final boring logs included with this report represents further interpretation by the geotechnical engineer of the field logs and incorporate, where appropriate, modifications based on laboratory classification and testing of the samples.







BORING LOG NO. B-1

Page 1 of 1

PROJECT: Addition to Campus Center North

CLIENT: Doucet & Associates, Inc.
Easthampton, Massachusetts

SITE: SUNY Purchase
Purchase, New York

GRAPHIC LOG	LOCATION See Exhibit A-2	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	
	DEPTH							
	0.1 0.4	5			14	6-7-7-8 N=14		
	BRICK PAVERS							
	PORTLAND CEMENT CONCRETE							
	FILL - SILTY SAND (SM), occasional cobbles, brown, loose to medium dense							
	16.0	10			8	4-1-3-4 N=4	14	
	SILTY SAND (SM), with gravel, occasional cobbles and boulders, brown, medium dense to dense, (GLACIAL TILL)							
	19.0	15			12	7-9-18-23 N=27		
	Auger Refusal on Probable Boulder at 19 Feet							
Stratification lines are approximate. In-situ, the transition may be gradual. Samples taken with 2" outside-diameter split spoon sampler driven by a safety hammer operated by rope and cathead.								
Advancement Method: Electric-powered drill with 6-inch inside diameter barrel to 0.4 feet, then 3 1/4-inch inside diameter continuous flight hollow-stem augers to 19 feet.		See Exhibit A-3 for description of field procedures. See Appendix B for description of laboratory procedures and additional data (if any).		Notes:				
Abandonment Method: Boring backfilled with soil cuttings upon completion.		See Appendix C for explanation of symbols and abbreviations.						
WATER LEVEL OBSERVATIONS		 201 Hammer Mill Rd Rocky Hill, CT		Boring Started: 1/12/2017		Boring Completed: 1/12/2017		
No free water observed				Drill Rig: Mobile B-51		Driller: J. Casson		
				Project No.: J2165193		Exhibit: A-4		

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL J2165193.GPJ TERRACON DATATEMPLATE.GDT 3/8/17


BORING LOG NO. B-2

Page 1 of 1

PROJECT: Addition to Campus Center North

CLIENT: Doucet & Associates, Inc.
Easthampton, Massachusetts

SITE: SUNY Purchase
Purchase, New York

GRAPHIC LOG	LOCATION See Exhibit A-2	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)
	DEPTH						
	0.1' TOPSOIL						
	1.0' SANDY SILT (ML), trace roots, brown to orange, loose, (SUBSOIL)				10	3-4-5-11 N=9	
	SILTY SAND (SM), with gravel, occasional cobbles, brown, medium dense to very dense, (GLACIAL TILL)				6	10-11-13-10 N=24	
		5			10	29-17-15-21 N=32	
					8	19-22-22-25 N=44	
		10			12	17-19-23-24 N=42	
		15			10	27-36-33-35 N=69	
	17.0' Boring Terminated at 17 Feet						
<p>Stratification lines are approximate. In-situ, the transition may be gradual. Samples taken with 2" outside-diameter split spoon sampler driven by a safety hammer operated by rope and cathead.</p>							
<p>Advancement Method: 3 1/4-inch inside diameter continuous flight hollow-stem augers</p>		<p>See Exhibit A-3 for description of field procedures. See Appendix B for description of laboratory procedures and additional data (if any). See Appendix C for explanation of symbols and abbreviations.</p>		<p>Notes:</p>			
<p>Abandonment Method: Boring backfilled with soil cuttings upon completion, Brick replaced and sealed with grout.</p>							
<p>WATER LEVEL OBSERVATIONS</p> <p>No free water observed</p>		 <p>201 Hammer Mill Rd Rocky Hill, CT</p>		<p>Boring Started: 1/12/2017</p>		<p>Boring Completed: 1/12/2017</p>	
				<p>Drill Rig: Mobile B-51</p>		<p>Driller: J. Casson</p>	
				<p>Project No.: J2165193</p>		<p>Exhibit: A-5</p>	

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL J2165193.GPJ TERRACON DATATEMPLATE.GDT 3/8/17


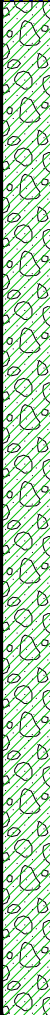
BORING LOG NO. B-3

Page 1 of 1

PROJECT: Addition to Campus Center North

CLIENT: Doucet & Associates, Inc.
Easthampton, Massachusetts

SITE: SUNY Purchase
Purchase, New York

GRAPHIC LOG	LOCATION See Exhibit A-2	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)
	DEPTH						
	0.1' TOPSOIL SANDY SILT (ML) , trace roots, brown to orange, loose, (SUBSOIL)				15	3-4-5-9 N=9	
	2.0' SILTY SAND (SM) , with gravel, occasional cobbles and boulders, brown to brown, dense to very dense, (GLACIAL TILL)				18	19-20-22-24 N=42	
		5					
					15	32-36-28-26 N=64	7
					17	31-29-37-32 N=66	
		10					
					19	13-30-31-50/3" N=61	
		15					
					12	22-22-27-45 N=49	
		20					
					13	12-10-50/4"	
		25					
	25.3' Sampler Refusal on Probable Boulder at 25.3 Feet				0	50/3"	

Stratification lines are approximate. In-situ, the transition may be gradual.
Samples taken with 2" outside-diameter split spoon sampler driven by a safety hammer operated by rope and cathead.

Advancement Method:
3 1/4-inch inside diameter continuous flight hollow-stem augers

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

WATER LEVEL OBSERVATIONS

No free water observed

Terracon
201 Hammer Mill Rd
Rocky Hill, CT

Boring Started: 1/12/2017

Boring Completed: 1/12/2017

Drill Rig: Mobile B-51

Driller: J. Casson

Project No.: J2165193

Exhibit: A-6

APPENDIX B

LABORATORY TESTING

Geotechnical Engineering Report

Addition to Campus Center North ■ Purchase, New York

March 10, 2017 ■ Terracon Project No. J2165193



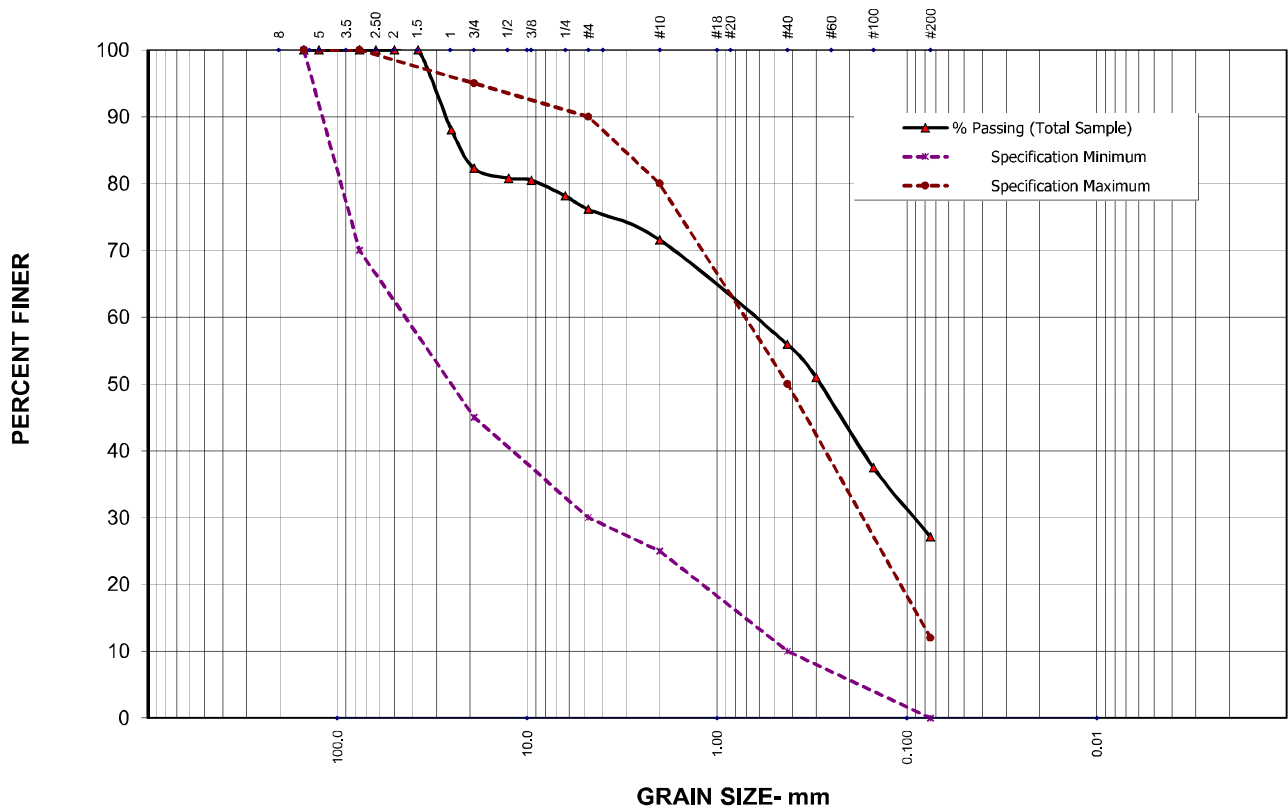
Laboratory Testing

Descriptive classifications of the soils indicated on the boring logs are in accordance with the enclosed General Notes and the Unified Soil Classification System (USCS). USCS symbols are also shown. A brief description of the USCS is also attached to this report. Classification was generally by visual/manual procedures, aided by laboratory testing.

Laboratory testing, consisting of two moisture content determinations (ASTM D2216) and two grain size distribution tests (ASTM D422), was performed on representative soil samples from the borings. The results of the moisture contents and grain size distribution tests are presented in this Appendix.

GRAIN SIZE DISTRIBUTION TEST REPORT

ASTM TEST METHOD: D422



% Cobbles	% Gravel	Coarse Medium Fine			% Fines	
		9.3	31.9	58.8	Silt (>0.002mm)	Clay (<0.002mm)
0	24	% Sand 49			27	

USCS Classification: Silty sand (SM), with gravel

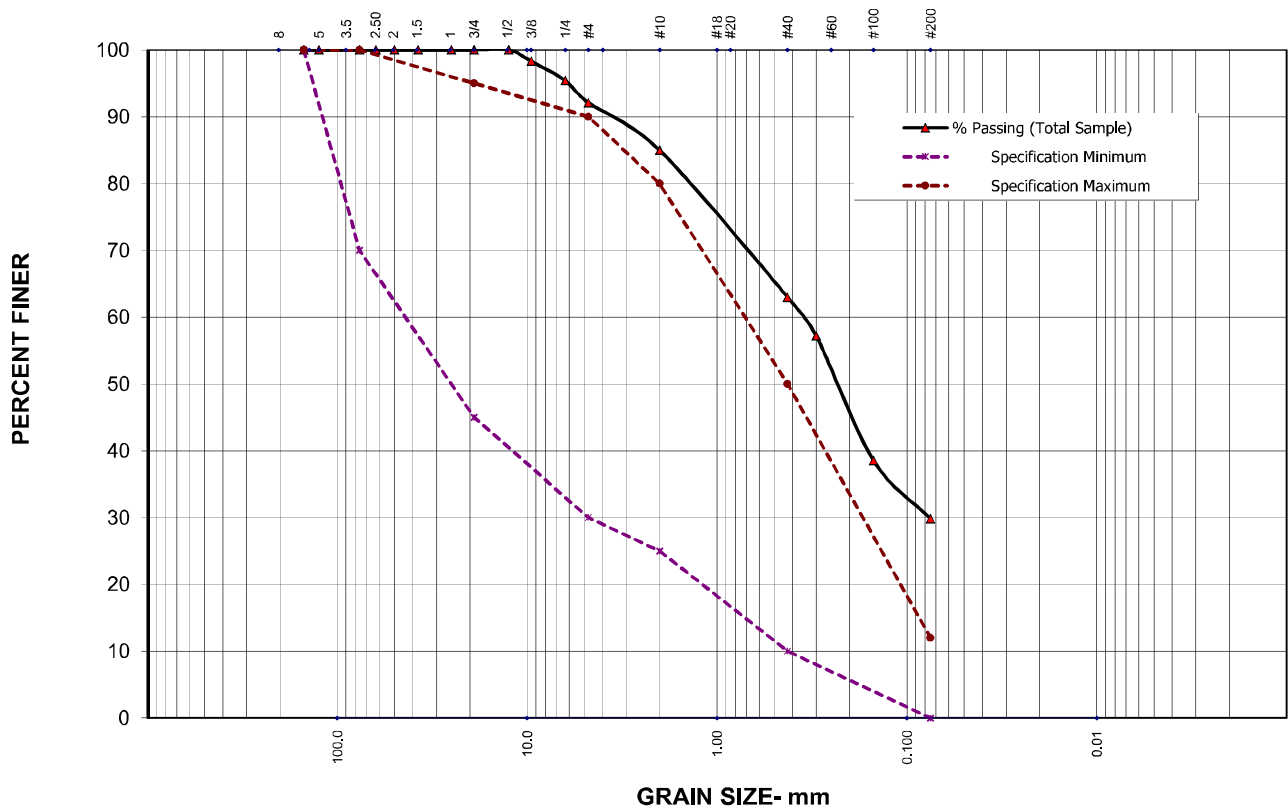
Sieve Size (mm)	U.S. Sieve Size (in.)	Cumulative Wt. Retained	% Passing (Total Sample)	% Passing (Sand Portion)	Specification Minimum	Specification Maximum
150.0	6"	0.00	100		100	100
125.0	5"	0.00	100			
76.3	3"	0.00	100		70	100
62.5	2.5"	0.00	100			
50.0	2"	0.00	100			
37.5	1.5"	0.00	100			
25.0	1"	29.71	88			
19.0	3/4"	43.99	82		45	95
12.5	1/2"	47.69	81			
9.5	3/8"	48.36	81			
6.3	1/4"	54.21	78			
4.75	#4	59.20	76		30	90
2.00	#10	70.56	72		25	80
0.425	#40	109.34	56		10	50
0.300	#50	121.60	51			
0.150	#100	155.03	38			
0.075	#200	180.86	27		0	12

Total Dry Wt. 248.06 g
Moisture Content 7 %

Project: Addition to Campus Center North	Project No.: J2165193	Date: 3/7/2017
City: Purchase, New York	Specification: Terracon Structural Fill	Report No: J2165193.0001
Source: B-3	Sampled from: 5 to 7 feet (Glacial Till)	
201 Hammer Mill Road Rocky Hill, CT 06067 860-721-1900 (p) 860-721-1939 (f) http://www.terracon.com/	Remarks: Tested By: C. Klopfer Reviewed By: BDO	Date: 1/24/2017 Date: 1/24/2017

GRAIN SIZE DISTRIBUTION TEST REPORT

ASTM TEST METHOD: D422



% Cobbles		% Gravel		Coarse	Medium	Fine	% Fines	
0		8		11.5	35.3	53.3	Silt (>0.002mm)	Clay (<0.002mm)
				% Sand		62	30	

USCS Classification: Silty sand (SM)

Sieve Size (mm)	U.S. Sieve Size (in.)	Cumulative Wt. Retained	% Passing (Total Sample)	% Passing (Sand Portion)	Specification Minimum	Specification Maximum
150.0	6"	0.00	100		100	100
125.0	5"	0.00	100			
76.3	3"	0.00	100		70	100
62.5	2.5"	0.00	100			
50.0	2"	0.00	100			
37.5	1.5"	0.00	100			
25.0	1"	0.00	100			
19.0	3/4"	0.00	100		45	95
12.5	1/2"	0.00	100			
9.5	3/8"	3.52	98			
6.3	1/4"	9.52	95			
4.75	#4	16.37	92		30	90
2.00	#10	31.15	85		25	80
0.425	#40	76.64	63		10	50
0.300	#50	88.68	57			
0.150	#100	127.25	39			
0.075	#200	145.32	30		0	12












Total Dry Wt. 207.09 g
Moisture Content 14 %

Project: Addition to Campus Center North	Project No.: J2165193	Date: 3/7/2017
City: Purchase, New York	Specification: Terracon Structural Fill	Report No: J2165193.0002
Source: B-1	Sampled from: 5 to 7 feet (Fill)	
201 Hammer Mill Road Rocky Hill, CT 06067 860-721-1900 (p) 860-721-1939 (f) http://www.terracon.com/	Remarks: Tested By: C. Klopfer Reviewed By: BDO	
		Date: 1/24/2017 Date: 1/24/2017

APPENDIX C
SUPPORTING DOCUMENTS

GENERAL NOTES

DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

SAMPLING			WATER LEVEL		Water Initially Encountered	FIELD TESTS	(HP)	Hand Penetrometer	
	Auger	Split Spoon			Water Level After a Specified Period of Time		(T)	Torvane	
					Water Level After a Specified Period of Time		(b/f)	Standard Penetration Test (blows per foot)	
	Shelby Tube	Macro Core		Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.			(PID)	Photo-Ionization Detector	
							(OVA)	Organic Vapor Analyzer	
Ring Sampler	Rock Core								
									
Grab Sample	No Recovery								

DESCRIPTIVE SOIL CLASSIFICATION

Soil classification is based on the Unified Soil Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

LOCATION AND ELEVATION NOTES

Unless otherwise noted, Latitude and Longitude are approximately determined using a hand-held GPS device. The accuracy of such devices is variable. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

STRENGTH TERMS	RELATIVE DENSITY OF COARSE-GRAINED SOILS (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance Includes gravels, sands and silts.			CONSISTENCY OF FINE-GRAINED SOILS (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance			
	Descriptive Term (Density)	Standard Penetration or N-Value Blows/Ft.	Ring Sampler Blows/Ft.	Descriptive Term (Consistency)	Unconfined Compressive Strength, Qu, psf	Standard Penetration or N-Value Blows/Ft.	Ring Sampler Blows/Ft.
	Very Loose	0 - 3	0 - 6	Very Soft	less than 500	0 - 1	< 3
	Loose	4 - 9	7 - 18	Soft	500 to 1,000	2 - 4	3 - 4
	Medium Dense	10 - 29	19 - 58	Medium-Stiff	1,000 to 2,000	4 - 8	5 - 9
	Dense	30 - 50	59 - 98	Stiff	2,000 to 4,000	8 - 15	10 - 18
	Very Dense	> 50	≥ 99	Very Stiff	4,000 to 8,000	15 - 30	19 - 42
				Hard	> 8,000	> 30	> 42

RELATIVE PROPORTIONS OF SAND AND GRAVEL

<u>Descriptive Term(s) of other constituents</u>	<u>Percent of Dry Weight</u>
Trace	< 15
With	15 - 29
Modifier	> 30

GRAIN SIZE TERMINOLOGY

<u>Major Component of Sample</u>	<u>Particle Size</u>
Boulders	Over 12 in. (300 mm)
Cobbles	12 in. to 3 in. (300mm to 75mm)
Gravel	3 in. to #4 sieve (75mm to 4.75 mm)
Sand	#4 to #200 sieve (4.75mm to 0.075mm)
Silt or Clay	Passing #200 sieve (0.075mm)

RELATIVE PROPORTIONS OF FINES

<u>Descriptive Term(s) of other constituents</u>	<u>Percent of Dry Weight</u>
Trace	< 5
With	5 - 12
Modifier	> 12

PLASTICITY DESCRIPTION

<u>Term</u>	<u>Plasticity Index</u>
Non-plastic	0
Low	1 - 10
Medium	11 - 30
High	> 30

UNIFIED SOIL CLASSIFICATION SYSTEM

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests ^A					Soil Classification	
					Group Symbol	Group Name ^B
Coarse Grained Soils: More than 50% retained on No. 200 sieve	Gravels: More than 50% of coarse fraction retained on No. 4 sieve	Clean Gravels: Less than 5% fines ^C	Cu ≥ 4 and 1 ≤ Cc ≤ 3 ^E		GW	Well-graded gravel ^F
			Cu < 4 and/or 1 > Cc > 3 ^E		GP	Poorly graded gravel ^F
		Gravels with Fines: More than 12% fines ^C	Fines classify as ML or MH		GM	Silty gravel ^{F,G,H}
			Fines classify as CL or CH		GC	Clayey gravel ^{F,G,H}
	Sands: 50% or more of coarse fraction passes No. 4 sieve	Clean Sands: Less than 5% fines ^D	Cu ≥ 6 and 1 ≤ Cc ≤ 3 ^E		SW	Well-graded sand ^I
			Cu < 6 and/or 1 > Cc > 3 ^E		SP	Poorly graded sand ^I
		Sands with Fines: More than 12% fines ^D	Fines classify as ML or MH		SM	Silty sand ^{G,H,I}
			Fines classify as CL or CH		SC	Clayey sand ^{G,H,I}
Fine-Grained Soils: 50% or more passes the No. 200 sieve	Silts and Clays: Liquid limit less than 50	Inorganic:	PI > 7 and plots on or above “A” line ^J		CL	Lean clay ^{K,L,M}
			PI < 4 or plots below “A” line ^J		ML	Silt ^{K,L,M}
		Organic:	Liquid limit - oven dried	< 0.75	OL	Organic clay ^{K,L,M,N}
			Liquid limit - not dried		Organic silt ^{K,L,M,O}	
	Silts and Clays: Liquid limit 50 or more	Inorganic:	PI plots on or above “A” line		CH	Fat clay ^{K,L,M}
			PI plots below “A” line		MH	Elastic Silt ^{K,L,M}
		Organic:	Liquid limit - oven dried	< 0.75	OH	Organic clay ^{K,L,M,P}
			Liquid limit - not dried		Organic silt ^{K,L,M,Q}	
Highly organic soils:	Primarily organic matter, dark in color, and organic odor				PT	Peat

^A Based on the material passing the 3-inch (75-mm) sieve

^B If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

^C Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

^D Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay

$$^E Cu = D_{60}/D_{10} \quad Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$$

^F If soil contains $\geq 15\%$ sand, add "with sand" to group name.

^G If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

^H If fines are organic, add "with organic fines" to group name.

^I If soil contains $\geq 15\%$ gravel, add "with gravel" to group name.

^J If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

^K If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

^L If soil contains $\geq 30\%$ plus No. 200 predominantly sand, add "sandy" to group name.

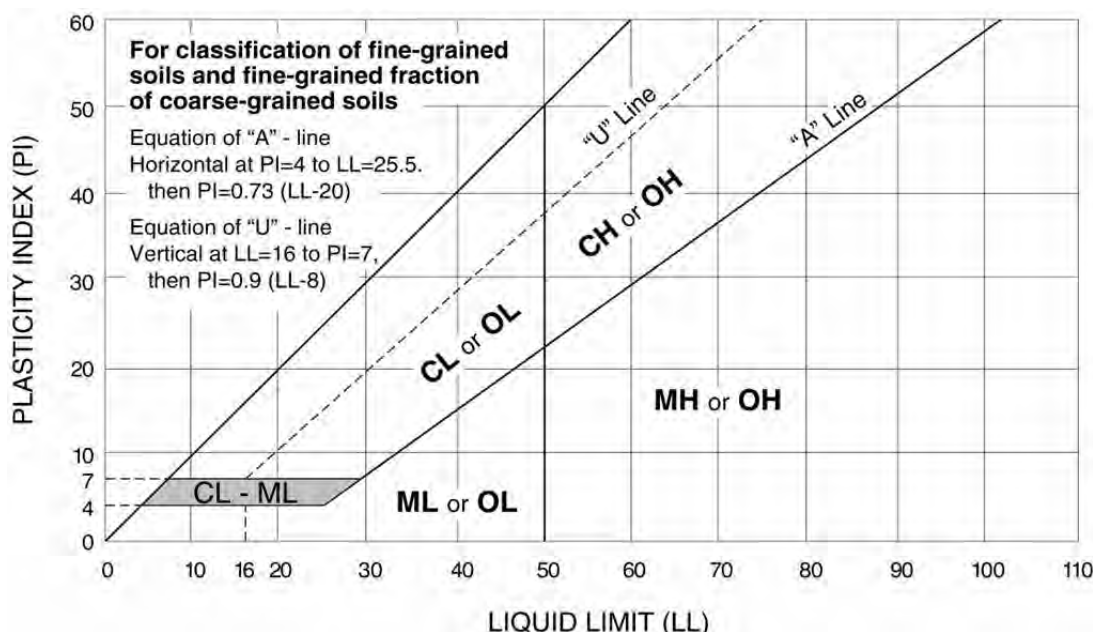
^M If soil contains $\geq 30\%$ plus No. 200, predominantly gravel, add "gravelly" to group name.

^N $PI \geq 4$ and plots on or above "A" line.

^O $PI < 4$ or plots below "A" line.

^P PI plots on or above "A" line.

^Q PI plots below "A" line.



SECTION 011000 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Project information.
 - 2. Work covered by Contract Documents.
 - 3. Work under separate Contracts.
 - 4. Access to site.
 - 5. Work restrictions.
 - 6. Specification and drawing conventions.
 - 7. Miscellaneous provisions.
- B. Related Sections include the following:
 - 1. Division 01 Section "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.3 PROJECT INFORMATION

- A. Project Identification: SUNY Purchase College, Café Addition and Renovation
 - 1. Project Location: 735 Anderson Hall Road, Purchase, NY 10577.
- B. Owner: SUNY Purchase College.
- C. Client: Chartwells.
- D. Architect: The Contract Documents were prepared for Project by Phase Zero Design, Simsbury, CT.

1.4 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Project consists of the following:
 - 1. New one-story addition to the Student Dining Commons.
- B. Type of Contract:
 - 1. Project will be constructed under a single prime contract.

1.5 SCHEDULE

- A. General: The Contractor shall prepare a detailed construction schedule, to be submitted to the Owner, Engineer, and Owner's Representative for review and approval. The schedule must clearly demonstrate the proper sequencing of construction activities.

1.6 WORK UNDER SEPARATE CONTRACTS

- A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying Work under this Contract or other contracts. Coordinate the Work of this Contract with work performed under separate contracts.
- B. Concurrent Work: Owner will award a separate contract for the following construction operations at Project site. Those operations will be conducted simultaneously with work under this Contract.

1. Roofing:

- a. New SBS modified bituminous membrane roofing, roof edge blocking and fascia, as part of adjacent reroofing project.
- b. Roof penetrations and patching of membrane roofing on existing building.
- c. Roof penetrations on new addition.
- d. This Contract includes furnishing and installation of all roof drains in new construction.

2. Millwork.

- a. This Contract includes furnishing and installation of wood blocking, conduit, plumbing and electrical systems for the installation of millwork by separate Contract.
- b. This Contract includes furnishing and installation of plastic laminates on surfaces for walls and soffits.

3. Furniture, fixtures and equipment.

- a. This Contract includes all mechanical, electrical and plumbing connections for food service equipment and walk-in refrigeration units.
- b. This Contract includes furnishing and installing all hoods.

4. Data/Low Voltage: Data cabling, security, cameras, Wi-Fi, and security access (card readers) for doors.

- a. This Contract includes furnishing and installation of infrastructure (pathways and power for devices) for installation of data and low voltage systems.

- C. Subsequent Work: Owner will bid and award separate contracts for the following additional work to be performed at site following Substantial Completion. Completion of that work will depend on successful completion of preparatory Work under this Contract as indicated.

1. Room signage.

1.7 ACCESS TO SITE

- A. General: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.

- B. Use of Site: Limit use of Project site to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
 - 1. Confine the parking of workmen's and construction vehicles, and the storage of construction materials to a designated staging area determined by the Owner.
 - 2. Owner Occupancy: Allow for Owner occupancy of Project site.
 - 3. Driveways and Entrances: Keep driveways and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
 - a. Schedule deliveries to minimize use of driveways and entrances.
 - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
- C. Use of Existing Building: Maintain existing building in a weathertight condition throughout construction period. Repair damage caused by construction operations. Protect building and its occupants during construction period.

1.8 COORDINATION WITH OCCUPANTS

- A. Partial Owner Occupancy: Owner will occupy the premises during entire construction period, with the exception of areas under construction. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's operations. Maintain existing exits, unless otherwise indicated.
 - 1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.
 - 2. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.
- B. Owner Limited Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed areas of building, before Substantial Completion, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and partial occupancy shall not constitute acceptance of the total Work.
 - 1. Architect will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied before Owner occupancy.
 - 2. Obtain a Certificate of Occupancy from authorities having jurisdiction before Owner occupancy.
 - 3. Before partial Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of building.
 - 4. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of building.

1.9 WORK RESTRICTIONS

- A. Work Restrictions, General: Comply with restrictions on construction operations.
 - 1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.
- B. On-Site Work Hours: Work shall be generally performed inside the existing building during normal business working hours of 7:00 a.m. to 5:00 p.m., Monday through Friday, except otherwise indicated.

1. Weekend Hours: Coordinate with Owner.
 2. Hours for Utility Shutdowns: Coordinate with Owner.
- C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
1. Notify Owner not less than two days in advance of proposed utility interruptions.
 2. Do not proceed with utility interruptions without Owner's written permission.
- D. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.
1. Notify Owner not less than two days in advance of proposed disruptive operations.
 2. Obtain Owner's written permission before proceeding with disruptive operations.
- E. Nonsmoking Building: Smoking is not permitted on site.
- F. Employee Identification: Provide identification tags for Contractor personnel working on Project site. Require personnel to use identification tags at all times.

1.10 SPECIFICATION FORMATS AND CONVENTIONS

- A. Specification Format: The Specifications are organized into Divisions and Sections using the 48-division format and CSI/CSC's "MasterFormat" numbering system.
1. Section Identification: The Specifications use Section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete because all available Section numbers are not used. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of Sections in the Contract Documents.
- B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- C. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
 2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.
 - a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

- D. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
 - 1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
 - 2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard and scheduled on Drawings.
- E. In general, the Specifications will describe the quality of the work and the Drawings, the extent of the work. The Drawings and Specifications are cooperative and supplementary; however, each item of the work is not necessarily mentioned in both the Drawings and the Specifications. All work necessary to complete the project, so described, is to be included in this Contract.
- F. In case of disagreement between the Drawings and Specifications, or within either document itself, the Architect shall interpret the Documents to require the better quality or greater quantity of work for the Owner that can reasonably be construed therefrom. Any work performed by the Contractor without consulting the Architect, when the same requires a decision, shall be performed at the Contractor's risk.

1.11 CODES, STANDARDS AND PERMITS

- A. All work under this contract shall conform to all codes and standards in effect as of the date of receipt of Bids which are applicable to this Project. All work shall also conform to specific requirements and interpretations of local authorities having jurisdiction over the Project. These Codes, standards, and authorities are referred to collectively as "the governing codes and authorities" and similar terms throughout the Specifications. Determination of applicable codes and standards and requirements of the authorities having jurisdiction shall be the responsibility of the Contractor; as shall be the analysis of all such codes and standards in regard to their applicability to the Project for the purposes of determining necessary construction to conform to such code requirements, for securing all approvals and permits necessary to proceed with construction, and to obtain all permits necessary for the Owner to occupy the facility for their intended use. In the case of conflicts between the requirements of different codes and standards, the most restrictive or stringent requirements shall be met.
- B. The codes that were used in the design of this Project are as follows:
 - 1. New York State Uniform Fire Prevention and Building Code (the Uniform Code) including the following:
 - a. 2015 International Building Code (IBC)
 - b. 2015 International Mechanical Code (IMC)
 - c. 2015 International Plumbing Code (IPC)
 - d. 2015 International Energy Conservation Code (IECC)
 - e. 2015 International Fire Code (IFC)
 - f. 2014 National Electric Code
 - g. 2009 ICC/ANSI A117.1 Accessible and Usable Buildings and Facilities
 - 2. Current New York Public Health Code.
 - 3. Current OSHA.
 - 4. Title III of the Americans with Disabilities Act (ADA) including the 2010 ADA Standards for Accessible Design.
- C. Code Enforcement and Approvals: Secure and pay for the general building permit for the work, and conform to all conditions and requirements of the permit and code enforcement authorities.

- D. Identify all permits (other than general building permit) required from authorities having jurisdiction over the Project for the construction and occupancy of the work. Prepare the necessary applications and submit required plans and documents to obtain such permits in a timely manner. Permit fees to be paid by the Subcontractor.
1. Display all permit cards as required by the authorities, and deliver legible photocopies of all permits to the Owner promptly upon their receipt.
 2. Arrange for all inspections, testing and approvals required for all permits. Notify the Owner and Architect at least three business days in advance, so they may arrange to observe.
 3. Comply with all conditions and provide all notices required by all permits.
 4. Perform and/or arrange for and pay for all testing and inspections required by the governing codes and authorities, other than those provided by the Owner, and notify the Owner and Architect of such inspections at least three business days in advance, so they may arrange to observe.
 5. Where inspecting authorities require corrective work in conjunction with applicable codes and authorities, promptly comply with such requirements, except in cases where such requirements clearly exceed the requirements of the Contract Documents, in which case proceed in accordance with the procedures for modifications to the Work established in the Contract Documents.

1.12 OCCUPATIONAL SAFETY AND HEALTH ACT

- A. The Contractor and each Subcontractor shall comply with the requirements of the Occupational Safety and Health Act of 1970 and the Construction Safety Act of 1969, including all standards and regulations which have been promulgated by the Governmental Authorities which administer such Acts. Said requirements, standards and regulations are incorporated herein by reference.
- B. The Contractor and each Subcontractor shall comply with said regulations, requirements and standards and require and be directly responsible for compliance therewith on the part of his agents, employees material men and Subcontractors; and shall directly receive and be responsible for all citations, assessments, fines or penalties which may be incurred by reason of his agents, employees, material men or Subcontractors failing to so comply.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

SECTION 012500 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for substitutions.
- B. Related Requirements:
 - 1. Division 01 Section "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.3 DEFINITIONS

- A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
 - 1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
 - 2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

1.4 ACTION SUBMITTALS

- A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Substitution Request Form: Use CSI Form 13.1A.
 - 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
 - b. Coordination information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
 - c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.

- d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - e. Samples, where applicable or requested.
 - f. Certificates and qualification data, where applicable or requested.
 - g. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
 - h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
 - i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
 - j. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
 - k. Cost information, including a proposal of change, if any, in the Contract Sum.
 - l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
 - m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within 7 days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.
- a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
 - b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.5 QUALITY ASSURANCE

- A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.6 PROCEDURES

- A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
 - a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - b. Requested substitution provides sustainable design characteristics that specified product provided.
 - c. Substitution request is fully documented and properly submitted.
 - d. Requested substitution will not adversely affect Contractor's construction schedule.
 - e. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - f. Requested substitution is compatible with other portions of the Work.
 - g. Requested substitution has been coordinated with other portions of the Work.
 - h. Requested substitution provides specified warranty.
 - i. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Not allowed.

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500

SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Sections include the following:
 - 1. Division 01 Section "Product Requirements" for administrative procedures for handling requests for substitutions made after Contract award.

1.3 MINOR CHANGES IN THE WORK

- A. Architect will issue supplemental instructions authorizing Minor Changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710, "Architect's Supplemental Instructions" or similar form prepared by Architect.

1.4 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - 1. Proposal Requests issued by Architect are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
 - 2. Within 10 days after receipt of Proposal Request, submit a quotation to the Architect, estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
 - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include costs of labor and supervision directly attributable to the change.
 - d. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

- B. Contractor-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by first submitting a "Request for Information" to the Architect. This request will be responded to by the Architect, wherein the Contractor may submit a Change Order Proposal.
1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
 2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 4. Include costs of labor and supervision directly attributable to the change.
 5. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
 6. Comply with requirements in Division 01 Section "Product Requirements" if the proposed change requires substitution of one product or system for product or system specified.

1.5 ADMINISTRATIVE CHANGE ORDERS

- A. Allowance Adjustment: To adjust allowance amounts, base each Change Order proposal on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.
1. Include installation costs in purchase amount only where indicated as part of the allowance.
 2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other margins claimed.
 3. Submit substantiation of a change in scope of work, if any, claimed in Change Orders related to unit-cost allowances.
 4. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.
- B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the Purchase Order amount or Contractor's handling, labor, installation, overhead, and profit. Submit claims within 21 days of receipt of the Change Order or Construction Change Directive authorizing work to proceed. Owner will reject claims submitted later than 21 days after such authorization.
1. Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of work has changed from what could have been foreseen from information in the Contract Documents.
 2. No change to Contractor's indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.
- C. Unit-Price Adjustment: See Division 01 Section "Unit Prices" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect measured scope of unit-price work.

1.6 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Proposal Request, the Contractor shall issue a Change Order for signature of Owner on AIA Document G701 or similar form.

1.7 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
 - 1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
 - 1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012600

SECTION 012900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.
- B. Related Sections include the following:
 - 1. Division 01 Section "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
 - 2. Division 01 Section "Construction Progress Documentation" for administrative requirements governing preparation and submittal of Contractor's Construction Schedule and Submittals Schedule.

1.3 DEFINITIONS

- A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.
 - 1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:
 - a. Application for Payment forms with Continuation Sheets.
 - b. Submittals Schedule.
 - c. Contractor's Construction Schedule.
 - 2. Submit the Schedule of Values to the Architect at earliest possible date but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
- B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section. For major trades with line item values greater than \$25,000, provide a separate line item for units of work within each trade with a value not exceeding \$25,000.
 - 1. Identification: Include the following Project identification on the Schedule of Values:

- a. Project name and location.
 - b. Name of Architect.
 - c. Architect's project number.
 - d. Contractor's name and address.
 - e. Date of submittal.
2. Submit draft of AIA Document G702 and AIA Document G703 Continuation Sheets.
3. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:
 - a. Related Specification Section or Division.
 - b. Description of the Work.
 - c. Name of subcontractor.
 - d. Name of manufacturer or fabricator.
 - e. Name of supplier.
 - f. Change Orders (numbers) that affect value.
 - g. Dollar value.
 - 1) Percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate.
 - a. Include separate line items under Contractor and principal subcontracts for LEED documentation and other Project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.
 - b. Include the following mandatory line items:
 - 1) Mobilization.
 - 2) Demobilization.
 - 3) Builders Risk Insurance.
 - 4) Bonds.
 - 5) Coordination Drawings.
 - 6) Scheduling.
 - 7) Commissioning.
 - 8) Project record documents.
 - 9) Operation and Maintenance manuals.
 - 10) Field Engineering.
 - 11) Daily Building Cleanup.
 - 12) Safety Program.
 - 13) Full-Time Project Manager.
 - 14) Full-Time Project Superintendent.
 - 15) Field Offices.
 - 16) Dumpsters.
 - 17) Cold Weather Protection.
 - 18) Temporary Heat.
5. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
6. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.

- a. Differentiate between items stored on-site and items stored off-site. If specified, include evidence of insurance or bonded warehousing.
7. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
8. Allowances: Provide a separate line item in the Schedule of Values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
9. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
 - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.
10. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.5 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.
 1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement.
 1. Prepare a draft of each Application for Payment and review with the Architect prior to submission of final Application. The draft copy shall be typewritten and include the application number and date.
- C. Payment Application Forms: Use AIA Document G702 and AIA Document G703 Continuation Sheets as form for Applications for Payment.
- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
 1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
 2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
- E. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.
 1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment, for stored materials.

2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
 3. Provide summary documentation for stored materials indicating the following:
 - a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
 - b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
 - c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.
- F. Transmittal: Submit three (3) signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.
- G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from every entity who is lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
 2. When an application shows completion of an item, submit final or full waivers.
 3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
 4. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.
- H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
1. List of subcontractors.
 2. Schedule of values.
 3. Contractor's construction schedule (preliminary if not final).
 4. Combined Contractor's construction schedule (preliminary if not final) incorporating Work of multiple contracts, with indication of acceptance of schedule by each Contractor.
 5. Products list (preliminary if not final).
 6. Schedule of unit prices.
 7. Submittal schedule (preliminary if not final).
 8. List of Contractor's staff assignments.
 9. List of Contractor's principal consultants.
 10. Copies of building permits.
 11. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 12. Initial progress report.
 13. Report of preconstruction conference.
 14. Certificates of insurance and insurance policies.
 15. Performance and payment bonds.
 16. Data needed to acquire Owner's insurance.
 17. OSHA training certificates.
- I. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.

2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- J. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
 2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 3. Updated final statement, accounting for final changes to the Contract Sum.
 4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
 5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
 6. AIA Document G707, "Consent of Surety to Final Payment."
 7. Evidence that claims have been settled.
 8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. General coordination procedures.
 - 2. Coordination drawings.
 - 3. Contractor's use of Architect's CAD Files.
 - 4. Requests for Information (RFIs).
 - 5. Project meetings.
- B. The Contractor and each Subcontractor shall participate in coordination requirements.
- C. Related Sections include the following:
 - 1. Division 01 Section "Construction Progress Documentation" for preparing and submitting Contractor's Construction Schedule.
 - 2. Division 01 Section "Execution" for procedures for coordinating general installation and field-engineering services.
 - 3. Division 01 Section "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

- A. RFI: Request from Contractor seeking interpretation or clarification of the Contract Documents.

1.4 INFORMATIONAL SUBMITTALS

- A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
 - 1. Name, address, and telephone number of entity performing subcontract or supplying products.
 - 2. Number and title of related Specification Section(s) covered by subcontract.
 - 3. Drawing number and detail references, as appropriate, covered by subcontract.
- B. Key Personnel Names: Within 10 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.

1. Keep list current at all times, resubmit upon update.

1.5 GENERAL COORDINATION PROCEDURES

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
 3. Make adequate provisions to accommodate items scheduled for later installation.
 4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.
 5. No claim for additional compensation or extension of Contract Time will be permitted for conditions resulting from lack of coordination.
- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
 1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
 1. Preparation of Contractor's Construction Schedule.
 2. Preparation of the Schedule of Values.
 3. Installation and removal of temporary facilities and controls.
 4. Delivery and processing of submittals.
 5. Preinstallation conferences.
 6. Progress meetings.
 7. Startup and adjustment of systems.
 8. Project closeout activities.
- D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.
 1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. Refer to other Sections for disposition of salvaged materials that are designated as Owner's property.

1.6 COORDINATION DRAWINGS

- A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.
1. Content: Project-specific information, drawn accurately to scale. Do not base Coordination Drawings on reproductions of the Contract Documents or standard printed data. Include the following information, as applicable:
 - a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
 - b. Indicate required installation sequences.
 - c. Indicate dimensions shown on the Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
 2. Sheet Size: At least 24 by 36 inches but no larger than 30 by 42 inches at a scale suitable for presentation of the information.
 3. Number of Copies: Submit a sufficient number of copies of each submittal for Architect and Consultant to retain one copy each.
 - a. Submit one additional copy where Coordination Drawings are required for operation and maintenance manuals. Architect will retain two copies; remainder will be returned. Mark up and retain one returned copy as a Project Record Drawing.
 4. Refer to individual Sections for Coordination Drawing requirements for Work in those Sections.
 5. Review: Architect will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make changes as directed and resubmit.
- B. Coordination Drawing Organization: Organize coordination drawings as follows:
1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
 2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within ceiling plenum to accommodate layout of light fixtures indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
 3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
 4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
 5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
 6. Mechanical and Plumbing Work: Show the following:
 - a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.

- b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
 - c. Fire-rated enclosures around ductwork.
 - 7. Electrical Work: Show the following:
 - a. Runs of vertical and horizontal conduit 1-1/4 inches in diameter and larger.
 - b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.
 - c. Panel board, switch board, switchgear, transformer, busway, generator, and motor control center locations.
 - d. Location of pull boxes and junction boxes, dimensioned from column center lines.
 - 8. Fire-Protection System: Show the following:
 - a. Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.
 - 9. Review: Architect will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make changes as directed and resubmit.
 - 10. Coordination Drawing Prints: Prepare coordination drawing prints according to requirements in Division 01 Section "Submittal Procedures."
 - C. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:
 - 1. File Preparation Format: Same digital data software program, version, and operating system as original Drawings.
 - 2. File Submittal Format: Submit or post coordination drawing files using Portable Data File (PDF) format.
 - 3. Architect will furnish Contractor one set of digital data files of Drawings for use in preparing coordination digital data files.
 - a. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Drawings.
 - b. Digital Data Software Program: Drawings are available in
 - c. Contractor shall execute a data licensing agreement in the form of Agreement form acceptable to Owner and Architect.
- 1.7 CONTRACTOR'S USE OF ARCHITECT'S CAD FILES
- A. General: At the Contractor's written request, a copy of the Architect's CAD files will be provided for the Contractor's use in preparing Coordination Drawings for Project.
- 1.8 ADMINISTRATIVE AND SUPERVISORY PERSONNEL
- A. General: In addition to Project superintendent, provide other administrative and supervisory personnel as required for proper performance of the Work.

1.9 REQUESTS FOR INFORMATION (RFIs)

- A. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI, to the Architect, in the form specified.
1. RFIs shall originate with Contractor or Subcontractor. RFIs submitted by entities other than the Contractor will be returned with no response.
 2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing interpretation and the following:
1. Project name.
 2. Date.
 3. Name of Subcontractor.
 4. Name of Architect.
 5. RFI number, numbered sequentially.
 6. Specification Section number and title and related paragraphs, as appropriate.
 7. Drawing number and detail references, as appropriate.
 8. Field dimensions and conditions, as appropriate.
 9. Contractor's suggested solution(s). If Contractor's solution(s) impact the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 10. Contractor's signature.
 11. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.
 - a. Supplementary drawings prepared by Contractor shall include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments.
- C. Hard-Copy RFIs:
1. Identify each page of attachments with the RFI number and sequential page number.
- D. Software-Generated RFIs: Software-generated form with substantially the same content as indicated above.
1. Attachments shall be electronic files in Adobe Acrobat PDF format.
- E. Architect's Action: Architect will review each RFI, determine action required, and return it. Allow five working days for Architect's response for each RFI. RFIs received after 1:00 p.m. will be considered as received the following working day.
1. The following Contractor-generated RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for approval of Contractor's means and methods.
 - d. Requests for coordination information already indicated in the Contract Documents.
 - e. Requests for adjustments in the Contract Time or the Contract Sum.
 - f. Requests for interpretation of Architect's actions on submittals.
 - g. Incomplete RFIs or RFIs with numerous errors.

2. Architect's action may include a request for additional information, in which case Architect's time for response will start again.
 3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 01 Section "Contract Modification Procedures."
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.
- F. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log biweekly. Include the following:
1. Project name.
 2. Name and address of Architect.
 3. RFI number including RFIs that were dropped and not submitted.
 4. RFI description.
 5. Date the RFI was submitted.
 6. Date Architect's response was received.
 7. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
- G. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within five days if Contractor disagrees with response.
1. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
 2. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

1.10 PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
 2. Agenda: Prepare the meeting agenda and distribute the agenda to all invited attendees.
 3. Minutes: Record significant discussions and agreements achieved and distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.
- B. Preconstruction Conference: Architect will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement. Hold the conference at Project site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.
1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Tentative construction schedule.
 - b. Phasing.

- c. Critical work sequencing and long-lead items.
 - d. Designation of key personnel and their duties.
 - e. Procedures for processing field decisions and Change Orders.
 - f. Procedures for RFIs.
 - g. Procedures for testing and inspecting.
 - h. Procedures for processing Applications for Payment.
 - i. Distribution of the Contract Documents.
 - j. Submittal procedures.
 - k. Preparation of Record Documents.
 - l. Use of the premises.
 - m. Work restrictions.
 - n. Owner's occupancy requirements.
 - o. Responsibility for temporary facilities and controls.
 - p. Construction waste management and recycling.
 - q. Parking availability.
 - r. Office, work, and storage areas.
 - s. Equipment deliveries and priorities.
 - t. First aid.
 - u. Security.
 - v. Progress cleaning.
 - w. Working hours.
3. Minutes: The Contractor shall record and distribute meeting minutes.
- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
- 1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
 - 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. The Contract Documents.
 - b. Options.
 - c. Related RFIs.
 - d. Related Change Orders.
 - e. Purchases.
 - f. Deliveries.
 - g. Submittals.
 - h. Review of mockups.
 - i. Possible conflicts.
 - j. Compatibility problems.
 - k. Time schedules.
 - l. Weather limitations.
 - m. Manufacturer's written recommendations.
 - n. Warranty requirements.
 - o. Compatibility of materials.
 - p. Acceptability of substrates.
 - q. Temporary facilities and controls.
 - r. Space and access limitations.
 - s. Regulations of authorities having jurisdiction.
 - t. Testing and inspecting requirements.
 - u. Installation procedures.
 - v. Coordination with other work.

- w. Required performance results.
 - x. Protection of adjacent work.
 - y. Protection of construction and personnel.
3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
 4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Progress Meetings: Attend progress meetings at interval determined by the Architect. Dates of meetings may coincide with preparation of payment requests.
1. Attendees: In addition to representatives of Owner and Architect, each Subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - 1) Review schedule for next period.
 - b. Review present and future needs of each entity present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Deliveries.
 - 4) Access.
 - 5) Site utilization.
 - 6) Temporary facilities and controls.
 - 7) Work hours.
 - 8) Hazards and risks.
 - 9) Progress cleaning.
 - 10) Quality and work standards.
 - 11) Status of correction of deficient items.
 - 12) Field observations.
 - 13) RFIs.
 - 14) Status of proposal requests.
 - 15) Pending changes.
 - 16) Status of Change Orders.
 - 17) Pending claims and disputes.
 - 18) Documentation of information for payment requests.
 3. Minutes: The Contractor shall record and distribute the meeting minutes.
 4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.

- a. **Schedule Updating:** Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.
- E. **Coordination Meetings:** Conduct Project coordination meetings at weekly intervals. Project coordination meetings are in addition to specific meetings held for other purposes.
 1. **Attendees:** In addition to representatives of Owner and Architect, each Subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. **Agenda:** Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. **Combined Contractor's Construction Schedule:** Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to Combined Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - b. **Schedule Updating:** Revise Combined Contractor's Construction Schedule after each coordination meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
 - c. **Review present and future needs of each contractor present, including the following:**
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Deliveries.
 - 4) Access.
 - 5) Site utilization.
 - 6) Temporary facilities and controls.
 - 7) Work hours.
 - 8) Hazards and risks.
 - 9) Progress cleaning.
 - 10) Quality and work standards.
 - 11) Change Orders.
 3. **Reporting:** Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.
- F. **Project Closeout Conference:** Schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than 90 days prior to the scheduled date of Substantial Completion.
 1. Conduct the conference to review requirements and responsibilities related to Project closeout.
 2. **Attendees:** Authorized representatives of Owner, Owner's Commissioning Authority, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 3. **Agenda:** Discuss items of significance that could affect or delay Project closeout, including the following:
 - a. Preparation of record documents.
 - b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
 - c. Submittal of written warranties.

- d. Requirements for preparing operations and maintenance data.
 - e. Requirements for delivery of material samples, attic stock, and spare parts.
 - f. Requirements for demonstration and training.
 - g. Preparation of Contractor's punch list.
 - h. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
 - i. Submittal procedures.
 - j. Coordination of separate contracts.
 - k. Owner's partial occupancy requirements.
 - l. Installation of Owner's furniture, fixtures, and equipment.
 - m. Responsibility for removing temporary facilities and controls.
4. Minutes: Entity conducting meeting will record and distribute meeting minutes.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 - 1. Preliminary Construction Schedule.
 - 2. Contractor's Construction Schedule.
 - 3. Daily construction reports.
 - 4. Material location reports.
 - 5. Field condition reports.
 - 6. Special reports.
 - 7. Certified payroll records.
- B. Related Sections include the following:
 - 1. Division 01 Section "Payment Procedures" for submitting the Schedule of Values.
 - 2. Division 01 Section "Project Management and Coordination" for submitting and distributing meeting and conference minutes.
 - 3. Division 01 Section "Submittal Procedures" for submitting schedules and reports.
 - 4. Division 01 Section "Quality Requirements" for submitting a schedule of tests and inspections.

1.3 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
 - 1. Critical activities are activities on the critical path. They must start and finish on the planned early start and finish times.
 - 2. Predecessor Activity: An activity that precedes another activity in the network.
 - 3. Successor Activity: An activity that follows another activity in the network.
- B. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.
- C. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.
- D. Event: The starting or ending point of an activity.

- E. Float: The measure of leeway in starting and completing an activity.
 - 1. Float time belongs to Owner.
 - 2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
 - 3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.
- F. Fragnet: A partial or fragmentary network that breaks down activities into smaller activities for greater detail.
- G. Major Area: A story of construction, a separate building, or a similar significant construction element.
- H. Milestone: A key or critical point in time for reference or measurement.
- I. Network Diagram: A graphic diagram of a network schedule, showing activities and activity relationships.
- J. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

1.4 INFORMATIONAL SUBMITTALS

- A. Format for Submittals: Submit required submittals in the following format:
 - 1. Working electronic copy of schedule file, where indicated.
 - 2. PDF electronic file.
 - 3. Two paper copies.
- B. Qualification Data: For scheduling consultant.
- C. Preliminary Network Diagram: Submit two opaque copies, large enough to show entire network for entire construction period. Show logic ties for activities.
 - 1. Include project calendar.
- D. Contractor's Construction Schedule: Submit two opaque copies of initial schedule, large enough to show entire schedule for entire construction period.
 - 1. Submit an electronic copy of schedule, using software indicated, on CD-R, and labeled to comply with requirements for submittals. Include type of schedule (Initial or Updated) and date on label.
- E. CPM Reports: Concurrent with CPM schedule, submit three copies of each of the following computer-generated reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.
 - 1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.
 - 2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
 - 3. Total Float Report: List of all activities sorted in ascending order of total float.
 - 4. Earnings Report: Compilation of Contractor's total earnings from the Notice to Proceed until most recent Application for Payment.

- F. Daily Construction Reports: Submit two copies at weekly intervals, to the Owner's Representative.
- G. Material Location Reports: Submit two copies at monthly intervals, to the Owner's Representative.
- H. Field Condition Reports: Submit two copies at time of discovery of differing conditions, to the Architect.
- I. Special Reports: Submit two copies at time of unusual event, to the Architect.
- J. Certified Payroll Records: Submit two copies at weekly intervals to the Owner's Representative.

1.5 QUALITY ASSURANCE

- A. Scheduling Consultant Qualifications: An experienced specialist in CPM scheduling and reporting, with capability of producing CPM reports and diagrams within 24 hours of Architect's request.
- B. Prescheduling Conference: Conduct a conference at Project site with Architect to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to the Preliminary Construction Schedule and Contractor's Construction Schedule, including, but not limited to, the following:
 - 1. Review software limitations and content and format for reports. Provide sample of CPM schedule format.
 - 2. Verify availability of qualified personnel needed to develop and update schedule.
 - 3. Review delivery dates for Owner-furnished products.
 - 4. Review schedule for work of Owner's separate contracts.
 - 5. Review time required for review of submittals and resubmittals.
 - 6. Review requirements for tests and inspections by independent testing and inspecting agencies.
 - 7. Review time required for Project closeout and Owner startup procedures, including commissioning activities.
 - 8. Review and finalize list of construction activities to be included in schedule.
 - 9. Review submittal requirements and procedures.
 - 10. Review procedures for updating schedule.
 - 11. Establish mandatory milestone dates and finish dates within each phase.
- C. Review and approval of the Contractor's Construction Schedule is advisory only and does not relieve the Contractor of the responsibility for completing the work within the Contract time.

1.6 COORDINATION

- A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.
- B. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.
 - 1. Secure time commitments for performing critical elements of the Work from parties involved.
 - 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.
- C. Calendar: Compile a project calendar for use in scheduling. Incorporate all limitations on working days and working hours, including the following:
 - 1. Legal Holidays.

2. Other non-working days determined by the Contractor.
3. Optional working days determined by the Contractor.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Time Frame: Extend schedule from date established for commencement of the Work to date of Substantial Completion.
 1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- B. Activities: Treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:
 1. Activity Duration: Define activities so no activity is longer than 10 days, unless specifically allowed by Architect.
 2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
 3. Submittal Review Time: Include review and resubmittal times indicated in Division 01 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.
 4. Startup and Testing Time: Include not less than one day for startup and testing.
 5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
- C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
 1. Phasing: Arrange list of activities on schedule by phase.
 2. Work under More Than One Contract: Include a separate activity for each contract.
 3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
 4. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Division 01 Section "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
 5. Work Restrictions: Show the effect of the following items on the schedule:
 - a. Coordination with existing construction.
 - b. Limitations of continued occupancies.
 - c. Uninterruptible services.
 - d. Partial occupancy before Substantial Completion.
 - e. Use of premises restrictions.
 - f. Provisions for future construction.
 - g. Seasonal variations.
 - h. Environmental control.
 6. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:

- a. Subcontract awards.
 - b. Submittals.
 - c. Purchases.
 - d. Mockups.
 - e. Fabrication.
 - f. Sample testing.
 - g. Deliveries.
 - h. Installation.
 - i. Tests and inspections.
 - j. Adjusting.
 - k. Curing.
 - l. Startup and placement into final use and operation.
 7. Area Separations: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
 - a. Structural completion.
 - b. Permanent space enclosure.
 - c. Completion of mechanical installation.
 - d. Completion of electrical installation.
 - e. Substantial Completion.
 8. Other Constraints: Include the following specific activities in each trade in each phase.
 - a. Interface between Contractor and Subcontractor.
 - b. Electrical connections to each piece of equipment.
 - c. Mechanical connections to each piece of equipment.
 - d. Concrete finishing.
 - e. Site work constraints on other activities.
 - D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion.
 - E. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using fragnets to demonstrate the effect of the proposed change on the overall project schedule.
 - F. Computer Software: Prepare schedules using a program that has been developed specifically to manage construction schedules.
- 2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)
- A. General: Prepare network diagrams using AON (activity-on-node) format.
 - B. Preliminary Network Diagram: Submit diagram within 14 days of date established for commencement of the Work. Outline significant construction activities for the first 60 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.
 - C. CPM Schedule: Prepare Contractor's Construction Schedule using a computerized, time-scaled CPM network analysis diagram for the Work.

1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 30 days after date established for commencement of the Work.
 - a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Architect's approval of the schedule.
 2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
 3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
 4. Use "one workday" as the unit of time. Include list of nonworking days and holidays incorporated into the schedule.
- D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the preliminary network diagram, prepare a skeleton network to identify probable critical paths.
1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
 - a. Preparation and processing of submittals.
 - b. Mobilization and demobilization.
 - c. Purchase of materials.
 - d. Delivery.
 - e. Fabrication.
 - f. Utility interruptions.
 - g. Installation.
 - h. Work by Owner that may affect or be affected by Contractor's activities.
 - i. Testing and commissioning.
 2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
 3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
 4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
 - a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.
- E. Initial Issue of Schedule: Prepare initial network diagram from a list of straight "early start-total float" sort. Identify critical activities. Prepare tabulated reports showing the following:
1. Contractor or subcontractor and the Work or activity.
 2. Description of activity.
 3. Principal events of activity.
 4. Immediate preceding and succeeding activities.
 5. Early and late start dates.
 6. Early and late finish dates.
 7. Activity duration in workdays.
 8. Total float or slack time.
 9. Average size of workforce.
 10. Dollar value of activity (coordinated with the Schedule of Values).

- F. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:
1. Identification of activities that have changed.
 2. Changes in early and late start dates.
 3. Changes in early and late finish dates.
 4. Changes in activity durations in workdays.
 5. Changes in the critical path.
 6. Changes in total float time.
 7. Changes in the Contract Time.
- G. Value Summaries: Prepare two cumulative value lists, sorted by finish dates.
1. In first list, tabulate activity number, early finish date, dollar value, and cumulative dollar value.
 2. In second list, tabulate activity number, late finish date, dollar value, and cumulative dollar value.
 3. In subsequent issues of both lists, substitute actual finish dates for activities completed as of list date.
 4. Prepare list for ease of comparison with payment requests; coordinate timing with progress meetings.
 - a. In both value summary lists, tabulate "actual percent complete" and "cumulative value completed" with total at bottom.
 - b. Submit value summary printouts one week before each regularly scheduled progress meeting.

2.3 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
1. List of subcontractors at Project site.
 2. List of separate contractors at Project site.
 3. Approximate count of personnel at Project site.
 4. Equipment at Project site.
 5. Material deliveries.
 6. High and low temperatures and general weather conditions.
 7. Accidents.
 8. Meetings and significant decisions.
 9. Unusual events (refer to special reports).
 10. Stoppages, delays, shortages, and losses.
 11. Meter readings and similar recordings.
 12. Emergency procedures.
 13. Orders and requests of authorities having jurisdiction.
 14. Change Orders received and implemented.
 15. Construction Change Directives received and implemented.
 16. Services connected and disconnected.
 17. Equipment or system tests and startups.
 18. Partial Completions and occupancies.
 19. Substantial Completions authorized.
- B. Material Location Reports: At monthly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site.

- C. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare and submit a detailed report. Submit with a request for interpretation. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.4 SPECIAL REPORTS

- A. General: Submit special reports directly to Owner within one day of an occurrence. Distribute copies of report to parties affected by the occurrence.
- B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Scheduling Consultant: Engage a consultant to provide planning, evaluation, and reporting using CPM scheduling.
 - 1. In-House Option: Owner may waive the requirement to retain a consultant if Contractor employs skilled personnel with experience in CPM scheduling and reporting techniques. Submit qualifications.
 - 2. Meetings: Scheduling consultant shall attend all meetings related to Project progress, alleged delays, and time impact.
- B. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before submission of Application for Payment.
 - 1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
 - 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 - 3. As the Work progresses, indicate Actual Completion percentage for each activity.
 - 4. Evaluate progress of the work jointly with the Owner at the end of each week to show progress and identify conflicts.
- C. Distribution: Distribute two copies each of approved schedule to Architect, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
 - 1. Post copies in Project meeting rooms and temporary field offices.
 - 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 013200

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
- B. Related Sections include the following:
 - 1. Division 01 Section "Payment Procedures" for submitting Applications for Payment and the Schedule of Values.
 - 2. Division 01 Section "Project Management and Coordination" for submitting and distributing meeting and conference minutes and for submitting Coordination Drawings.
 - 3. Division 01 Section "Construction Progress Documentation" for submitting schedules and reports, including Contractor's Construction Schedule.
 - 4. Division 01 Section "Quality Requirements" for submitting test and inspection reports and for mockup requirements.
 - 5. Division 01 Section "Closeout Procedures" for submitting warranties.
 - 6. Division 01 Section "Operation and Maintenance Data" for submitting operation and maintenance manuals.
 - 7. Division 01 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
 - 8. Division 01 Section "Demonstration and Training" for submitting videotapes of demonstration of equipment and training of Owner's personnel.
 - 9. Divisions 02 through 33 Sections for specific requirements for submittals in those Sections.

1.3 DEFINITIONS

- A. Action Submittals: Written and graphic information that requires Architect's responsive action.
- B. Informational Submittals: Written information that does not require Architect's and responsive action. Submittals may be rejected for not complying with requirements.
- C. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.
- D. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.4 ACTION SUBMITTALS

- A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.
1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.
 2. Initial Submittal: Submit concurrently with preliminary network diagram. Include submittals required during the first 60 days of construction. List those required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
 3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's Construction Schedule.
 4. Update the submittals schedule periodically as the work progresses. Submit concurrently with each Application for payment.
 5. Utilize a computerized program for tracking submittals. Submit the following reports bi-weekly:
 - a. Complete list of reviewed submittals.
 - b. Listing of submittals to date.
 - c. Listing of approved submittals.
 - d. Listing of rejected submittals.
 - e. Listing of submittals returned for correction.
 - f. List of outstanding submittals.
 6. At the request of the Architect provide reports capable of being sorted by the following criteria:
 - a. Approved status.
 - b. Subcontractor/Supplier.
 - c. Submission date.
 - d. Number of days late for return.
 - e. Number of days under review.

1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. Architect's Digital Data Files: Electronic digital data files of the Contract Drawings will not be provided by Architect for Contractor's use in preparing submittals.
1. Architect will furnish Contractor one set of digital data drawing files of the Contract Drawings for use in preparing Shop Drawings and Project record drawings.
 - a. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
 - b. Digital Drawing Software Program: The Contract Drawings are available in Revit and Auto CAD.
 - c. Contractor shall execute a data licensing agreement in an Agreement form attached at the end of this Section.
 - d. The following digital data files will be furnished for each appropriate discipline:
 - 1) Floor plans.
 - 2) Reflected ceiling plans.

- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
 3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
 4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. Submittals received after 1:00 p.m. will be considered as received the following working day. Submittals that are incomplete shall not be considered submitted until all pertinent information is received in accordance with this Section. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
1. Initial Review: Allow two weeks for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Subcontractor when a submittal being processed must be delayed for coordination.
 2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
 3. Resubmittal Review: Allow two weeks for review of each resubmittal.
 - a. Resubmittals will be reviewed no more than two times at the Owner's expense. Resubmittals which fail to comply with Contract requirements will be reviewed at the Contractor's expense, based on an hourly rate of \$150 per hour, not to exceed \$1,200 for each subsequent submittal.
 - b. The Owner reserves the right to deduct said reimbursement from the Contractor's application for payment on a monthly basis.
 4. Concurrent Consultant Review: Submittals may be transmitted simultaneously to Architect and to Architect's consultants, as required. Allow two weeks for review of each submittal. Consultant will return submittal to Architect before being returned to Contractor.
- D. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:
1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
 2. Name file with submittal number or other unique identifier, including revision identifier.
 - a. File name shall be formatted as follows: **HUB-064023.01-8-2.4A.**
 - 1) Project Name-
 - 2) Specification Section number followed by a decimal point and then a sequential number for the submittal number of that product-
 - 3) Specification Section page number-
 - 4) Paragraph number where product is specified.

- 5) Resubmittals shall include a numerical suffix after submittal number as follows:
 - a) **HUB-064023.02-8-2.4A.**
3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.
4. Transmittal Form for Electronic Submittals: Use electronic form acceptable to Architect, containing the following information:
 - a. Project name.
 - b. Date.
 - c. Name and address of Architect.
 - d. Name of Contractor.
 - e. Name of firm or entity that prepared submittal.
 - f. Names of subcontractor, manufacturer, and supplier.
 - g. Category and type of submittal.
 - h. Submittal purpose and description.
 - i. Specification Section number and title.
 - j. Specification paragraph number or drawing designation and generic name for each of multiple items.
 - k. Drawing number and detail references, as appropriate.
 - l. Location(s) where product is to be installed, as appropriate.
 - m. Related physical samples submitted directly.
 - n. Indication of full or partial submittal.
 - o. Transmittal number, numbered consecutively.
 - p. Submittal and transmittal distribution record.
 - q. Other necessary identification.
 - r. Remarks.
5. Metadata: Include the following information as keywords in the electronic submittal file metadata:
 - a. Project name.
 - b. Number and title of appropriate Specification Section.
 - c. Manufacturer name.
 - d. Product name.
- E. Paper Submittals: Place a permanent label or title block on each submittal item for identification.
 1. Indicate name of firm or entity that prepared each submittal on label or title block.
 2. Provide a space approximately 6 by 8 inches on label or beside title block to record Subcontractor's review and approval markings and action taken by Architect.
 3. Include the following information on label for processing and recording action taken:
 - a. Project name.
 - b. Date.
 - c. Name and address of Architect
 - d. Name and address of Subcontractor.
 - e. Name and address of supplier.
 - f. Name of manufacturer.
 - g. Submittal number or other unique identifier, including revision identifier.
 - h. File name shall be formatted as follows: **HUB-064023.01-8-2.4A.**

- 2) Specification Section number followed by a decimal point and then a sequential number for the submittal number of that product-
 - 3) Specification Section page number-
 - 4) Paragraph number where product is specified.
 - 5) Resubmittals shall include a numerical suffix after submittal number as follows:
 - a) **HUB-064023.02-8-2.4A.**
 - i. Drawing number and detail references, as appropriate.
 - j. Location(s) where product is to be installed, as appropriate.
 - k. Other necessary identification.
4. Additional Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.
 - a. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect.
5. Transmittal for Paper Submittals: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will return submittals, without review, received from sources other than Contractor.
 - a. Transmittal Form: Provide locations on form for the following information:
 - 1) Project name.
 - 2) Date.
 - 3) Destination (To:).
 - 4) Source (From:).
 - 5) Names of subcontractor, manufacturer, and supplier.
 - 6) Category and type of submittal.
 - 7) Submittal purpose and description.
 - 8) Specification Section number and title.
 - 9) Drawing number and detail references, as appropriate.
 - 10) Transmittal number, numbered consecutively.
 - 11) Submittal and transmittal distribution record.
 - 12) Remarks.
 - 13) Signature of transmitter.
- F. Options: Identify options requiring selection by Architect.
- G. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.
- H. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
 1. Note date and content of previous submittal.
 2. Note date and content of revision in label or title block and clearly indicate extent of revision.
 3. Resubmit submittals until they are marked "Approved" or "Approved as Corrected."
- I. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

- J. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

- A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
1. Submit electronic submittals via email as PDF electronic files.
 - a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
 2. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
 - a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
 - b. Provide a notarized statement on original paper copy certificates and certifications where indicated.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
 2. Mark each copy of each submittal to show which products and options are applicable.
 3. Include the following information, as applicable:
 - a. Manufacturer's written recommendations.
 - b. Manufacturer's product specifications.
 - c. Manufacturer's installation instructions.
 - d. Standard color charts.
 - e. Manufacturer's catalog cuts.
 - f. Wiring diagrams showing factory-installed wiring.
 - g. Printed performance curves.
 - h. Operational range diagrams.
 - i. Mill reports.
 - j. Standard product operation and maintenance manuals.
 - k. Compliance with specified referenced standards.
 - l. Testing by recognized testing agency.
 - m. Application of testing agency labels and seals.
 - n. Notation of coordination requirements.
 4. For equipment, include the following in addition to the above, as applicable:
 - a. Wiring diagrams showing factory-installed wiring.
 - b. Printed performance curves.
 - c. Operational range diagrams.

- d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
 5. Submit Product Data before or concurrent with Samples.
 6. Submit Product Data in the following format:
 - a. PDF electronic file.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data, **unless submittal based on Architect's digital data drawing files is otherwise permitted.**
 1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Dimensions.
 - b. Identification of products.
 - c. Fabrication and installation drawings.
 - d. Roughing-in and setting diagrams.
 - e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
 - f. Shopwork manufacturing instructions.
 - g. Templates and patterns.
 - h. Schedules.
 - i. Design calculations.
 - j. Compliance with specified standards.
 - k. Notation of coordination requirements.
 - l. Notation of dimensions established by field measurement.
 - m. Relationship to adjoining construction clearly indicated.
 - n. Seal and signature of professional engineer if specified.
 - o. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.
 2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 30 by 42 inches.
 3. Submit Shop Drawings in the following formats:
 - a. PDF electronic file.
 - b. Submit one paper copy of shop drawings indicated. Architect will retain hard copy, scan and return electronically. Mark up and retain one returned copy as a Project Record Drawing.
 - 1) Submit all large format shop drawings (24x36 or larger) in paper copies:
- D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
 1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
 2. Identification: Attach label on unexposed side of Samples that includes the following:
 - a. Generic description of Sample.
 - b. Product name and name of manufacturer.
 - c. Sample source.
 - d. Number and title of appropriate Specification Section.

3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
 - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
 - a. Number of Samples: Submit two full sets of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
 - a. Number of Samples: Submit three sets of Samples. Architect will retain two Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a Project Record Sample.
 - 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
 - 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.
- E. Product Schedule or List: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
 1. Type of product. Include unique identifier for each product.
 2. Number and name of room or space.
 3. Location within room or space.
 4. Number of Copies: Submit five copies of product schedule or list, unless otherwise indicated. Architect will return four copies.
 - a. Mark up and retain one returned copy as a Project Record Document.
- F. Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."
- G. Application for Payment: Comply with requirements specified in Division 01 Section "Payment Procedures."
- H. Schedule of Values: Comply with requirements specified in Division 01 Section "Payment Procedures."

- I. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
 - 1. Name, address, and telephone number of entity performing subcontract or supplying products.
 - 2. Number and title of related Specification Section(s) covered by subcontract.
 - 3. Drawing number and detail references, as appropriate, covered by subcontract.
 - 4. Number of Copies: Submit five copies of subcontractor list, unless otherwise indicated. Architect will return four copies.
 - a. Mark up and retain one returned copy as a Project Record Document.
- J. Coordination Drawings: Comply with requirements specified in Division 01 Section "Project Management and Coordination."
- K. Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."
- L. Application for Payment and Schedule of Values: Comply with requirements specified in Division 01 Section "Payment Procedures."
- M. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Division 01 Section "Quality Requirements."
- N. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Division 01 Section "Closeout Procedures."
- O. Maintenance Data: Comply with requirements specified in Division 01 Section "Operation and Maintenance Data."
- P. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- Q. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.
- R. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
- S. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- T. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- U. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

- V. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- W. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- X. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
 - 1. Name of evaluation organization.
 - 2. Date of evaluation.
 - 3. Time period when report is in effect.
 - 4. Product and manufacturers' names.
 - 5. Description of product.
 - 6. Test procedures and results.
 - 7. Limitations of use.
- Y. Preconstruction Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
- Z. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- AA. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
- BB. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.
- CC. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:
 - 1. Preparation of substrates.
 - 2. Required substrate tolerances.
 - 3. Sequence of installation or erection.
 - 4. Required installation tolerances.
 - 5. Required adjustments.
 - 6. Recommendations for cleaning and protection.
- DD. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:
 - 1. Name, address, and telephone number of factory-authorized service representative making report.

2. Statement on condition of substrates and their acceptability for installation of product.
 3. Statement that products at Project site comply with requirements.
 4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
 5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 6. Statement whether conditions, products, and installation will affect warranty.
 7. Other required items indicated in individual Specification Sections.
- EE. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.
- FF. Material Safety Data Sheets (MSDSs): Submit information directly to Owner; do not submit to Architect.
1. Architect will not review submittals that include MSDSs and will return the entire submittal for resubmittal.

2.2 DELEGATED DESIGN

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit five copies of a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

- A. Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
- B. Project Closeout and Maintenance Material Submittals: See requirements in Division 01 Section "Closeout Procedures."
- C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S ACTION

- A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.
- B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:
 - 1. "Approved": The portion of Work covered by the submittal may proceed provided it complies with the Contract Documents.
 - 2. "Approved as Corrected": The portion of Work covered by the submittal may proceed provided it complies with notations or corrections on the submittal, and with the Contract Documents.
 - 3. "Not Approved" or "Revise and Resubmit": Revise or prepare a new submittal in accordance with notations; resubmit. Do not proceed with that portion of the Work covered by the submittal.
- C. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- D. Partial submittals are not acceptable, will be considered nonresponsive, and will be returned without review.
- E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION 013300

SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
- C. Related Sections include the following:
 - 1. Division 01 Section "Construction Progress Documentation" for developing a schedule of required tests and inspections.
 - 2. Division 01 Section "Cutting and Patching" for repair and restoration of construction disturbed by testing and inspecting activities.
 - 3. Divisions 02 through 33 Sections for specific test and inspection requirements.

1.3 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.
- C. Mockups: Full-size, physical assemblies that are constructed on-site. Mockups are used to verify selections made under sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Approved mockups establish the standard by which the Work will be judged.

1. Integrated Exterior Mockups: Mockups of the exterior envelope erected separately from the building but on Project site, consisting of multiple products, assemblies, and subassemblies.
 2. Room Mockups: Mockups of typical interior spaces complete with wall, floor, and ceiling finishes, doors, windows, millwork, casework, specialties, furnishings and equipment, and lighting.
- D. Preconstruction Testing: Tests and inspections that are performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.
- E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.
- F. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.
- G. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- I. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.
- J. Experienced: When used with an entity, "experienced" means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.4 CONFLICTING REQUIREMENTS

- A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.5 INFORMATIONAL SUBMITTALS

- A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.

- B. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- C. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
 - 1. Specification Section number and title.
 - 2. Description of test and inspection.
 - 3. Identification of applicable standards.
 - 4. Identification of test and inspection methods.
 - 5. Number of tests and inspections required.
 - 6. Time schedule or time span for tests and inspections.
 - 7. Entity responsible for performing tests and inspections.
 - 8. Requirements for obtaining samples.
 - 9. Unique characteristics of each quality-control service.
- D. Reports: Prepare and submit certified written reports that include the following:
 - 1. Date of issue.
 - 2. Project title and number.
 - 3. Name, address, and telephone number of testing agency.
 - 4. Dates and locations of samples and tests or inspections.
 - 5. Names of individuals making tests and inspections.
 - 6. Description of the Work and test and inspection method.
 - 7. Identification of product and Specification Section.
 - 8. Complete test or inspection data.
 - 9. Test and inspection results and an interpretation of test results.
 - 10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
 - 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
 - 12. Name and signature of laboratory inspector.
 - 13. Recommendations on retesting and reinspecting.
- E. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.6 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- C. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the State of New York and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.
- F. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
 - 1. Requirement for specialists shall not supersede building codes and regulations governing the Work.
- G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 548; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.
 - 1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
 - 2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
- H. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
 - 1. Contractor responsibilities include the following:
 - a. Provide test specimens representative of proposed products and construction.
 - b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
 - c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
 - d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
 - e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
 - f. When testing is complete, remove test specimens, assemblies, mockups, and laboratory mockups; do not reuse products on Project.
 - 2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
- J. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
 - 1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
 - 2. Notify Architect seven days in advance of dates and times when mockups will be constructed.
 - 3. Demonstrate the proposed range of aesthetic effects and workmanship.
 - 4. Obtain Architect's approval of mockups before starting work, fabrication, or construction.

- a. Allow seven days for initial review and each re-review of each mockup.
5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
6. Demolish and remove mockups when directed by the Architect, unless otherwise indicated.

1.7 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
 1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
 2. Payment for these services will be made by the Owner.
 3. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.
- B. Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
 1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
 - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
 2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
 3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Division 01 Section "Submittal Procedures."
- D. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- E. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
 1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.

3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
 4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
 5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
 6. Do not perform any duties of Contractor.
- F. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
 4. Facilities for storage and field curing of test samples.
 5. Delivery of samples to testing agencies.
 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 7. Security and protection for samples and for testing and inspecting equipment at Project site.
- G. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- H. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Submit schedule within 30 days of date established for commencement of the Work.
1. Distribution: Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.
- 1.8 SPECIAL TESTS AND INSPECTIONS
- A. Special Tests and Inspections: Owner will engage a qualified testing agency and special inspector to conduct special tests and inspections required by the New York State Building Code and by authorities having jurisdiction as the responsibility of Owner, and as follows:
1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
 2. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
 3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.
 4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
 5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
 6. Retesting and reinspecting corrected work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

- A. Prepare a record of tests and inspections. Include the following:
 - 1. Date test or inspection was conducted.
 - 2. Description of the Work tested or inspected.
 - 3. Date test or inspection results were transmitted to Architect.
 - 4. Identification of testing agency or special inspector conducting test or inspection.
- B. Maintain log at Project site. Post changes and modifications as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.

3.2 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
 - 1. Provide materials and comply with installation requirements specified in other Specification Sections. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.
 - 2. Comply with the Contract Document requirements for Division 01 Section "Cutting and Patching."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

SECTION 014200 - REFERENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
- D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- H. "Provide": Furnish and install, complete and ready for the intended use.
- I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.3 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

- C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
 - 1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.
- D. Abbreviations and Acronyms for Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the organizations responsible for the standards and regulations.

1.4 ABBREVIATIONS AND ACRONYMS

- A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Thomson Gale's "Encyclopedia of Associations" or in Columbia Books' "National Trade & Professional Associations of the U.S."

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Related Sections include the following:
 - 1. Division 01 Section "Summary" for limitations on utility interruptions and other work restrictions.
 - 2. Division 01 Section "Submittal Procedures" for procedures for submitting copies of implementation and termination schedule and utility reports.
 - 3. Division 01 Section "Execution" for progress cleaning requirements.
 - 4. Division 01 Section "Indoor Air Quality Requirements."
 - 5. Divisions 02 through 33 Sections for temporary heat, ventilation, and humidity requirements for products in those Sections.

1.3 USE CHARGES

- A. General: Cost or use charges for temporary facilities shall be included in the Contract Sum. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Architect, occupants of Project, testing agencies, and authorities having jurisdiction.
- B. Water Service from Existing System: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.
- C. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

1.4 INFORMATIONAL SUBMITTALS

- A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.
- B. Erosion- and Sedimentation-Control Plan: Show compliance with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.

1.5 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.
- C. Accessible Temporary Egress: Comply with applicable provisions in the 2010 ADA Standards and ICC/ANSI A117.1.

1.6 PROJECT CONDITIONS

- A. Temporary Use of Permanent Facilities: Installer of each permanent service shall assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Portable Chain-Link Fencing: Minimum 2-inch, 9-gage, galvanized steel, chain-link fabric fencing; minimum 6 feet high with galvanized steel pipe posts; minimum 2-3/8-inch- OD line posts and 2-7/8-inch- OD corner and pull posts, with 1-5/8-inch- OD top and bottom rails. Provide galvanized steel bases for supporting posts.

2.2 TEMPORARY FACILITIES

- A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.
- B. Common-Use Field Office: Of sufficient size to accommodate needs of Owner, Architect, and construction personnel office activities and to accommodate Project meetings specified in other Division 01 Sections. Keep office clean and orderly. Furnish and equip offices as follows:
 - 1. Furniture required for Project-site documents including file cabinets, plan tables, plan racks, and bookcases.
 - 2. Conference room of sufficient size to accommodate meetings of 10 individuals. Provide electrical power service and 120-V ac duplex receptacles, with no fewer than one receptacle on each wall. Furnish room with conference table, chairs, and 4-foot- square tack and marker boards.
 - 3. Drinking water and private toilet.
 - 4. Coffee machine and supplies.
 - 5. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F.
 - 6. Lighting fixtures capable of maintaining average illumination of 20 fc at desk height.
- C. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.
 - 1. Store combustible materials apart from building.

2.3 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. Electrical Power Cords: Provide grounded extension cords; use "hard-service" cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords, if single lengths will not reach areas where construction activities are in progress.
- C. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
 - 1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
 - 2. Heating Units: Listed and labeled for type of fuel being consumed, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- D. Air-Filtration Units: Primary and secondary HEPA-filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
 - 1. Locate facilities to limit site disturbance as specified in Division 01 Section "Summary."
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
 - 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Water Service: Connect to Owner's existing water service facilities. Clean and maintain water service facilities in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.
 - 1. Where installations below an outlet might be damaged by spillage or leakage, provide a drip pan of suitable size to minimize water damage. Drain accumulated water promptly from pans.
- C. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

- D. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.
1. Prior to commencing work, isolate the HVAC system in area where work is to be performed according to coordination drawings.
 - a. Disconnect supply and return ductwork in work area from HVAC systems servicing occupied areas.
 - b. Maintain negative air pressure within work area using HEPA-equipped air-filtration units, starting with commencement of temporary partition construction, and continuing until removal of temporary partitions is complete.
 2. Maintain dust partitions during the Work. Use vacuum collection attachments on dust-producing equipment. Isolate limited work within occupied areas using portable dust-containment devices.
 3. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.
- E. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
- F. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.
- G. Electric Power Service: Connect to Owner's existing electric power service. Maintain equipment in a condition acceptable to Owner.
- H. Lighting: Provide temporary lighting with local switching that provides adequate illumination for demolition operations, observations, inspections, and traffic conditions.
1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
- I. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install one telephone line and one facsimile line for field office.
1. Provide additional telephone lines for the following:
 - a. Provide a dedicated telephone line for each facsimile machine.
 - b. Provide one telephone line(s) for common use.
 2. At each telephone, post a list of important telephone numbers.
 - a. Police and fire departments.
 - b. Ambulance service.
 - c. Contractor's home office.
 - d. Architect's office.
 - e. Engineers' offices.
 - f. Owner's office.
 - g. Principal subcontractors' field and home offices.

3. Provide superintendent with cellular telephone or portable two-way radio for use when away from field office.
- J. Electronic Communication Service: Provide a desktop computer in the primary field office adequate for use by Architect and Owner to access Project electronic documents and maintain electronic communications. Equip computer with not less than the following:
 1. Processor: Intel Pentium D or Intel CoreDuo, 3.0 GHz processing speed.
 2. Memory: 4 gigabyte, minimum.
 3. Disk Storage: 300 gigabyte hard-disk drive and combination DVD-RW/CD-RW drive.
 4. Display: 22-inch LCD monitor with 256-Mb dedicated video RAM.
 5. Full-size keyboard and mouse.
 6. Network Connectivity: 10/100BaseT Ethernet.
 7. Operating System: Microsoft Windows XP Professional.
 8. Productivity Software:
 - a. Microsoft Office Professional, XP or higher, including Word, Excel, and Outlook.
 - b. Adobe Reader 7.0 or higher.
 - c. WinZip 7.0 or higher.
 9. Printer: "All-in-one" unit equipped with printer server, combining color printing, photocopying, scanning, and faxing, or separate units for each of these three functions.
 10. Internet Service: Broadband modem, router and ISP, equipped with hardware firewall, providing minimum 384 Kbps upload and 1 Mbps download speeds at each computer.
 11. Internet Security: Integrated software, providing software firewall, virus, spyware, phishing, and spam protection in a combined application.
 12. Backup: External hard drive, minimum 40 gigabyte, with automated backup software providing daily backups.

3.3 SUPPORT FACILITIES INSTALLATION

- A. General: Comply with the following:
 1. Provide construction for temporary offices, shops, and sheds located within construction area or within 30 feet of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.
 2. Maintain support facilities until near Substantial Completion. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
- B. Traffic Controls: Comply with requirements of authorities having jurisdiction.
 1. Protect existing site improvements to remain including curbs, pavement, and utilities.
 2. Maintain access for fire-fighting equipment.
- C. Parking: Use designated areas of Owner's existing parking areas for construction personnel.
- D. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
 1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties nor endanger permanent Work or temporary facilities.
 2. Remove snow and ice as required to minimize accumulations.

- E. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
1. Identification Signs: Provide Project identification sign as indicated on Drawings.
 2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
 - a. Provide temporary, directional signs for construction personnel and visitors.
 3. Maintain and touchup signs so they are legible at all times.
- F. Collection and Disposal of Waste: Collect waste from construction areas and elsewhere daily. Comply with requirements of NFPA 241 for removal of combustible waste material and debris. Enforce requirements strictly. Do not hold materials more than 7 days during normal weather or 3 days when the temperature is expected to rise above 80 deg F. Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly.
1. Comply with Division 01 Section "Execution" for progress cleaning requirements.
 2. Provide sufficient quantity of dumpsters at strategic locations within the Contract limit lines for collection of waste from the work of all Subcontractors.
 3. Do not pass materials through open windows, or through window openings when any portion of the window remains in the opening.
- G. Temporary Lifts and Hoists: The Contractor shall provide, operate and maintain in safe operating order facilities for hoisting materials, rubbish, employees and to otherwise carry out the Work. Truck cranes, fork lifts, man lifts and similar devices required for the performance of the Work by each Subcontractor shall be provided by the Subcontractor.
1. Provide temporary lifts and hoists that comply in all respects with the most stringent of all applicable Federal (including OSHA), state and local laws, rules, regulations, codes and ordinances, and provisions of Division 01 of this Specification.
 2. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.
 3. The Contractor is responsible for engaging a structural engineer licensed in the State of New York to provide calculations evaluating all elevated floor structures for support of proposed temporary lifts and hoists equipment loads. Submit the calculations, signed and sealed by the Contractor's structural engineer, to Architect.
- H. Staging and Scaffolding: Where staging and scaffolding is required, the Contractor shall provide the entire installation.
1. Staging shall be of approved design, erected and removed by experienced stage builders and shall have all accident prevention devices required by State and local laws.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
- B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
1. Comply with work restrictions specified in Division 01 Section "Summary."

- C. Stormwater Control: Comply with authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
- D. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.
- E. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.
 - 1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
 - 2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Provide Owner with one set of keys.
- F. Security Enclosure and Lockup: Install substantial temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.
- G. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- H. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.
- I. Temporary Enclosures: Provide all temporary enclosures for protection of construction in progress and completed, from exposure, foul weather, other construction operations and similar activities.
 - 1. Where heat is needed and the permanent building enclosure is not complete, provide temporary enclosures where there is no other provision for containment of heat. Provide enclosures as required on the exterior or interior side of the building, whether the roof has been installed or not, and whether windows or doors have been installed or not, in order to protect the Work and allow Work to continue in accordance with the requirements of the Specifications. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.
 - a. Erect and maintain temporary enclosures and temporary heat during the months of November through March.
 - 2. Install tarpaulins securely, with fire-retardant-treated wood framing and other materials. Close openings of 25 square feet or less with plywood or similar materials.
 - 3. Close openings through floor or roof decks and horizontal surfaces with load-bearing wood-framed construction.
 - 4. Where temporary wood or plywood enclosure exceeds 100 square feet in area, use UL-labeled fire-retardant treated material for framing and main sheathing.
 - 5. Do not use new permanent doors and frames for temporary enclosures until finishing work is begun, and then only if carefully protected from damage. Prior to installation of permanent doors and frames, provide temporary wood or plywood doors with wood frames and proper hardware to make the doors self-closing.
 - a. Close and lock all openings accessible from ground level at end of each day=s work to prevent entry of unauthorized persons.

- J. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by Owner from fumes and noise.
1. Construct dustproof partitions with gypsum wallboard with joints taped on occupied side, and fire-retardant plywood on construction operations side.
 2. Construct dustproof partitions with 2 layers of 3-mil polyethylene sheet on each side. Cover floor with 2 layers of 3-mil polyethylene sheet, extending sheets 18 inches up the sidewalls. Overlap and tape full length of joints. Cover floor with fire-retardant plywood.
 - a. Construct vestibule and airlock at each entrance through temporary partition with not less than 48 inches between doors. Maintain water-dampened foot mats in vestibule.
 3. Insulate partitions to provide noise protection to occupied areas.
 4. Seal joints and perimeter. Equip partitions with dustproof doors and security locks.
 5. Protect air-handling equipment.
 6. Weather strip openings.
 7. Provide walk-off mats at each entrance through temporary partition.
- K. Protection: Protect the Work at all times from damages. Provide all pumps, equipment and enclosures to ensure this protection.
1. Remove all snow and ice as may be required for proper protection and prosecution of the work.
 2. Provide all shoring, bracing and sheeting as required for safety and for proper execution of work.
 3. Protect all work from damage during cold weather. If low temperatures make it impossible to continue operations safely in spite of cold weather precautions, cease work and notify Architect. Repair and/or replacement of all work damaged from frost, freezing or any elements of the weather are the responsibility of the Contractor responsible for temporary protection of the Work.
 4. Should high wind warnings be issued by the U.S. Weather Advisory Bureau, take every precaution to minimize danger to persons, to the Work, and to adjacent properties, including, but not limited to, removing all loose materials, tools and/or equipment from exposed locations, and removing or securing scaffolding or other temporary work.
 5. Protect the building and the site from damage, loss or liability due to theft or vandalism when the work is not in progress at night, weekends, or holidays.
 6. Exercise precaution for the protection of persons and property at all times. Observe the provisions of applicable laws and construction codes. Take additional safety and health measures, or cause such measures to be taken as reasonably necessary. Maintain guards on machinery, equipment and other hazards as set forth in the safety provisions of the Manual of Accident Prevention in Construction, published by the Associated General Contractors of America, to the extent that such provisions are not in contravention of applicable laws.
 7. Protect and preserve in operating conditions all utilities traversing the work area. Repair all damages to any utility due to work performed under this Contract, the satisfaction of the Architect at no additional cost to the Owner.
 8. Protect all existing and new finished surfaces against damage from work under this Contract. Restore or replace finishes that are damaged to their original condition, subject to approval by the Architect, and at no additional cost to the Owner.
- L. Roof Protection: The Contractor shall protect all existing roof surfaces to prevent damage from selective demolition and new construction operations. Keep traffic on roof systems to a minimum, and permit traffic only as required to complete the work under this Contract.
1. Repair or replace roofing system components and substrates to their original condition where damaged by operations under this Contract. Comply with Specifications and/or roofing manufacturer's written recommendations for maintaining new and existing roofing warranties, subject to approval by the Architect, and at no additional cost to the Owner.

- M. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.
1. Prohibit smoking in construction areas.
 2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
 3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.

3.5 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.
1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
1. Materials and facilities that constitute temporary facilities are property of Contractor.
 2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
 3. At Substantial Completion, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 01 Section "Closeout Procedures."

END OF SECTION 015000

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.
- B. Related Sections include the following:
 - 1. Division 01 Section "Substitution Procedures" for requests for substitutions.
 - 2. Division 01 Section "References" for applicable industry standards for products specified.
 - 3. Division 01 Section "Closeout Procedures" for submitting warranties for Contract closeout.
 - 4. Divisions 02 through 33 Sections for specific requirements for warranties on products and installations specified to be warranted.

1.3 DEFINITIONS

- A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility, except that products consisting of recycled-content materials are allowed, unless explicitly stated otherwise.
 - a. Products salvaged or recycled from other projects are not considered new products.
 - b. Products manufactured and stored for more than one year prior to the start date of this project are not considered new products.
 - 3. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
 - 4. "Or Equal" Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

- a. An item equal to that named or described in the specifications may be furnished; and an item shall be considered equal to the item so named or described if, in the opinion of the awarding authority: (1) it is at least equal in quality, durability, appearance, strength and design, (2) it will perform at least equally the function imposed by the general design for the public work being contracted for or the material being purchased, and (3) it conforms substantially, even with deviations, to the detailed requirements for the item in the said specifications.
- B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification, or for purposes of evaluating "or equal" products.

1.4 ACTION SUBMITTALS

- A. Product List: Submit a list, in tabular form, showing specified products. Include generic names of products required. Include manufacturer's name and proprietary product names for each product.
 1. Coordinate product list with Contractor's Construction Schedule and the Submittals Schedule.
 2. Form: Tabulate information for each product under the following column headings:
 - a. Specification Section number and title.
 - b. Generic name used in the Contract Documents.
 - c. Proprietary name, model number, and similar designations.
 - d. Manufacturer's name and address.
 - e. Supplier's name and address.
 - f. Installer's name and address.
 - g. Projected delivery date or time span of delivery period.
 - h. Identification of items that require early submittal approval for scheduled delivery date.
 3. Initial Submittal: Within 30 days after date of commencement of the Work, submit 3 copies of initial product list. Include a written explanation for omissions of data and for variations from Contract requirements.
 - a. At Contractor's option, initial submittal may be limited to product selections and designations that must be established early in Contract period.
 4. Completed List: Within 90 days after date of commencement of the Work, submit 3 copies of completed product list. Include a written explanation for omissions of data and for variations from Contract requirements.
 5. Architect's Action: Architect will respond in writing to Contractor within 15 days of receipt of completed product list. Architect's response will include a list of unacceptable product selections and a brief explanation of reasons for this action. Architect's response, or lack of response, does not constitute a waiver of requirement to comply with the Contract Documents.
- B. Comparable Product Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 1. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within 15 days of

receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.

- a. Form of Approval: As specified in Division 01 Section "Submittal Procedures."
- b. Use product specified if Architect cannot make a decision on use of a comparable product request within time allocated.

- C. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 01 Section "Submittal Procedures." Show compliance with requirements.

1.5 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.

1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.

- B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.

- C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Store cementitious products and materials on elevated platforms.
5. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
7. Protect stored products from damage and liquids from freezing.
8. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.7 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
 - 1. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
 - 2. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.
 - 1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 - 2. Specified Form: When specified forms are included with the Specifications, prepare a written document using appropriate form properly executed.
 - 3. Refer to Divisions 02 through 33 Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Division 01 Section "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, that are new at time of installation.
 - 1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 - 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 - 3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
 - 4. Where products are accompanied by the term "as selected," Architect will make selection.
 - 5. Where products are accompanied by the term "match sample," sample to be matched is Architect's.
 - 6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.
 - 7. Or Equal: Where products are specified by name and accompanied by the term "or equal" or "or approved equal" or "or approved," comply with provisions in Part 2 "Comparable Products" Article to obtain approval for use of an unnamed product.

B. Product Selection Procedures:

1. Products:
 - a. Nonrestricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed equal product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.
2. Manufacturers:
 - a. Nonrestricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed equal manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.
3. Product Options: Where Specifications indicate that sizes, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide the specified product or system. Comply with provisions in Part 2 "Product Substitutions" Article for consideration of an unnamed product or system.
4. Basis-of-Design Product: Where Specifications name a product and include a list of manufacturers, provide the specified product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product by the other named manufacturers.
5. Visual Matching Specification: Where Specifications require matching an established Sample, select a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
 - a. If no product available within specified category matches and complies with other specified requirements, comply with provisions in Part 2 "Product Substitutions" Article for proposal of product.
6. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product that complies with other specified requirements.
 - a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that does not include premium items.
 - b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

- A. Conditions: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
1. Evidence that the proposed product does not require extensive revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.

2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 3. Evidence that proposed product provides specified warranty.
 4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
 5. Samples, if requested.
- B. Submittal Requirements: Approval by the Architect of Contractor's request for use of comparable product is not intended to satisfy other submittal requirements. Comply with specified submittal requirements.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:
 - 1. Construction layout.
 - 2. General installation of products.
 - 3. Progress cleaning.
 - 4. Starting and adjusting.
 - 5. Protection of installed construction.
 - 6. Correction of the Work.
- B. Related Sections include the following:
 - 1. Division 01 Section "Cutting and Patching" for procedural requirements for cutting and patching necessary for the installation or performance of other components of the Work.
 - 2. Division 01 Section "Closeout Procedures" for final cleaning.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.
 - 1. Before construction, verify the location and points of connection of utility services.
- B. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.
 - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.
 - 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

- C. Examination and Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
 - 1. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
 - 2. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 - 3. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 - 4. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.
- D. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
 - 1. Description of the Work.
 - 2. List of detrimental conditions, including substrates.
 - 3. List of unacceptable installation tolerances.
 - 4. Recommended corrections.

3.2 PREPARATION

- A. Existing Utility Information: Furnish information to Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.
- B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.
 - 1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
 - 2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.

3. Inform installers of lines and levels to which they must comply.
 4. Check the location, level and plumb, of every major element as the Work progresses.
 5. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
 6. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and invert elevations.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.4 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
1. Make vertical work plumb and make horizontal work level.
 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
 4. Maintain minimum headroom clearance of 7'-6" in spaces without a suspended ceiling.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- G. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.
1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
 2. Allow for building movement, including thermal expansion and contraction.

3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.5 OWNER-INSTALLED PRODUCTS

- A. Site Access: Provide access to Project site for Owner's construction forces.
- B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction forces.
 1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
 2. Preinstallation Conferences: Include Owner's construction forces at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction forces if portions of the Work depend on Owner's construction.

3.6 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.
 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F.
 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
 1. Remove liquid spills promptly.
 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.7 STARTING AND ADJUSTING

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.
- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Division 01 Section "Quality Requirements."

3.8 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.9 CORRECTION OF THE WORK

- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 01 Section "Cutting and Patching."
 - 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Restore permanent facilities used during construction to their specified condition.

- C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
- E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 017300

SECTION 017329 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes procedural requirements for cutting and patching.
- B. Related Sections include the following:
 - 1. Divisions 02 through 33 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.
 - 2. Division 07 Section "Penetration Firestopping" for patching fire-rated construction.

1.3 DEFINITIONS

- A. Cutting: Penetration of in-place construction necessary to permit installation or performance of other Work, including the removal of debris.
- B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

1.4 SUBMITTALS

- A. Cutting and Patching Proposal: Submit a proposal describing procedures at least 10 days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:
 - 1. Extent: Describe cutting and patching, show how they will be performed, and indicate why they cannot be avoided.
 - 2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.
 - 3. Products: List products to be used and firms or entities that will perform the Work.
 - 4. Dates: Indicate when cutting and patching will be performed.
 - 5. Utility Services and Mechanical/Electrical Systems: List services/systems that cutting and patching procedures will disturb or affect. List services/systems that will be relocated and those that will be temporarily out of service. Indicate how long services/systems will be disrupted.
 - 6. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.

7. Architect's Approval: Obtain approval of cutting and patching proposal before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

1.5 QUALITY ASSURANCE

- A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio. Structural elements include, but are not limited to the following:
 1. Concrete foundation construction.
 2. Bearing and retaining walls.
 3. Lintels.
 4. Structural decking.
 5. Miscellaneous structural metals.
 6. Interior and/or exterior load bearing masonry wall construction.
- B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operating elements include the following:
 1. Primary operational systems and equipment.
 2. Air or smoke barriers.
 3. Fire-suppression systems.
 4. Mechanical systems piping and ducts.
 5. Control systems.
 6. Communication systems.
 7. Conveying systems.
 8. Electrical wiring systems.
- C. Miscellaneous Elements: Do not cut and patch miscellaneous elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Miscellaneous elements include the following:
 1. Water, moisture, or vapor barriers.
 2. Membranes and flashings.
 3. Piping, ductwork, vessels, and equipment.
 4. Noise- and vibration-control elements and systems.
 5. Roofing systems.
- D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
- E. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections.
- B. In-Place Materials: Use materials identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
 - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
 - 1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
 - 2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Temporary Support: Provide temporary support of Work to be cut.
- B. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- D. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.

3.3 PERFORMANCE

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

- B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 4. Excavating and Backfilling: Comply with requirements in applicable Division 2 Sections where required by cutting and patching operations.
 5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
 6. Proceed with patching after construction operations requiring cutting are complete.
- C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.
1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
 - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
 - b. Restore damaged pipe covering to its original condition.
 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
 4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
 5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.
- D. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION 017329

SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements of the Contractor for the following:
 - 1. Salvaging nonhazardous demolition and construction waste.
 - 2. Recycling nonhazardous demolition and construction waste.
 - 3. Disposing of nonhazardous demolition and construction waste.
- B. The Contractor is responsible for all costs associated with construction waste management and disposal.
- C. Related Sections include the following:
 - 1. Division 01 Section "Temporary Facilities and Controls" for environmental-protection measures during construction, and location of waste containers at Project site.
 - 2. Division 01 Section "Indoor Air Quality Requirements."

1.3 DEFINITIONS

- A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B. Demolition Waste: Building, structure, and site improvement materials resulting from demolition operations.
- C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
- D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
- E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
- F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.4 PERFORMANCE REQUIREMENTS

- A. General: Achieve end-of-Project rates for salvage/recycling of 75 percent by weight of total non-hazardous solid waste generated by the Work. Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials, including the following:

1. Demolition Waste:

- a. Asphalt paving.
- b. Concrete.
- c. Concrete reinforcing steel.
- d. Brick.
- e. Concrete masonry units.
- f. Plywood and oriented strand board.
- g. Wood paneling.
- h. Wood trim.
- i. Structural and miscellaneous steel.
- j. Rough hardware.
- k. Roofing.
- l. Insulation.
- m. Doors and frames.
- n. Door hardware.
- o. Windows.
- p. Glazing.
- q. Metal studs.
- r. Gypsum board.
- s. Acoustical tile and panels.
- t. Carpet.
- u. Carpet pad.
- v. Cabinets.
- w. Plumbing fixtures.
- x. Piping.
- y. Supports and hangers.
- z. Valves.
- aa. Sprinklers.
- bb. Mechanical equipment.
- cc. Refrigerants.
- dd. Electrical conduit.
- ee. Copper wiring.
- ff. Lighting fixtures.
- gg. Lamps.
- hh. Ballasts.
- ii. Electrical devices.
- jj. Switchgear and panelboards.
- kk. Transformers.

2. Construction Waste:

- a. Masonry and CMU.
- b. Lumber.
- c. Wood sheet materials.
- d. Wood trim.
- e. Metals.
- f. Roofing.

- g. Insulation.
- h. Carpet and pad.
- i. Gypsum board.
- j. Piping.
- k. Electrical conduit.
- l. Packaging: Regardless of salvage/recycle goal indicated in "General" Paragraph above, salvage or recycle 100 percent of the following uncontaminated packaging materials:
 - 1) Paper.
 - 2) Cardboard.
 - 3) Boxes.
 - 4) Plastic sheet and film.
 - 5) Polystyrene packaging.
 - 6) Wood crates.
 - 7) Plastic pails.

1.5 REQUIREMENTS FOR CONSTRUCTION WASTE MANAGEMENT

- A. The Contractor shall prepare and submit a Construction Waste Management Plan to the Owner and Architect for approval. The CWM Plan shall outline the provisions to be implemented by the Contractor and Subcontractors to recycle and salvage demolition and construction waste generated during the project.
- B. Upon approval of the CWM Plan by the Owner and Architect, it shall be implemented by the Contractor and Subcontractors throughout the duration of the project, and documented in accordance with the Submittal Requirements below.
- C. The Construction Waste Management Plan shall include, but not be limited to, the following components:
 - 1. Listing of Targeted Materials: The contractor shall develop a list of the waste materials from the Project that will be targeted for reuse, salvage, or recycling. The following materials, at minimum, shall be accounted for (materials that will not be recycled shall be indicated as such):
 - a. Cardboard, paper, packaging
 - b. Clean dimensional wood, palette wood
 - c. Beverage containers
 - d. Concrete and/or Concrete Masonry Units (CMU)
 - e. Metals from banding, stud trim, ductwork, piping, rebar, roofing, other trim, steel, iron, galvanized sheet steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze.
 - f. Drywall
 - g. Carpet and pad
 - h. Paint
 - i. Rigid Foam
 - j. Glass
 - k. Plastics
 - 2. Landfill Information: The contractor shall provide the name and location of the landfill(s) where trash will be disposed of.
 - 3. Recycling or Salvaging Facilities: The contractor shall provide the names and locations of the recycling or salvaging facilities where waste materials will be delivered.
 - 4. Sorting Method: The contractor shall provide a description of the proposed means of sorting and transporting the recyclable materials (whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler and removed from the site for off-site sorting). Waste haulers using off-site sorting operations shall provide a

- written description of the sorting process used, and their method for calculating project-specific recycling rates.
5. Packaging Waste: The contractor shall note whether suppliers will eliminate or take back packaging for major materials delivered to the site.
 6. Implementation and Supervision: The contractor shall include provisions in the Construction Waste Management Plan for addressing conditions in the field that do not adhere to the CWM Plan, including provisions to rectify non-compliant conditions.
 7. Additional Information: The contractor shall include any additional information deemed relevant to describe the scope and intent of the CWM Plan to the Owner and Architect.
- D. Construction Waste Management and recycling requirements shall be incorporated into all Subcontractors' contracts.

1.6 SUBMITTAL REQUIREMENTS

- A. Waste Management Plan: Submit 3 copies of plan within 30 days of date established for the Notice to Proceed.
- B. Provide a monthly diversion summary and back-up documentation for where debris was taken.

1.7 INFORMATIONAL SUBMITTALS

- A. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit report. Use Form CWM-7 for construction waste and Form CWM-8 for demolition waste. Include the following information:
 1. Material category.
 2. Generation point of waste.
 3. Total quantity of waste in tons.
 4. Quantity of waste salvaged, both estimated and actual in tons.
 5. Quantity of waste recycled, both estimated and actual in tons.
 6. Total quantity of waste recovered (salvaged plus recycled) in tons.
 7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.
- B. Waste Reduction Calculations: Before request for Substantial Completion, submit calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.
- C. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.
- D. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.
- E. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- F. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- G. Qualification Data: For waste management coordinator.

1.8 QUALITY ASSURANCE

- A. Waste Management Coordinator Qualifications: Experienced firm, with a record of successful waste management coordination of projects with similar requirements.
- B. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. Waste Management Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to waste management including, but not limited to, the following:
 - 1. Review and discuss waste management plan including responsibilities of Waste Management Coordinator.
 - 2. Review requirements for documenting quantities of each type of waste and its disposition.
 - 3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
 - 4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
 - 5. Review waste management requirements for each trade.

1.9 WASTE MANAGEMENT PLAN

- A. General: Develop plan consisting of waste identification, waste reduction work plan, and cost/revenue analysis. Include separate sections in plan for demolition and construction waste. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.
- B. Waste Identification: Indicate anticipated types and quantities of demolition, site-clearing, and construction waste generated by the Work. Include estimated quantities and assumptions for estimates.
- C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
 - 1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
 - 2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
 - 3. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
 - 4. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
 - 5. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
 - 6. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location on Project site where materials separation will be located.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

- A. General: Implement waste management plan as approved by Architect and Owner. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
 - 1. Comply with Division 01 Section "Temporary Facilities and Controls" for operation, termination, and removal requirements.
- B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan.
- C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.
 - 1. Distribute waste management plan to everyone concerned within three days of submittal return.
 - 2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.
- D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
 - 2. Comply with Division 01 Section "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

3.2 SALVAGING DEMOLITION WASTE

- A. Salvaged Items for Reuse in the Work: Salvage items for reuse and handle as follows:
 - 1. Clean salvaged items.
 - 2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
 - 3. Store items in a secure area until installation.
 - 4. Protect items from damage during transport and storage.
 - 5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.
- B. Salvaged Items for Sale and Donation: Not permitted on Project site.

3.3 RECYCLING DEMOLITION WASTE, GENERAL

- A. General: Recycle paper and beverage containers used by on-site workers.

- B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Owner.
- C. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.
- D. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.
 - 1. Provide appropriately marked containers or bins for controlling recyclable waste until removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
 - a. Inspect containers and bins for contamination and remove contaminated materials if found.
 - 2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 - 3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
 - 4. Store components off the ground and protect from the weather.
 - 5. Remove recyclable waste from Owner's property and transport to recycling receiver or processor.

3.4 RECYCLING DEMOLITION WASTE

- A. Asphalt Paving: Break up and transport paving to asphalt-recycling facility.
- B. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.
 - 1. Pulverize concrete to maximum 4 inch size.
- C. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.
- D. Metals: Separate metals by type.
 - 1. Structural Steel: Stack members according to size, type of member, and length.
 - 2. Remove and dispose of bolts, nuts, washers, and other rough hardware.
- E. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.
- F. Acoustical Ceiling Panels and Tile: Stack large clean pieces on wood pallets and store in a dry location.
- G. Metal Suspension System: Separate metal members, including trim and other metals from acoustical panels and tile, and sort with other metals.
- H. Carpet: Roll large pieces tightly after removing debris, trash, adhesive, and tack strips.
 - 1. Store clean, dry carpet in a closed container or trailer provided by carpet reclamation agency or carpet recycler.
- I. Carpet Tile: Remove debris, trash, and adhesive.

1. Stack tile on pallet and store clean, dry carpet in a closed container or trailer provided by carpet reclamation agency or carpet recycler.
- J. Piping: Reduce piping to straight lengths and store by material and size. Separate supports, hangers, valves, sprinklers, and other components by material and size.
- K. Conduit: Reduce conduit to straight lengths and store by material and size.
- L. Lamps: Separate lamps by type and store according to requirements in 40 CFR 273.

3.5 RECYCLING CONSTRUCTION WASTE, GENERAL

- A. General: Recycle paper and beverage containers used by on-site workers.
- B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Owner.
- C. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical.
 1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
 - a. Inspect containers and bins for contamination and remove contaminated materials if found.
 2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
 4. Store components off the ground and protect from the weather.
 5. Remove recyclable waste off Owner's property and transport to recycling receiver or processor.

3.6 RECYCLING CONSTRUCTION WASTE

- A. Packaging:
 1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
 2. Polystyrene Packaging: Separate and bag materials.
 3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
 4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.
- B. Site-Clearing Wastes: Chip brush, branches, and trees on-site.
- C. Wood Materials:
 1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
 2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.
- D. Gypsum Board: Stack large clean pieces on wood pallets and store in a dry location.

1. Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.

3.7 DISPOSAL OF WASTE

- A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
 1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Burning: Do not burn waste materials.
- C. Disposal: Transport waste materials off Owner's property and legally dispose of them.

END OF SECTION 017419

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Substantial Completion procedures.
 - 2. Final completion procedures.
 - 3. Warranties.
 - 4. Final cleaning.
 - 5. Repair of the Work.
- B. Related Sections include the following:
 - 1. Division 01 Section "Payment Procedures" for requirements for Applications for Payment for Substantial and Final Completion.
 - 2. Division 01 Section "Execution" for progress cleaning of Project site.
 - 3. Division 01 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
 - 4. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
 - 5. Division 01 Section "Demonstration and Training" for requirements for instructing Owner's personnel.
 - 6. Divisions 02 through 33 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.3 ACTION SUBMITTALS

- A. Product Data: For cleaning agents.
- B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
- C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.4 CLOSEOUT SUBMITTALS

- A. Certificates of Release: From authorities having jurisdiction.
- B. Certificate of Insurance: For continuing coverage.
- C. Field Report: For pest control inspection.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.6 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.
- B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
 2. Advise Owner of pending insurance changeover requirements.
 3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 4. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 5. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
 6. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 7. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect. Label with manufacturer's name and model number where applicable.
 - a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Architect's signature for receipt of submittals.
 8. Submit test/adjust/balance records.
 9. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
- C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
1. Advise Owner of pending insurance changeover requirements.
 2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 3. Complete startup and testing of systems and equipment.
 4. Perform preventive maintenance on equipment used prior to Substantial Completion.
 5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Division 01 Section "Demonstration and Training."
 6. Advise Owner of changeover in heat and other utilities.

7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
9. Complete final cleaning requirements, including touchup painting.
10. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

D. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for Final Completion.

1.7 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:

1. Submit a final Application for Payment according to Division 01 Section "Payment Procedures."
2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training videotapes.

B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.8 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Preparation: Submit three copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order.
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
3. Include the following information at the top of each page:
 - a. Project name.
 - b. Date.
 - c. Name of Architect.
 - d. Name of Contractor.

e. Page number.

1.9 SUBMITTAL OF PROJECT WARRANTIES

- A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.
- B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
- C. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
 - 1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
 - 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
 - 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
- D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
 - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
 - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.

- b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - e. Remove snow and ice to provide safe access to building.
 - f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - h. Sweep concrete floors broom clean in unoccupied spaces.
 - i. HEPA vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
 - j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - k. Remove labels that are not permanent.
 - l. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
 - 1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
 - m. Wipe surfaces of mechanical and electrical equipment, elevator equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - n. Replace parts subject to unusual operating conditions.
 - o. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - p. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - q. Clean ducts, blowers, and coils if units were operated without filters during construction.
 - r. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
 - s. Leave Project clean and ready for occupancy.
- C. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

3.2 REPAIR OF THE WORK

- A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.
- B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.

1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that already show evidence of repair or restoration.
 - a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION 017700

SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
 - 1. Operation and maintenance documentation directory.
 - 2. Emergency manuals.
 - 3. Operation manuals for systems, subsystems, and equipment.
 - 4. Maintenance manuals for the care and maintenance of products, materials, and finishes, systems and equipment.
- B. Related Sections include the following:
 - 1. Division 01 Section "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
 - 2. Division 01 Section "Closeout Procedures" for submitting operation and maintenance manuals.
 - 3. Division 01 Section "Project Record Documents" for preparing Record Drawings for operation and maintenance manuals.
 - 4. Divisions 02 through 33 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

1.3 DEFINITIONS

- A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.
- B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 CLOSEOUT SUBMITTALS

- A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
 - 1. Architect and Commissioning Authority will comment on whether content of operations and maintenance submittals are acceptable.
 - 2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
- B. Format: Submit operations and maintenance manuals in the following format:

1. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Architect.
 - a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
 - b. Enable inserted reviewer comments on draft submittals.
 2. Three paper copies. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves. Architect will return two copies.
- C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect will comment on whether general scope and content of manual are acceptable.
- D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect and Commissioning Authority will return copy with comments.
1. Correct or revise each manual to comply with Architect's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's and Commissioning Authority's comments and prior to commencing demonstration and training.

1.5 COORDINATION

- A. Where operation and maintenance documentation includes information on installations by more than one factory-authorized service representative, assemble and coordinate information furnished by representatives and prepare manuals.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

- A. Organization: Include a section in the directory for each of the following:
1. List of documents.
 2. List of systems.
 3. List of equipment.
 4. Table of contents.
- B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
- C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
- D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.2 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

- A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
1. Title page.
 2. Table of contents.
 3. Manual contents.
- B. Title Page: Enclose title page in transparent plastic sleeve. Include the following information:
1. Subject matter included in manual.
 2. Name and address of Project.
 3. Name and address of Owner.
 4. Date of submittal.
 5. Name, address, and telephone number of Contractor.
 6. Name and address of Architect.
 7. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
1. Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
 - a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
 - b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.
 2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
 3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.
 4. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
 5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
 - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.

- b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.3 EMERGENCY MANUALS

- A. Content: Organize manual into a separate section for each of the following:
 1. Type of emergency.
 2. Emergency instructions.
 3. Emergency procedures.
- B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
 1. Fire.
 2. Flood.
 3. Gas leak.
 4. Water leak.
 5. Power failure.
 6. Water outage.
 7. System, subsystem, or equipment failure.
 8. Chemical release or spill.
- C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.
- D. Emergency Procedures: Include the following, as applicable:
 1. Instructions on stopping.
 2. Shutdown instructions for each type of emergency.
 3. Operating instructions for conditions outside normal operating limits.
 4. Required sequences for electric or electronic systems.
 5. Special operating instructions and procedures.

2.4 OPERATION MANUALS

- A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
 1. System, subsystem, and equipment descriptions.
 2. Performance and design criteria if Contractor is delegated design responsibility.
 3. Operating standards.
 4. Operating procedures.
 5. Operating logs.
 6. Wiring diagrams.
 7. Control diagrams.
 8. Piped system diagrams.
 9. Precautions against improper use.
 10. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:

1. Product name and model number.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.5 PRODUCT MAINTENANCE MANUAL

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
 - 1. Include procedures to follow and required notifications for warranty claims.

2.6 SYSTEMS AND EQUIPMENT MAINTENANCE MANUAL

- A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.
- B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
- C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
 - 1. Standard printed maintenance instructions and bulletins.
 - 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
 - 3. Identification and nomenclature of parts and components.
 - 4. List of items recommended to be stocked as spare parts.
- D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
 - 1. Test and inspection instructions.
 - 2. Troubleshooting guide.
 - 3. Precautions against improper maintenance.
 - 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - 5. Aligning, adjusting, and checking instructions.
 - 6. Demonstration and training videotape, if available.
- E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
 - 1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
 - 2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
- F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

- H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
 - 1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

- A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.
- B. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.
- C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- D. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
 - 1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
 - 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
 - 1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
- F. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation.
 - 1. Do not use original Project Record Documents as part of operation and maintenance manuals.
- G. Comply with Division 01 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 017823

SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:
 - 1. Record Drawings.
 - 2. Record Specifications.
 - 3. Record Product Data.
 - 4. Miscellaneous record submittals.
- B. Related Sections include the following:
 - 1. Division 01 Section "Closeout Procedures" for general closeout procedures.
 - 2. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
 - 3. Divisions 02 through 33 Sections for specific requirements for Project Record Documents of the Work in those Sections.

1.3 CLOSEOUT SUBMITTALS

- A. Record Drawings: Comply with the following:
 - 1. Number of Copies: Submit one set of marked-up Record Prints.
 - 2. Number of Copies: Submit copies of record Drawings as follows:
 - a. Initial Submittal:
 - 1) Submit one paper-copy set of marked-up record prints.
 - 2) Submit PDF electronic files of scanned record prints and one of file prints.
 - 3) Submit record digital data files and one set of plots.
 - 4) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
 - b. Final Submittal:
 - 1) Submit three paper-copy sets of marked-up record prints.
 - 2) Submit PDF electronic files of scanned record prints and three sets of prints.
 - 3) Print each drawing, whether or not changes and additional information were recorded.

- c. Final Submittal:
 - 1) Submit one paper-copy set of marked-up record prints.
 - 2) Submit record digital data files and three sets of record digital data file plots.
 - 3) Plot each drawing file, whether or not changes and additional information were recorded.
- B. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications.
- C. Record Product Data: Submit one copy of each Product Data submittal.
 - 1. Where Record Product Data is required as part of operation and maintenance manuals, submit marked-up Product Data as an insert in manual instead of submittal as Record Product Data.
- D. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit one paper copy of each submittal.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

- A. Record Prints: Maintain one set of black-line white prints of the Contract Drawings and Shop Drawings.
 - 1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
 - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - b. Accurately record information in an understandable drawing technique.
 - c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
 - 2. Content: Types of items requiring marking include, but are not limited to, the following:
 - a. Dimensional changes to Drawings.
 - b. Revisions to details shown on Drawings.
 - c. Depths of foundations below first floor.
 - d. Locations and depths of underground utilities.
 - e. Revisions to routing of piping and conduits.
 - f. Revisions to electrical circuitry.
 - g. Actual equipment locations.
 - h. Duct size and routing.
 - i. Locations of concealed internal utilities.
 - j. Changes made by Change Order or Construction Change Directive.
 - k. Changes made following Architect's written orders.
 - l. Details not on the original Contract Drawings.
 - m. Field records for variable and concealed conditions.
 - n. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
 4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
 5. Mark important additional information that was either shown schematically or omitted from original Drawings.
 6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:
1. Format: Annotated PDF electronic file with comment function enabled.
 2. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
 3. Refer instances of uncertainty to Architect for resolution.
 4. Architect will furnish Contractor one set of digital data files of the Contract Drawings for use in recording information.
 - a. See Division 01 Section "Submittal Procedures" for requirements related to use of Architect's digital data files.
 - b. Architect will provide data file layer information. Record markups in separate layers.
- C. Newly Prepared Record Drawings: Prepare new Drawings instead of preparing record Drawings where Architect determines that neither the original Contract Drawings nor Shop Drawings are suitable to show actual installation.
1. New Drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution, or other modification.
 2. Consult Architect for proper scale and scope of detailing and notations required to record the actual physical installation and its relation to other construction. Integrate newly prepared record Drawings into record Drawing sets; comply with procedures for formatting, organizing, copying, binding, and submitting.
- D. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
1. Record Prints: Organize Record Prints into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
 2. Format: Annotated PDF electronic file with comment function enabled.
 3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
 4. Identification: As follows:
 - a. Project name.
 - b. Date.
 - c. Designation "PROJECT RECORD DRAWINGS."
 - d. Name of Architect.

2.2 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
 - 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 - 2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
 - 3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
 - 4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
 - 5. Note related Change Orders, Record Product Data, and Record Drawings where applicable.
- B. Format: Submit record Specifications as annotated PDF electronic file or scanned PDF electronic file(s) of marked-up paper copy of Specifications as required.

2.3 RECORD PRODUCT DATA

- A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
 - 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 - 2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
 - 3. Note related Change Orders, Record Specifications, and Record Drawings where applicable.
- B. Format: Submit record Product Data as annotated PDF electronic file or scanned PDF electronic file(s) of marked-up paper copy of Product Data.
 - 1. Include record Product Data directory organized by Specification Section number and title, electronically linked to each item of record Product Data.

2.4 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.
- B. Format: Submit miscellaneous record submittals as PDF electronic file or scanned PDF electronic file(s) of marked-up miscellaneous record submittals as required.
 - 1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.
- B. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

END OF SECTION 017839

SECTION 017900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
 - 1. Demonstration of operation of systems, subsystems, and equipment.
 - 2. Training in operation and maintenance of systems, subsystems, and equipment.
- B. Related Sections include the following:
 - 1. Division 01 Section "Project Management and Coordination" for requirements for preinstruction conferences.
 - 2. Divisions 02 through 33 Sections for specific requirements for demonstration and training for products in those Sections.

1.3 INFORMATIONAL SUBMITTALS

- A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
 - 1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.
- B. Qualification Data: For instructors.
- C. Attendance Record: For each training module, submit list of participants and length of instruction time.
- D. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

1.4 QUALITY ASSURANCE

- A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

- B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Division 01 Section "Quality Requirements," experienced in operation and maintenance procedures and training.
- C. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:
 - 1. Inspect and discuss locations and other facilities required for instruction.
 - 2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
 - 3. Review required content of instruction.
 - 4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.5 COORDINATION

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations.
- B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
- C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections, and as follows:
 - 1. Fire-protection systems, including fire alarm and fire-extinguishing systems.
 - 2. Intrusion detection systems.
 - 3. HVAC systems, including air-handling equipment, air distribution systems, and terminal equipment and devices.
 - 4. HVAC instrumentation and controls.
 - 5. Electrical service and distribution, including transformers, switchboards, panelboards, uninterruptible power supplies, and motor controls.
 - 6. Lighting equipment and controls.
 - 7. Communication systems, including intercommunication, voice and data equipment.
- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following:
 - 1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
 - a. System, subsystem, and equipment descriptions.
 - b. Performance and design criteria if Contractor is delegated design responsibility.

- c. Operating standards.
 - d. Regulatory requirements.
 - e. Equipment function.
 - f. Operating characteristics.
 - g. Limiting conditions.
 - h. Performance curves.
2. Documentation: Review the following items in detail:
- a. Emergency manuals.
 - b. Operations manuals.
 - c. Maintenance manuals.
 - d. Project Record Documents.
 - e. Identification systems.
 - f. Warranties and bonds.
 - g. Maintenance service agreements and similar continuing commitments.
3. Emergencies: Include the following, as applicable:
- a. Instructions on meaning of warnings, trouble indications, and error messages.
 - b. Instructions on stopping.
 - c. Shutdown instructions for each type of emergency.
 - d. Operating instructions for conditions outside of normal operating limits.
 - e. Sequences for electric or electronic systems.
 - f. Special operating instructions and procedures.
4. Operations: Include the following, as applicable:
- a. Startup procedures.
 - b. Equipment or system break-in procedures.
 - c. Routine and normal operating instructions.
 - d. Regulation and control procedures.
 - e. Control sequences.
 - f. Safety procedures.
 - g. Instructions on stopping.
 - h. Normal shutdown instructions.
 - i. Operating procedures for emergencies.
 - j. Operating procedures for system, subsystem, or equipment failure.
 - k. Seasonal and weekend operating instructions.
 - l. Required sequences for electric or electronic systems.
 - m. Special operating instructions and procedures.
5. Adjustments: Include the following:
- a. Alignments.
 - b. Checking adjustments.
 - c. Noise and vibration adjustments.
 - d. Economy and efficiency adjustments.
6. Troubleshooting: Include the following:
- a. Diagnostic instructions.
 - b. Test and inspection procedures.

7. Maintenance: Include the following:
 - a. Inspection procedures.
 - b. Types of cleaning agents to be used and methods of cleaning.
 - c. List of cleaning agents and methods of cleaning detrimental to product.
 - d. Procedures for routine cleaning
 - e. Procedures for preventive maintenance.
 - f. Procedures for routine maintenance.
 - g. Instruction on use of special tools.
8. Repairs: Include the following:
 - a. Diagnosis instructions.
 - b. Repair instructions.
 - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - d. Instructions for identifying parts and components.
 - e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a combined training manual.
- B. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

- A. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
 1. Owner will furnish Contractor with names and positions of participants.
- B. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
 1. Schedule training with Owner with at least seven days' advance notice.
- C. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a demonstration performance-based test.
- D. Cleanup: Collect used and leftover educational materials and give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

END OF SECTION 017900

SECTION 018119 – INDOOR AIR QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Microbial and fungal contamination control.
 - 2. Indoor air quality and pollution control.
 - 3. Heating, ventilating, and air conditioning.
 - 4. Description of Indoor Air Quality (IAQ) Construction Plan.
 - 5. IAQ Construction requirements.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 01 Section “Temporary Facilities and Controls” for temporary facility requirements.
 - 2. Division 01 Section “Closeout Procedures” for final cleaning.

1.3 INDOOR AIR QUALITY

- A. Goals: The Owner has set the following goals to maintain indoor air quality for jobsite operations for this Project, within the limits of the construction schedule, Contract sum, and utilizing available materials, equipment, products, and services.
 - 1. Protect workers on-site from undue health risks during construction.
 - 2. Prevent residual problems with indoor air quality in the completed building.
- B. Product Emission Rate Standards: Test to ASTM D 5116 for Maximum Indoor Air Concentration Levels.
 - 1. Formaldehyde:
 - a. 0.03 parts per million where no other requirements are specified.
 - b. 0.005 parts per million where products are specified as formaldehyde free.
 - 2. Total VOC Emissions for Carpet Tile, Adhesives, and Sealers: 0.05 mg/m² per hour.
 - 3. 4 Phenyl Cyclohexene (4-PC) Particulate Emissions for Carpet: 1 part per billion.
 - 4. Total Particulate Emission Rate Levels: 50 ug/m³.
 - 5. Primary and Secondary Regulated Pollutants: Conform to USEPA, Code of Federal Regulations, Title 40, Part 50 National Air Ambient Air Quality Standard. Refer to EPA Web Site: <http://www.epa.gov/epahome/rules.html#codified>.
 - 6. Other Pollutants not Listed: Not greater than 1/10 of Threshold Limit Value - Time Weighted Average (TLV-TWA) Industrial workplace standard.

- C. Architectural Coatings - Volatile Organic Compound (VOC) Content Limits: Conform to US Environmental Protection Agency (EPA) Federal Register 48886/Vol. 63, No. 176 Friday, September 11, 1998/Rules and Regulations. Refer to EPA Web Site: <http://www.epa.gov/>.

1.4 SUBMITTALS

- A. Indoor Air Quality Construction Plan: Within fourteen (14) days of Notice to Proceed, prior to any waste removal by the Subcontractor, the Subcontractor shall develop and submit for review an indoor air quality plan, including the following:
1. List of IAQ protective measures to be instituted on the site.
 2. Schedule for inspections and maintenance of IAQ measures.
- B. Moisture-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage, including delivery, handling, and storage provisions for materials subject to water absorption or water damage, discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water damaged Work.
1. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.
- C. Dust-Control and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust-control and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Identify further options if proposed measures are later determined to be inadequate. Include the following:
1. Locations of dust-control partitions at each phase of the work.
 2. HVAC system isolation schematic drawing.
 3. Location of proposed air filtration system discharge.
 4. Other dust-control measures.
 5. Waste management plan.
- D. Substitutions: If the Subcontractor elects to use procedures, materials, equipment or products that are not specified, but meet the intent of these specifications, submit an alternative solution for approval.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Do not use products in combination with or in contact with other products that can be identified as combining to form toxic fumes or sustained odors.
- B. Do not use solvents within interior areas that may penetrate and be retained in absorptive materials such as concrete, gypsum board, wood, cellulose products, fibrous material, and textiles.

PART 3 - EXECUTION

3.1 GENERAL

- A. Protect construction materials from contamination and pollution from contact with construction dust, debris, fumes, solvents, and other environmentally polluting materials.
- B. Conduct regular inspection and maintenance of indoor air quality measures including ventilation system protection, and ventilation rate.
- C. Use low-toxic cleaning supplies for surfaces, equipment, and worker's personal use. Options include soybean-based solvents and cleaning options and citrus-based cleaners.
- D. Use safety meetings, signage, and subcontractor agreements to communicate the goals of the indoor air quality construction plan.
- E. Clean spills immediately involving solvents or cleaners.

3.2 HEATING, VENTILATING, AND AIR CONDITIONING

- A. The Contractor is required to meet or exceed the minimum requirements of the Sheet Metal and Air conditioning National Contractor's Association (SMACNA) IAQ Guidelines for Occupied Buildings Under Construction, 1995, and the following:
 - 1. Do not run HVAC system during course of construction unless the Owner has authorized the use of the permanent heating system. Seal ductwork intake and exhaust vents.
 - 2. Heat, dehumidify and ventilate building during course of Work as necessary to maintain environmental conditions suitable for drying and curing materials and for prevention of conditions suitable for mold and mildew growth.
 - a. Ventilate building removing moisture, dust, fumes, and odors.
 - b. Temper and dehumidify air as needed to remove excess moisture.
 - c. Refer to Division 01 Section "Temporary Facilities and Controls" for temporary heating requirements.

3.3 MOISTURE AND MOLD CONTROL

- A. Contractor's Moisture-Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.
- B. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:
 - 1. Protect porous materials from water damage.
 - 2. Protect stored and installed material from flowing or standing water.
 - 3. Keep porous and organic materials from coming into prolonged contact with concrete.
 - 4. Remove standing water from decks.
 - 5. Keep deck openings covered or dammed.
- C. Partially Enclosed Construction Phase: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:
 - 1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.

2. Keep interior spaces reasonably clean and protected from water damage.
 3. Periodically collect and remove waste containing cellulose or other organic matter.
 4. Discard or replace water-damaged material.
 5. Do not install material that is wet.
 6. Discard, replace or clean stored or installed material that begins to grow mold.
 7. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.
- D. Controlled Construction Phase of Construction: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
 2. Use permanent HVAC system to control humidity.
 3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.
 - a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective.
 - b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record daily readings over a forty-eight hour period. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.
 - c. Remove materials that can not be completely restored to their manufactured moisture level within 48 hours.
- E. Perform, schedule, and sequence Work as required to limit conditions supporting formations of microbes, molds, and fungi.
1. Control water penetration, dampness, and humidity to prevent products not treated for exterior use from becoming soaked or damp.
- B. When visible formations are observed and when formations completely removed by non-abrasive surface cleaning:
1. Remove and replace materials identified as food sources for microbes, molds, and fungi.
 2. Correct conditions supporting microbial, mold, and fungal growth.
- C. Remove interior products and finishes, identified as food sources, that have absorbed sufficient moisture to become damp whether or not microbial, mold, or fungal growth is observed. Products may include, but not be limited to, the following:
1. Gypsum board cores.
 2. Organic materials composed of cellulose fiber or paper.
 3. Materials containing sucrose or other binders identified supporting microbial growth.
- D. Remove fibrous insulation materials subject to retaining moisture such as duct liner, insulation, and other materials that are made wet or damp and cannot immediately be made dry.
- E. Repair or replace ductwork, pans, and other conditions where moisture condensation, water penetration, or drained water has caused damage to such materials.
1. Remove conditions that have become an environment for microbes, molds, or fungi.
 2. Do not permit conditions leading to standing water.

- F. Remedial Action: Notify Owner and Architect prior to beginning remedial action where continuation by hazardous chemicals, microbes, and fungi is suspected.

3.4 DUST CONTROL

- A. Prevent construction dust from entering Owner occupied areas. Erect temporary partitions in accordance with Division 01 Section "Temporary Facilities and Controls."
- B. Levels of airborne respirable dust in excess of 15 mg/m³ are considered excessive. Should such levels be reached or exceeded, discontinue activities which are creating dust, clean all surfaces, and take action to reduce the level of dust being created to within acceptable limits.

END OF SECTION 018119

SECTION 024119 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Demolition and removal of portions of exterior masonry walls as indicated.
 - 2. Demolition and removal of storefront, as indicated.
 - 3. Demolition and removal of portions of concrete slabs, as indicated.
 - 4. Demolition and removal of stair handrail, as indicated.
 - 5. Demolition and removal of interior partitions, and/or portions of interior partitions, as indicated.
 - 6. Demolition and removal of finish systems, including ceilings and floor finishes as indicated.
 - 7. Demolition and removal of doors, frames and hardware, as indicated.
 - 8. Demolition and removal of mechanical, electrical and plumbing systems, as indicated.
 - 9. Removal and salvage of the following to be returned to Owner:
 - a. Loose furniture, fixtures and equipment.
- B. Related Sections include the following:
 - 1. Division 01 Section "Summary" for use of premises and Owner-occupancy requirements.
 - 2. Division 01 Section "Temporary Facilities and Controls" for temporary construction and environmental-protection measures for selective demolition operations.
 - 3. Division 01 Section "Cutting and Patching" for cutting and patching procedures.
 - 4. Division 02 Abatement Sections.

1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.
- B. Remove and Salvage: Detach items from existing construction and deliver them to Owner.
- C. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.
- D. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.4 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.

- B. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be encountered during selective demolition remain Owner's property.

- 1. Carefully remove and salvage each item or object in a manner to prevent damage and deliver promptly to Owner.

1.5 PRE-DEMOLITION MEETINGS

- A. Pre-demolition Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to selective demolition including, but not limited to, the following:

- 1. Inspect and discuss condition of construction to be selectively demolished.
 - 2. Review structural load limitations of existing structure.
 - 3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
 - 4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
 - 5. Review areas where existing construction is to remain and requires protection.

1.6 INFORMATIONAL SUBMITTALS

- A. Proposed Protection Measures: Submit report, including drawings, that indicates the measures proposed for protecting individuals and property **for environmental protection, for dust control, and for noise control**. Indicate proposed locations and construction of barriers.

- B. Schedule of Selective Demolition Activities: Indicate the following:

- 1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
 - 2. Interruption of utility services. Indicate how long utility services will be interrupted.
 - 3. Coordination for shutoff, capping, and continuation of utility services.
 - 4. Locations of proposed dust- and noise-control temporary partitions and means of egress.
 - 5. Coordination of Owner's continuing occupancy of portions of existing building.
 - 6. Means of protection for items to remain and items in path of waste removal from building.

- C. Warranties: Documentation indicated that existing warranties are still in effect after completion of selective demolition.

1.7 CLOSEOUT SUBMITTALS

- A. Inventory: After selective demolition is complete, submit a list of items that have been removed and salvaged.

- B. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.8 PROJECT CONDITIONS

- A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
 - 1. Comply with requirements specified in Division 01 Section "Summary."
- B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- D. Hazardous Materials: Hazardous materials are present in construction to be selectively demolished. A report on the presence of hazardous materials is included in Division 00 Section "Existing Hazardous Materials Information." Examine report to become aware of locations where hazardous materials are present.
 - 1. Hazardous material remediation is specified in other Division 02 Sections.
 - 2. If unidentified hazardous materials are encountered during the work, do not disturb hazardous materials or items suspected of containing hazardous materials. Stop all work on the project and immediately notify Architect and Owner.
- E. Storage or sale of removed items or materials on-site is not permitted.
- F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
 - 1. Maintain fire-protection facilities in service during selective demolition operations.

1.9 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties. Notify warrantor before proceeding. Existing warranties include the following:
 - 1. Membrane roofing system.
- B. Notify warrantor on completion of selective demolition, and obtain documentation verifying that existing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped.
- B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.
- D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.
- E. Engage a professional engineer to survey condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective demolition operations.
- F. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs.
 - 1. Inventory and record the condition of items to be removed and salvaged. Provide photographs of conditions that might be misconstrued as damage caused by salvage operations.
 - 2. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems: Maintain services/systems indicated to remain and protect them against damage during selective demolition operations.
 - 1. Comply with requirements for existing services/systems interruptions specified in Division 01 Section "Summary."
- B. Service/System Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
 - 1. Owner will arrange to shut off indicated services/systems when requested by Contractor.
 - 2. If services/systems are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
 - 3. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated to be removed.
 - a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
 - b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
 - c. Equipment to Be Removed: Disconnect and cap services and remove equipment.

- d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
- e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.

3.3 PREPARATION

- A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. Comply with requirements for access and protection specified in Division 01 Section "Temporary Facilities and Controls."
- B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 - 1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
 - 2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
 - 3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
 - 4. Cover and protect furniture, furnishings, and equipment that have not been removed.
 - 5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Division 01 Section "Temporary Facilities and Controls."
 - 6. Comply with indoor air quality requirements specified in Division 01 Section "Indoor Air Quality Construction Plan."
- C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
 - 1. Strengthen or add new supports when required during progress of selective demolition.

3.4 SELECTIVE DEMOLITION, GENERAL

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
 - 1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
 - 2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
 - 3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.

4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
5. Maintain adequate ventilation when using cutting torches.
6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
9. Dispose of demolished items and materials promptly.

B. Removed and Salvaged Items:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area designated by Owner.
5. Protect items from damage during transport and storage.

C. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

- D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and reinstalled in their original locations after selective demolition operations are complete.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- A. Concrete: Demolish in small sections. Cut concrete to a depth of at least 3/4 inch at junctures with construction to remain, using power-driven saw. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete indicated for selective demolition. Neatly trim openings to dimensions indicated.
- B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.
- C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.
- D. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings." Do not use methods requiring solvent-based adhesive strippers.
1. Remove residual adhesive and prepare substrate for new floor coverings by one of the methods recommended by RFCI.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them.
 - 1. Do not allow demolished materials to accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 - 3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
- B. Burning: Do not burn demolished materials.
- C. Disposal: Transport demolished materials off Owner's property.
 - 1. Include cost of all transportation and disposal.
 - 2. Provide verification of all disposal trips.
 - 3. Hazardous materials are to be handled and disposed of in accordance with all State, Local, and Federal regulations.

3.7 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 024119

SECTION 061053 - MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Wood blocking, nailers, and plywood associated with roofing.
 - 2. Wood blocking in partition framing, including wood blocking for Owner furnished millwork and equipment.
 - 3. Plywood backing panels.
- B. Related Sections include the following:
 - 1. Division 08 Section "Door Hardware" for door hardware and additional installation requirements.

1.3 DEFINITIONS

- A. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.
- B. Lumber grading agencies, and the abbreviations used to reference them, include the following:
 - 1. NeLMA: Northeastern Lumber Manufacturers' Association.
 - 2. NLGA: National Lumber Grades Authority.

1.4 SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
 - 1. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
 - 2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
 - 3. Include copies of warranties from chemical treatment manufacturers for each type of treatment.
- B. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:
 - 1. Fire-retardant-treated wood.

2. Power-driven fasteners.
3. Powder-actuated fasteners.
4. Expansion anchors.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.
- B. Deliver interior wood materials that are to be exposed to view only after building is enclosed and weatherproof, wet work other than painting is dry, and HVAC system is operating and maintaining temperature and humidity at occupancy levels.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
 1. Factory mark each piece of lumber with grade stamp of grading agency.
 2. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
 3. Provide dressed lumber, S4S, unless otherwise indicated.
- B. Plywood: DOC PS 1.
 1. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.
 2. Factory mark panels to indicate compliance with applicable standard.

2.2 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
- B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
 1. Use treatment that does not promote corrosion of metal fasteners.
 2. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.

- C. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Kiln-dry plywood after treatment to a maximum moisture content of 15 percent.
- D. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.
- E. Application: Treat the following:
 - 1. Concealed blocking in wall framing and window opening framing.
 - 2. Plywood backing panels.
- F. Manufacturers: Subject to compliance with requirements, provide products by one the following:
 - 1. Dricon.
 - 2. Hoover Treated Wood Products.
 - 3. Koppers Performance Chemicals.

2.3 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
 - 1. Blocking.
 - 2. Nailers.
 - 3. Furring.
- B. For items of dimension lumber size, provide Construction or No. 2 lumber with 15 percent maximum moisture content and the following species:
 - 1. Hem-fir (north); NLGA.
- C. For blocking not used for attachment of other construction Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.
- D. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.
- E. Application: Provide kiln dried lumber in the following locations:
 - 1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing.

2.4 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
 - 1. Where carpentry is exposed to weather, in ground contact, fire retardant treated, or in area of high relative humidity, provide G185 galvanized steel fasteners, or fasteners with hot-dipped galvanized after fabrication.

- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: NES NER-272.
- D. Wood Screws: ASME B18.6.1.
- E. Lag Bolts: ASME B18.2.1.
- F. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.
- G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.
 - 1. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.
- B. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
 - 1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.
- C. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:
 - 1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
- D. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- E. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. NES NER-272 for power-driven fasteners.
 - 2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.

- F. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; do not countersink nail heads, unless otherwise indicated.

3.2 WOOD BLOCKING AND NAILER INSTALLATION

- A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.

3.3 FIRE-RETARDANT-TREATED (FRT) MATERIALS INSTALLATION

- A. Cutting to length, drilling holes, joining cuts and light sanding are permissible. It is not necessary to field treat cut ends to maintain flame spread rating.
 - 1. Ripping, milling, and surfacing of FRT lumber is not permitted.
 - 2. FRT plywood can be cut in either direction without loss of fire protection.

3.4 PROTECTION

- A. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061053

SECTION 064023 - INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Plastic-laminate-clad cabinets.
 - 2. Plastic-laminate-clad soffits.
 - 3. Wood soffit panels.
 - 4. Suspended plastic-laminate clad wood trellis.
 - 5. Wood handrails for installation at existing stairs.
 - 6. Banquettes.
- B. Section also includes:
 - 1. Wood furring, blocking, shims, and hanging strips for installing interior architectural woodwork, unless concealed within other construction before cabinet installation.
- C. Related Sections include the following:
 - 1. Division 06 Section "Miscellaneous Rough Carpentry" for wood furring, blocking, shims, fire retardant treated plywood, and hanging strips required for installing woodwork and concealed within other construction before woodwork installation.
 - 2. Division 09 Section "Painting" for field finishing standing and running wood trim.
 - 3. Division 12 Section "Simulated Stone Countertops" for solid-surface countertops installed with custom interior architectural woodwork (separate contract).

1.3 DEFINITIONS

- A. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items unless concealed within other construction before woodwork installation.
- B. Exposed Exterior Surfaces of Cabinets: All exterior surfaces exposed to view as follows:
 - 1. All surfaces visible when door and drawers are closed, including knee spaces.
 - 2. Underside of cabinet bottoms over 42 inches above finish floor, including cabinet bottoms behind light valances and the bottom edge of light valances.
 - 3. Cabinet tops under 80 inches above finish floor, or if over 80 inches and visible from an upper level.
 - 4. Visible front edges of stretchers, ends, divisions, tops, bottoms, shelves and nailers.
 - 5. Sloping tops of cabinets that are visible.

- C. Exposed Interior Surfaces of Cabinets: All interior surfaces exposed to view in open casework or behind glass doors as follows:
 - 1. Shelves, including edgebanding.
 - 2. Divisions and partitions.
 - 3. Interior face of ends (sides), backs, and bottoms (including pull-outs).
 - 4. Interior surfaces of cabinet top members 36 inches or more above finished floor.
 - 5. Interior face of door and applied drawer fronts.
- D. Semi-exposed Surfaces of Cabinets: Interior surfaces exposed to view only when doors or drawers are opened as follows:
 - 1. Shelves, including edgebanding.
 - 2. Divisions and partitions.
 - 3. Interior face of ends (sides), backs, and bottoms (including pull-outs).
 - 4. Interior surfaces of cabinet top members 36 inches or more above finished floor.
 - 5. Drawer sides, sub-fronts, backs, and bottoms.
 - 6. Underside of cabinet bottoms between 24 and 42 inches above finished floor.
 - 7. Security and dust panels or drawer stretchers.
- E. Concealed Surfaces of Cabinets: Exterior or interior surfaces that are covered or not normally exposed to view, as follows:
 - 1. Toe space, unless otherwise specified.
 - 2. Sleepers, stretchers, and solid sub-tops.
 - 3. Underside of cabinet bottoms less than 24 inches above finished floor.
 - 4. Flat tops of cabinets 80 inches or more above finished floor, except if visible from an upper level.
 - 5. The three non-visible sides of adjustable shelves.
 - 6. The underside of countertops, knee spaces, and drawer aprons.
 - 7. The faces of cabinet ends of adjoining units that butt together.

1.4 SUBMITTALS

- A. Product Data: For high-pressure decorative laminate, adhesive for bonding plastic laminate, cabinet hardware and accessories.
- B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
 - 1. Indicate AWI/QCP Number assigned to this Project on all pages of shop drawings.
 - 2. Show details full size.
 - 3. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
 - 4. Show locations and sizes of cutouts and holes for plumbing fixtures and faucets installed in architectural woodwork.
- C. Samples for Initial Selection:
 - 1. Plastic laminates.
 - 2. PVC edge material.

D. Samples for Verification:

1. Lumber for transparent finish, not less than 5 inches wide by 24 inches long, for each species and cut, finished on 1 side and 1 edge.
2. Plastic laminates, 8 by 10 inches, for each type, color, pattern, and surface finish.
3. Corner pieces as follows:
 - a. Cabinet-front frame joints between stiles and rails, as well as exposed end pieces, 18 inches high by 18 inches wide by 6 inches deep.
4. Exposed cabinet hardware and accessories, one unit for each type.
5. Full size cabinet samples, including all mounting hardware and fasteners.
 - a. One full size base cabinet with drawer and all hardware.
 - b. One full size upper cabinet.

E. Product Certificates: For each type of product, signed by product manufacturer.

F. Woodwork Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

G. Qualification Data: For Fabricator.

H. Delegated-Design Submittal: For design of suspended wood ceiling system, seismic restraints and attachment devices.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance. Shop is a certified participant in AWI's Quality Certification Program.
- B. Installer Qualifications: Fabricator of products, or installer approved by fabricator and a certified participant in AWI's Quality Certification Program.
- C. Professional Structural Engineer Qualifications: A professional structural engineer who is legally qualified to practice in the State of New York and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations that are similar to those indicated for this Project in material, design, and extent.
- D. Accessibility: Comply with applicable provisions in the 2010 ADA Standards and ICC/ANSI A117.1.
- E. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Woodwork Quality Standards" for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.
 1. Contractor shall register the work of this Section with the AWI Quality Certification Program.
 2. Provide AWI Quality Certification labels and certificates indicating that interior architectural woodwork, including installation, complies with requirements of grades specified.
 3. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.

- F. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Build mockups of typical plastic-laminate-clad cabinets, including the following:
 - a. A minimum of two base cabinets, with countertop.
 - b. One upper cabinet.
 - c. One tall cabinet.
 - 2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver woodwork until painting and similar operations that could damage woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent during the remainder of the construction period.
- B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed, and indicate measurements on Shop Drawings.

1.8 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Division 01 Section "Quality Requirements," and licensed in the State of New York to design suspension system, seismic restraints, and attachment devices for suspended trellis ceiling.

- B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: Comply with ASTM E 84 for Class C materials.
 - 2. Smoke-Developed Index: 450 or less.

2.2 MATERIALS

- A. General: Provide materials that comply with requirements of AWT's quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.
- B. Wood Products: Comply with the following:
 - 1. Hardboard: AHA A135.4.
 - 2. Medium-Density Fiberboard: ANSI A208.2, Grade MD, made with binder containing no urea formaldehyde.
 - 3. Particleboard: ANSI A208.1, Grade M-2.
 - 4. Softwood Plywood: DOC PS 1.
- C. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper complying with LMA SAT-1.
 - 1. Provide PVC or polyester edge banding complying with LMA EDG-1 on components with exposed or semiexposed edges.
- D. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or, if not indicated, as required by woodwork quality standard.
 - 1. Basis of Design Products (**PL-01,02,03**): Subject to compliance with requirements, provide **Wilsonart** in colors as indicated on the Finish Legend or comparable product by one of the following:
 - a. Formica.
 - b. Pionite.

2.3 CABINET HARDWARE AND ACCESSORIES

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets.
- B. Butt Hinges: 2-3/4-inch, 5-knuckle steel hinges made from 0.095-inch- thick metal, and as follows:
 - 1. Semiconcealed Hinges for Overlay Doors: BHMA A156.9, B01521.
- C. Wire Pulls:
 - 1. Basis of Design Product: Subject to compliance with requirements, provide the following:
 - a. **Top Knobs; Square Bar Pull M1158.**
 - 2. Finish: Brushed satin nickel.
 - 3. Length: 5-1/16- inches center to center.

- D. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf brackets, B04081.
- E. Shelf Rests: BHMA A156.9, B04013; plastic, two-pin type with shelf hold-down clip.
- F. Catches: Magnetic catches, BHMA A156.9, B03141.
- G. Drawer Slides: BHMA A156.9, B05091.
 - 1. Heavy Duty (Grade 1HD-100 and Grade 1HD-200): Side mounted; full-extension type; zinc-plated steel ball-bearing slides.
 - 2. Box Drawer Slides: Grade 1HD-100; for drawers not more than 6 inches high and 24 inches wide.
 - 3. File Drawer Slides: Grade 1HD-200; for drawers more than 6 inches high or 24 inches wide.
- H. Locks: Furnish locks on all cabinet doors and drawers, keyed alike per room, with one master key.
 - 1. Door Locks: BHMA A156.11, E07121.
 - 2. Drawer Locks: BHMA A156.11, E07041.
- I. Grommets for Cable Passage through Countertops: 3-1/2-inch OD, aluminum grommet and matching cap with slot for wire passage, and radiused brush.
 - 1. Basis of Design Product: Subject to compliance with requirements, provide the following:
 - a. **Doug Mockett & Company, Inc.; ABG3-94.**
- J. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
 - 1. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.
- K. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.4 MISCELLANEOUS MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.
- C. Adhesives, General: Do not use adhesives that contain urea formaldehyde.
- D. Adhesive for Bonding Plastic Laminate: Contact cement.
- E. VOC Limits for Installation Adhesives and Glues: Use installation adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - 1. Wood Glues: 30 g/L.
 - 2. Multipurpose Construction Adhesives: 70 g/L.
 - 3. Contact Adhesive: 250 g/L.

2.5 FABRICATION, GENERAL

- A. Interior Woodwork Grade: Unless otherwise indicated, provide Custom-grade interior woodwork complying with referenced quality standard.
- B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.
- C. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
 - 1. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members 3/4 Inch Thick or Less: 1/16 inch.
- D. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
 - 1. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements indicated on Shop Drawings before disassembling for shipment.
- E. Shop-cut openings to maximum extent possible to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
 - 1. Seal edges of openings in countertops with a coat of varnish.

2.6 PLASTIC-LAMINATE-CLAD CABINETS

- A. Grade: Custom.
- B. Type of Construction: Frameless.
- C. Cabinet, Door, and Drawer Front Interface Style: Flush overlay.
- D. Cabinet Fabrication: 3/4-inch particleboard.
- E. Shelving: Fabricated from particleboard with surfaces indicated, in the following thicknesses:
 - 1. Shelving up to 36- inches wide: 1-inch thick.
 - 2. Shelving 36- inches to 48- inches wide: 1-1/4-inch thick.
- F. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate complying with the following requirements:
 - 1. Horizontal Surfaces Other Than Tops: Grade HGS.
 - 2. Vertical Surfaces, Base and Tall Cabinets: Grade HGS.
 - 3. Vertical Surfaces, Upper Cabinets: Grade VGS.
 - 4. Edges: PVC edge banding, 0.12 inch (3 mm) thick, in color selected by Architect from manufacturer's full range.
 - 5. Pattern Direction: Vertically for drawer fronts, doors, and fixed panels.

G. Materials for Semiexposed Surfaces:

1. Horizontal Surfaces, Shelves: Grade HGS.
2. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate.
 - a. Edges of Plastic-Laminate Shelves: PVC edge banding, 0.12 inch (3 mm) thick, in color as selected by Architect from manufacturer's full range.
 - b. For semi-exposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, Grade VGS for vertical surfaces with VGS specified for exposed surfaces.
 - c. For semi-exposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, Grade HGS for vertical surfaces with HGS specified for exposed surfaces.
3. Drawer Sides and Backs: Thermoset decorative panels.
4. Drawer Bottoms: Thermoset decorative panels.

H. Concealed Backs of Panels with Exposed Plastic Laminate Surfaces: High-pressure decorative laminate, Grade BKL.

2.7 SUSPENDED TRELLIS CEILINGS

A. Grade: Premium.

B. Slotted Channel Framing System: Fabricated from 12-gauge cold formed steel, hot-dipped galvanized finish.

1. Product: Subject to compliance with requirements, provide the following:
 - a. **UNISTRUT Channel Framing System; P1000.**
2. Channels: Minimum pull out resistance of 1,000 lbs. when load is applied over a 3/8-inch long section.
 - a. Channel profile: 1-5/8" x 1-5/8".
3. Fasteners: Provide stainless steel fasteners as required for the assembly.
4. Finish: Painted black to comply with Division 09 Section "Painting."

2.8 WOOD HANDRAILS (FIELD FINISHED)

A. Interior Handrails: White maple, plain sliced, of size and shape indicated.

B. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets for attaching to other work. Furnish inserts and other anchorage devices for connecting to gypsum board or masonry work.

- 1.
2. Wall Brackets: Provide minimum clearance of 1-1/2- inches from bottom of handrail to top of horizontal projection of the bracket, and minimum 1-1/2- inches clear from wall to edge of handrail.
 - a. Product: Subject to compliance with requirements, provide the following, or equal:
 - 1) The Wagner Companies; Style D Handrail Bracket, No. 4591, malleable iron.

2.9 BANQUETTES

- A. Banquettes: Constructed with multi-ply exterior grade hardwood plywood frames, flame retardant sheet webbing suspension system and flame retardant foams. Frames assembled with pneumatic staples and glued, screwed and/or reinforced at all potential stress points. Custom fabricate banquettes to configurations indicated.
- B. Fire-Test-Response Characteristics of Upholstered Seating:
 - 1. Fabric: Class 1 according to DOC CS 191-1953 or 16 CFR 1610, tested according to California Technical Bulletin 117.
 - 2. Padding: Comply with California Technical Bulletin 117.
 - 3. Full-Scale Fire Test: Comply with California Technical Bulletin 133.
- C. Fabrics, General: Performance requirements are indicated for basis of design products for the purpose of comparing equal or comparable products by listed manufacturers.
 - 1. Basis of Design Products (**FAB-001,002,003**): Subject to compliance with requirements, provide products indicated on Finish Material List.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition woodwork to average prevailing humidity conditions in installation areas.
- B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.2 INSTALLATION

- A. Grade: Install woodwork to comply with requirements for the same grade specified in Part 2 for fabrication of type of woodwork involved.
- B. Assemble woodwork and complete fabrication at Project site to comply with requirements for fabrication in Part 2, to extent that it was not completed in the shop.
- C. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches.
- D. Scribe and cut woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- E. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.
- F. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible. Do not use pieces less than 96 inches long, except where shorter single-length pieces are necessary. Scarf running joints and stagger in adjacent and related members.

1. Fill gaps, if any, between top of base and wall with plastic wood filler, sand smooth, and finish same as wood base if finished.
 2. Install standing and running trim with no more variation from a straight line than 1/8 inch in 96 inches.
- G. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
1. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
 2. Maintain veneer sequence matching of cabinets with transparent finish.
 3. Fasten wall cabinets through back, near top and bottom, at ends and not more than 16 inches o.c. with No. 10 wafer-head screws sized for 1-inch penetration into wood framing, blocking, or hanging strips.
- H. Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.
- I. Refer to Division 09 Section "Painting" for final finishing of installed architectural woodwork.

3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
- B. Clean, lubricate, and adjust hardware.
- C. Clean woodwork on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 064023

SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Perimeter insulation under slabs-on-grade.
 - 2. Perimeter wall insulation (supporting backfill).
 - 3. Thermal insulation.
 - 4. Sound attenuation insulation.
 - 5. Fire safing insulation.
 - 6. Vapor retarders.
- B. Related Sections include the following:
 - 1. Division 04 Section "Unit Masonry" for insulation installed in cavity walls.
 - 2. Division 07 Section "Ethylene-Propylene-Diene-Monomer (EPDM) Roofing" for insulation specified as part of roofing construction.
 - 3. Division 09 Section "Gypsum Board Assemblies" for installation in metal-framed assemblies of insulation specified by referencing this Section.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Verification: Full-size units for each type of exposed insulation indicated.
- C. Low-emitting product certification.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- B. Research/Evaluation Reports: For foam-plastic insulation, from ICC-ES.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of building insulation through one source from a single manufacturer.

- B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
 - 1. Surface-Burning Characteristics: ASTM E 84.
 - 2. Fire-Resistance Ratings: ASTM E 119.
 - 3. Combustion Characteristics: ASTM E 136.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.
- B. Protect plastic insulation as follows:
 - 1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
 - 2. Protect against ignition at all times. Do not deliver plastic insulating materials to Project site before installation time.
 - 3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.
- C. Indoor Air Quality Requirements: The following practices shall be implemented in accordance with Division 01 Section "Indoor Air Quality Requirements."
 - 1. Insulations are to be stored per manufacturer's recommendations for allowable temperature and humidity range. Insulations shall not be allowed to become damp.
 - 2. Where feasible, fiberglass, mineral wool, and other fibrous insulations shall be stored separately from materials which have high short-term emissions. Materials with high short-term emissions include, but are not limited to: adhesives, sealants and glazing compounds (specifically those with petrochemical vehicles or carriers); paint, wood preservatives, and finishes; control and/or expansion joint fillers; hard finishes requiring adhesive installation; gypsum board (with associated finish processes and products); and composite or engineered wood products with formaldehyde binders.
 - 3. Where feasible, exposed fiberglass or mineral wool insulations shall not be stored in occupied spaces, near HVAC diffusers (supply or return), or near fresh air intakes.

PART 2 - PRODUCTS

2.1 FOAM-PLASTIC BOARD INSULATION

- A. Extruded-Polystyrene Board Insulation (Perimeter Wall): ASTM C 578, of type and density indicated below, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively:
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Dow Chemical Company; Styrofoam Brand Square Edge.
 - b. GreenGuard; XPS Type IV.
 - c. Owens Corning; Foamular 250.

2. Type IV, 1.60 lb/cu. ft.
3. Thermal Resistance: 5 year aged R-values of 5.4 and 5.0 minimum, at 40 deg. F and 75 deg. F respectively.
4. Compressive Strength: ASTM D1621, 25 psi.
5. Water absorption: ASTM C272, 0.1% by volume maximum.

B. Extruded-Polystyrene Board Insulation (Under Slab): ASTM C 578, of type and density indicated below, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively:

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Dow Chemical Company; Styrofoam Highload 40.
 - b. GreenGuard; XPS Type VI.
 - c. Owens Corning; Foamular 400.
2. Type VI, 1.80 lb/cu. ft.
3. Thermal Resistance: 5 year aged R-values of 5.4 and 5.0 minimum, at 40 deg. F and 75 deg. F respectively.
4. Compressive Strength: ASTM D1621, 40 psi.
5. Water absorption: ASTM C272, 0.1% by volume maximum.

2.2 GLASS-FIBER BLANKET INSULATION (THERMAL)

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. CertainTeed Corporation; CertaPro AcoustaTherm Batts.
2. Johns Manville; Unfaced.
3. Knauf; EcoBatt.
4. Owens Corning; Ecotouch Thermal Batt Insulation.

B. Thermal Insulation: Provide insulating materials as follows:

1. Unfaced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
 - a. Provide thickness indicated or as required to fill depth of partition.

2.3 GLASS-FIBER BLANKET INSULATION (SOUND ATTENUATION)

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. CertainTeed Corporation; CertaPro AcoustaTherm Batts.
2. Johns Manville; Sound Control Batts.
3. Knauf; EcoBatt.
4. Owens Corning; Sound Attenuation Batt Insulation (SAB).

B. Sound Attenuation Insulation: Provide insulating materials as follows:

1. Unfaced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

- a. Thickness: As indicated, not less than 3-1/2 inches.

2.4 MINERAL-WOOL-BOARD INSULATION (FIRE SAFING)

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Johns Manville; MinWool Safing.
 - 2. Roxul Inc.; Roxul SAFE.
 - 3. Thermafiber; Safing Insulation.
- B. Unfaced, Mineral-Wool Board Insulation: ASTM C 612; water repellant rigid insulation board with a rigid upper surface, with maximum flame-spread and smoke-developed indexes of zero, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
 - 1. Nominal density of 4.5 lb/cu. ft. minimum.

2.5 VAPOR RETARDERS

- A. Polyethylene Vapor Retarders: ASTM D 4397, 6 mils thick, with maximum permeance rating of 0.13 perm.
- B. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.
- C. Vapor-Retarder Fasteners: Pancake-head, self-tapping steel drill screws; with fender washers.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements of Sections in which substrates and related work are specified and for other conditions affecting performance.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected. Commencement of work indicates acceptance of substrates.

3.2 PREPARATION

- A. Clean substrates of substances harmful to insulation or vapor retarders, including removing projections capable of puncturing vapor retarders or of interfering with insulation attachment.

3.3 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice, rain, and snow.

- C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. For preformed insulating units, provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.4 INSTALLATION OF PERIMETER AND UNDER-SLAB INSULATION

- A. On vertical surfaces, set insulation units in adhesive applied according to manufacturer's written instructions. Use adhesive recommended by insulation manufacturer.
 - 1. If not otherwise indicated, extend insulation a minimum of 48 inches below exterior grade line.
- B. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.
- C. Protect below-grade insulation on vertical surfaces from damage during backfilling by applying protection course with joints butted. Set in adhesive according to insulation manufacturer's written instructions.
- D. Protect top surface of horizontal insulation from damage during concrete work by applying protection course with joints butted.

3.5 INSTALLATION OF GENERAL BUILDING INSULATION

- A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
- B. Install mineral-fiber insulation in cavities formed by framing members according to the following requirements:
 - 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill cavity, provide lengths that will produce a snug fit between ends.
 - 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 - 3. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
- C. Install unfaced, slag-wool-fiber/rock-wool-fiber blanket insulation in penetrations in all non-fire rated horizontal floor/ceiling assemblies, including edge of slab conditions indicated. Fill annular space of penetration to resist the free passage of flame and the products of combustion.

3.6 INSTALLATION OF VAPOR RETARDERS

- A. General: Extend vapor retarder to extremities of areas to be protected from vapor transmission. Secure in place with adhesives or other anchorage system as indicated. Extend vapor retarder to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.

- B. Seal vertical joints in vapor retarders over framing by lapping not less than two wall studs. Fasten vapor retarders to wood framing at top, end, and bottom edges; at perimeter of wall openings; and at lap joints. Space fasteners 16 inches o.c.
- C. Seal overlapping joints in vapor retarders with vapor-retarder tape according to vapor-retarder manufacturer's written instructions. Seal butt joints with vapor-retarder tape. Locate all joints over framing members or other solid substrates.
- D. Firmly attach vapor retarders to solid substrates with vapor-retarder fasteners as recommended by vapor-retarder manufacturer.
- E. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarder.
- F. Repair tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarder.

3.7 PROTECTION

- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 072100

SECTION 078413 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Penetrations in fire-resistance-rated walls, including open penetrations.
- B. Related Sections include the following:
 - 1. Division 07 Section "Thermal Insulation" for fire safing insulation in non-fire rated horizontal floor/ceiling assemblies.
 - 2. Division 07 Section "Fire-Resistive Joint Systems" for joints in or between fire-resistance-rated construction.
 - 3. Division 21 Sections specifying fire-suppression piping penetrations.
 - 4. Division 22 Sections specifying plumbing piping penetrations.
 - 5. Division 23 Sections specifying duct and piping penetrations.
 - 6. Division 26 Sections specifying cable and conduit penetrations.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For each through-penetration firestop system, show each type of construction condition penetrated, relationships to adjoining construction, and type of penetrating item. Include firestop design designation of qualified testing and inspecting agency that evidences compliance with requirements for each condition indicated.
 - 1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop system configuration for construction and penetrating items.
 - 2. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular through-penetration firestop condition, submit illustration, with modifications marked, approved by through-penetration firestop system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

3. For those firestop applications that exist for which no qualified tested system is available through a manufacturer, an engineering judgment derived from similar qualified tested system designs or other tests is to be submitted to local authorities having jurisdiction for their review and approval prior to installation. Engineering judgment documents must follow requirements set forth by the International Firestop Council.
- C. Through-Penetration Firestop System Schedule: Indicate locations of each through-penetration firestop system, along with the following information:
 1. Types of penetrating items.
 2. Types of constructions penetrated, including fire-resistance ratings and, where applicable, thicknesses of construction penetrated.
 3. Through-penetration firestop systems for each location identified by firestop design designation of qualified testing and inspecting agency.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: For through-penetration firestop system products, signed by product manufacturer.
- C. Product Test Reports: From a qualified testing agency indicating through-penetration firestop system complies with requirements, based on comprehensive testing of current products.
- D. Material Safety Data Sheets.

1.6 QUALITY ASSURANCE

- A. Installation Responsibility: Assign installation of through-penetration firestop systems and fire-resistive joint systems in Project to a single qualified installer.
- B. Source Limitations: Obtain through-penetration firestop systems, for each kind of penetration and construction condition indicated, through one source from a single manufacturer.
- C. Fire-Test-Response Characteristics: Provide through-penetration firestop systems that comply with the following requirements and those specified in Part 1 "Performance Requirements" Article:
 1. Penetration firestopping tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.
 2. Penetration firestopping is identical to those tested per testing standard referenced in "Penetration Firestopping" Article. Provide rated systems complying with the following requirements:
 - a. Penetration firestopping products bear classification marking of qualified testing and inspecting agency.
 - b. Classification markings on penetration firestopping correspond to designations listed by the following:
 - 1) UL in its "Fire Resistance Directory."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver through-penetration firestop system products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, lot number, shelf life if applicable, qualified testing and inspecting agency's classification marking applicable to Project, curing time, and mixing instructions for multicomponent materials.
- B. Store and handle materials for through-penetration firestop systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install through-penetration firestop systems when ambient or substrate temperatures are outside limits permitted by through-penetration firestop system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. Ventilate through-penetration firestop systems per manufacturer's written instructions by natural means or, where this is inadequate, forced-air circulation.
- C. Do not use products and materials that contain flammable solvents.

1.9 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.
- C. Notify Owner's inspecting agency at least seven days in advance of through-penetration firestop system installations; confirm dates and times on days preceding each series of installations.
- D. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until each installation has been examined by Owner's inspecting agency and building inspector, if required by authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the through-penetration firestop systems indicated for each application in the Through-Penetration Firestop System Schedule at the end of Part 3 that are produced by one of the following manufacturers:
 - 1. Hilti, Inc.
 - 2. 3M; Fire Protection Products Division.
 - 3. Tremco; Tremstop Fire Protection Systems Group.

2.2 PERFORMANCE REQUIREMENTS

- A. General: For penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.
- B. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.
 - 1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
 - 2. For floor penetrations with annular spaces exceeding 4 inches in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved, either by installing floor plates or by other means.
 - 3. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

2.3 PENETRATION FIRESTOPPING

- A. Provide penetration firestopping that is produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.
- B. Penetrations in Fire-Resistance-Rated Walls: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
 - 1. Fire-resistance-rated walls include fire walls, fire-barrier walls, smoke-barrier walls, and fire partitions.
 - 2. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
- C. Exposed Penetration Firestopping: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.
- D. VOC Content: Provide penetration firestopping that complies with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - 1. Architectural Sealants: 250 g/L.
 - 2. Sealant Primers for Nonporous Substrates: 250 g/L.
 - 3. Sealant Primers for Porous Substrates: 775 g/L.
- E. Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials and to comply with Part 1 "Performance Requirements" Article. Use only components specified by through-penetration firestop system manufacturer and approved by qualified testing and inspecting agency for firestop systems indicated. Accessories include, but are not limited to, the following items:
 - 1. Permanent forming/damming/backing materials, including the following:
 - a. Slag-/rock-wool-fiber insulation.

- b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
 - c. Fire-rated form board.
 - d. Fillers for sealants.
- 2. Temporary forming materials.
 - 3. Substrate primers.
 - 4. Collars.
 - 5. Steel sleeves.

2.4 FILL MATERIALS

- A. General: Provide through-penetration firestop systems containing the types of fill materials required in the Through-Penetration Firestop System Schedule at the end of Part 3 by referencing the types of materials described in this Article. Fill materials are those referred to in directories of referenced testing and inspecting agencies as "fill," "void," or "cavity" materials.
- B. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic or plastic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.
- C. Latex Sealants: Single-component latex formulations that after cure do not re-emulsify during exposure to moisture.
- D. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
- E. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized steel sheet.
- F. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.
- G. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.
- H. Pillows/Bags/Blocks: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives.
- I. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.
- J. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:
 - 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces, and nonsag formulation for openings in vertical and other surfaces requiring a nonslumping, gunnable sealant, unless indicated firestop system limits use to nonsag grade for both opening conditions.
 - 2. Grade for Horizontal Surfaces: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces.
 - 3. Grade for Vertical Surfaces: Nonsag formulation for openings in vertical and other surfaces.

2.5 MIXING

- A. For those products requiring mixing before application, comply with through-penetration firestop system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of work.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Clean out openings immediately before installing through-penetration firestop systems to comply with firestop system manufacturer's written instructions and with the following requirements:
 - 1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of through-penetration firestop systems.
 - 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with through-penetration firestop systems. Remove loose particles remaining from cleaning operation.
 - 3. Remove laitance and form-release agents from concrete.
- B. Priming: Prime substrates where recommended in writing by through-penetration firestop system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking Tape: Use masking tape to prevent through-penetration firestop systems from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestop system materials. Remove tape as soon as possible without disturbing firestop system's seal with substrates.

3.3 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

- A. General: Install through-penetration firestop systems to comply with Part 1 "Performance Requirements" Article and with firestop system manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Install forming/damming/backing materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.
- C. Install fill materials for firestop systems by proven techniques to produce the following results:
 1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

- A. Identify through-penetration firestop systems with preprinted plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of edge of the firestop systems, and on both sides of partition, so that labels will be visible to anyone seeking to remove penetrating items or firestop systems. Use self-adhering type with adhesives capable of permanently bonding labels to surfaces on which labels are placed and, in combination with label material, will result in partial destruction of label if removal is attempted. Include the following information on labels:
 1. The words "WARNING - PENETRATION FIRESTOPPING SYSTEM - DO NOT DISTURB. NOTIFY BUILDING MANAGEMENT OF ANY DAMAGE."
 2. Contractor's name, address, and phone number.
 3. Through-penetration firestop system designation of applicable testing and inspecting agency.
 4. Date of installation.
 5. Through-penetration firestop system manufacturer's name.
 6. Installer's name.

3.5 FIELD QUALITY CONTROL

- A. Inspecting Agency: Owner will engage a qualified, independent inspecting agency to inspect through-penetration firestops. Independent inspecting agency shall comply with ASTM E 2174 requirements including those related to qualifications, conducting inspections, and preparing test reports.
 1. Inspection of through-penetration firestopping shall be performed in accordance with ASTM E 2174, "Standard Practice for On-Site Inspection of Installed Fire Stops" or other recognized standard.
- B. Where deficiencies are found, repair or replace through-penetration firestop systems so they comply with requirements.
- C. Proceed with enclosing through-penetration firestop systems with other construction only after inspection reports are issued and firestop installations comply with requirements.

3.6 CLEANING AND PROTECTING

- A. Clean off excess fill materials adjacent to openings as Work progresses by methods and with cleaning materials that are approved in writing by through-penetration firestop system manufacturers and that do not damage materials in which openings occur.

- B. Provide final protection and maintain conditions during and after installation that ensure that through-penetration firestop systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated through-penetration firestop systems immediately and install new materials to produce systems complying with specified requirements.

3.7 THROUGH-PENETRATION FIRESTOP SYSTEM SCHEDULE

- A. Where UL-classified systems are indicated, they refer to alpha-alpha-numeric designations listed in UL's "Fire Resistance Directory" under product Category XHEZ.
- B. Firestop Systems with No Penetrating Items.
 - 1. Available UL-Classified Systems: C-AJ-001-0999.
- C. Firestop Systems for Metallic Pipes, Conduit or Tubing:
 - 1. Available UL-Classified Systems: C-AJ-1001-1999 and W-L-1001-1999.
- D. Firestop Systems for Nonmetallic Pipe, Conduit or Tubing:
 - 1. Available UL-Classified Systems: C-AJ-2001-2999 and W-L-2001-2999.
- E. Firestop Systems for Electrical Cables:
 - 1. Available UL-Classified Systems: C-AJ-3001-3999 and W-L-3001-3999.
- F. Firestop Systems for Cable Trays:
 - 1. Available UL-Classified Systems: C-AJ-4001-4999 and W-L-3001-3999.
- G. Firestop Systems for Insulated Pipes:
 - 1. Available UL-Classified Systems: C-AJ-5001-5999 and W-L-5001-5999.
- H. Firestop Systems for Miscellaneous Electrical Penetrants (Busducts):
 - 1. Available UL-Classified Systems: C-AJ-6001-6999 and W-L-6001-6999.
- I. Firestop Systems for Miscellaneous Mechanical Penetrants (Ductwork):
 - 1. Available UL-Classified Systems: C-AJ-7001-7999 and W-L-7001-7999.
- J. Firestop Systems for Groupings of Penetrants:
 - 1. Available UL-Classified Systems: C-AJ-8001-8999 and W-L-8001-8999.

END OF SECTION 078413

SECTION 078446 - FIRE-RESISTIVE JOINT SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes fire-resistive joint systems for the following:
 - 1. Wall-to-wall joints.
 - 2. Head-of-wall joints.
- B. Related Sections include the following:
 - 1. Division 07 Section "Penetration Firestopping" for systems installed in openings in walls and floors with and without penetrating items.
 - 2. Division 07 Section "Joint Sealants" for non-fire-resistive joint sealants.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For each fire-resistive joint system, show each kind of construction condition in which joints are installed; also show relationships to adjoining construction. Include fire-resistive joint system design designation of testing and inspecting agency acceptable to authorities having jurisdiction that demonstrates compliance with requirements for each condition indicated.
 - 1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each fire-resistive joint system configuration for construction and penetrating items.
 - 2. For those firestop applications that exist for which no qualified tested system is available through a manufacturer, an engineering judgment derived from similar qualified tested system designs or other tests is to be submitted to local authorities having jurisdiction for their review and approval prior to installation. Engineering judgment documents must follow requirements set forth by the International Firestop Council.
- C. Product Certificates: For each type of fire-resistive joint system, signed by product manufacturer.
- D. Qualification Data: For Installer.
- E. Field quality-control test reports.
- F. Evaluation Reports: Evidence of fire-resistive joint systems' compliance with ICC ES AC308, from the ICC Evaluation Service.
- G. Research/Evaluation Reports: For each type of fire-resistive joint system.

- H. Material Safety Data Sheets.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain fire-resistive joint systems, for each kind of joint and construction condition indicated, through one source from a single manufacturer.
- B. Fire-Test-Response Characteristics: Provide fire-resistive joint systems that comply with the following requirements:
 - 1. Fire-resistance tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL or another agency performing testing and follow-up inspection services for fire-resistive joint systems acceptable to authorities having jurisdiction.
 - 2. Fire-resistive joint systems are identical to those tested per methods indicated in Part 1 "Performance Requirements" Article and comply with the following:
 - a. Fire-resistive joint system products bear classification marking of qualified testing and inspecting agency.
 - b. Fire-resistive joint systems correspond to those indicated by referencing system designations of the qualified testing and inspecting agency.
- C. Preinstallation Conference: Conduct conference at Project site.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver fire-resistive joint system products to Project site in original, unopened containers or packages with qualified testing and inspecting agency's classification marking applicable to Project and with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, lot number, shelf life, curing time, and mixing instructions for multicomponent materials.
- B. Store and handle materials for fire-resistive joint systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install fire-resistive joint systems when ambient or substrate temperatures are outside limits permitted by fire-resistive joint system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. Ventilate fire-resistive joint systems per manufacturer's written instructions by natural means or, if this is inadequate, forced-air circulation.

1.7 COORDINATION

- A. Coordinate construction of joints to ensure that fire-resistive joint systems are installed according to specified requirements.
- B. Coordinate sizing of joints to accommodate fire-resistive joint systems.
- C. Notify Owner's inspecting agency at least seven days in advance of fire-resistive joint system installations; confirm dates and times on days preceding each series of installations.

- D. Do not cover up fire-resistive joint system installations that will become concealed behind other construction until Owner's inspecting agency and building inspector of authorities having jurisdiction have examined each installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the following fire-resistive joint systems indicated for each application in the Fire-Resistive Joint System Schedule at the end of Part 3:
 - 1. Hilti, Inc.; CFS-SP WB Firestop Joint Spray.
 - 2. 3M; Fire Protection Products Division; FireDam™ Spray 200.
 - 3. Tremco; Fire Protection Systems Group; Tremstop Acrylic.

2.2 FIRE-RESISTIVE JOINT SYSTEMS

- A. Where required, provide fire-resistive joint systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which fire-resistive joint systems are installed. Fire-resistive joint systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.
- B. Compatibility: Provide fire-resistive joint systems that are compatible with joint substrates, under conditions of service and application, as demonstrated by fire-resistive joint system manufacturer based on testing and field experience.
- C. Joint Systems in and between Fire-Resistance-Rated Constructions: Provide systems with assembly ratings equaling or exceeding the fire-resistance ratings of construction that they join, and with movement capabilities indicated as determined by ASTM E 1966 or UL 2079.
 - 1. Load-bearing capabilities as determined by evaluation during the time of test.
- D. For fire-resistive systems exposed to view, provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.
- E. VOC Content: Provide fire-resistive joint systems that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - 1. Architectural Sealants: 250 g/L.
 - 2. Sealant Primers for Nonporous Substrates: 250 g/L.
 - 3. Sealant Primers for Porous Substrates: 775 g/L.
- F. Mold Resistance: Provide penetration firestopping with mold and mildew resistance rating of 0 as determined by ASTM G 21.
- G. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials, that are needed to install fill materials and to comply with Part 1 "Performance Requirements" Article. Use only components specified by fire-resistive joint system manufacturer and approved by the qualified testing and inspecting agency for systems indicated.

- H. Labels: Self-adhering labels for identification of fire-resistive joint systems and fire resistant rated partitions identified in Part 3.
 - 1. Product: Subject to compliance with requirements, provide labels by the following, or equal:
 - a. Emedco (www.emedco.com).
 - b. Fire Wall Signs, Inc. (www.firewallsigns.com).
 - c. Seton (www.seton.com).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of work.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Clean joints immediately before installing fire-resistive joint systems to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:
 - 1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of fill materials.
 - 2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with fill materials. Remove loose particles remaining from cleaning operation.
 - 3. Remove laitance and form-release agents from concrete.
- B. Priming: Prime substrates where recommended in writing by fire-resistive joint system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking Tape: Use masking tape to prevent fill materials of fire-resistive joint system from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from fire-resistive joint system materials. Remove tape as soon as possible without disturbing fire-resistive joint system's seal with substrates or damaging adjoining surfaces.

3.3 INSTALLATION

- A. General: Install fire-resistive joint systems to comply with Part 1 "Performance Requirements" Article and fire-resistive joint system manufacturer's written installation instructions for products and applications indicated.
- B. Install forming/packing/backing materials and other accessories of types required to support fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
- C. Install fill materials for fire-resistive joint systems by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings and forming/packing/backing materials as required to achieve fire-resistance ratings indicated.
2. Apply fill materials so they contact and adhere to substrates formed by joints.
3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

- A. Identify fire-resistive joint systems with preprinted plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of joint edge so labels will be visible to anyone seeking to remove or penetrate joint system. Use self-adhering type with adhesives capable of permanently bonding labels to surfaces on which labels are placed and, in combination with label material, will result in partial destruction of label if removal is attempted. Include the following information on labels:
1. The words "WARNING - FIRE-RESISTIVE JOINT SYSTEM - DO NOT DISTURB. NOTIFY BUILDING MANAGEMENT OF ANY DAMAGE."
 2. Contractor's name, address, and phone number.
 3. Designation of applicable testing agency.
 4. Date of installation.
 5. Manufacturer's name.
 6. Installer's name.
- B. Identify fire resistance rated walls including fire walls, fire barriers, fire partitions, smoke barriers and smoke partitions required to have protected openings or through penetration firestopping. Attach labels permanently to surfaces so that labels will be visible to anyone seeking to install penetrating items or firestop systems. Use self-adhering type with adhesives capable of permanently bonding labels to surfaces on which labels are placed and, in combination with label material, will result in partial destruction of label if removal is attempted.
1. Locate labels above accessible ceilings and in attic spaces, spaced at intervals not exceeding 30 feet measured horizontally, along both sides of the wall or partition, and not less than 15 feet from end of wall.
 2. For occupied spaces without a finished ceiling, coordinate location of labeling with Architect.
 3. Include lettering not less than 3 inches in height incorporating the words "*1 HOUR RATED FIRE BARRIER – PROTECT ALL OPENINGS AND PENETRATIONS.*" Specifically identify the hourly rating of the wall and the type of partition (i.e. fire wall, fire barrier, fire partition) for each condition.

3.5 FIELD QUALITY CONTROL

- A. Inspecting Agency: Owner will engage a qualified independent inspecting agency to inspect fire-resistive joint systems and prepare inspection reports.
1. Inspection of fire resistive joints and perimeter fire barriers shall be performed in accordance with ASTM E 2393, "Standard Practice for On-Site Inspection of Installed Fire Resistive Joints and Perimeter Fire Barriers"
- B. Testing Services: Inspecting of completed installations of fire-resistive joint systems shall take place in successive stages as installation of fire-resistive joint systems proceeds. Do not proceed with installation of joint systems for the next area until inspecting agency determines completed work shows compliance with requirements.

1. Inspecting agency shall state in each report whether inspected fire-resistive joint systems comply with or deviate from requirements.
- C. Remove and replace fire-resistive joint systems where inspections indicate that they do not comply with specified requirements.
- D. Additional inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- E. Proceed with enclosing fire-resistive joint systems with other construction only after inspection reports are issued and fire-resistive joint systems comply with requirements.

3.6 CLEANING AND PROTECTING

- A. Clean off excess fill materials adjacent to joints as Work progresses by methods and with cleaning materials that are approved in writing by fire-resistive joint system manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure fire-resistive joint systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated fire-resistive joint systems immediately and install new materials to produce fire-resistive joint systems complying with specified requirements.

3.7 FIRE-RESISTIVE JOINT SYSTEM SCHEDULE

- A. Designation System for Joints in or between Fire-Resistance-Rated Constructions: Alphanumeric systems listed in UL's "Fire Resistance Directory" under Product Category XHBN.
- B. Head-of-Wall Fire-Resistive Joint Systems:
 1. Available UL-Classified Systems: HW-D-0000-0999.
 2. Assembly Rating: As indicated.
 3. Movement Capabilities: Class II – 25 percent compression or extension.
- C. Wall-to-Wall, Fire-Resistive Joint Systems:
 1. UL-Classified Systems: WW-D-0000-0999.
 2. Assembly Rating: As indicated.
 3. Nominal Joint Width: As indicated.
 4. Movement Capabilities: Class II – 25 percent compression or extension.

END OF SECTION 078446

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Silicone joint sealants.
 - 2. Urethane joint sealants.
 - 3. Latex joint sealants.
 - 4. Acoustical joint sealants.
- B. Related Sections include the following:
 - 1. Division 04 Section "Unit Masonry" for masonry control and expansion joint fillers and gaskets.
 - 2. Division 08 Section "Glazing" for glazing sealants.
 - 3. Division 09 Section "Gypsum Board Assemblies" for sealing perimeter joints of gypsum board partitions to reduce sound transmission.
 - 4. Division 09 Section "Acoustical Panel Ceilings" for sealing edge moldings at perimeters of acoustical ceilings.

1.3 PRECONSTRUCTION TESTING

- A. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
 - 1. Use ASTM C 1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
 - 2. Submit not fewer than eight pieces of each type of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
 - 3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
 - 4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.
 - 5. Testing will not be required if joint-sealant manufacturers submit joint preparation data that are based on previous testing of current sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.

1.4 PERFORMANCE REQUIREMENTS

- A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.

- B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

1.5 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- C. Samples for Verification: For each type and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- wide joints formed between two 6-inch- long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- D. Joint-Sealant Schedule: Include the following information:
 - 1. Joint-sealant application, joint location, and designation.
 - 2. Joint-sealant manufacturer and product name.
 - 3. Joint-sealant formulation.
 - 4. Joint-sealant color.

1.6 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of joint sealant and accessory, signed by product manufacturer.
- B. Qualification Data: For Installer.
- C. Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:
 - 1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
 - 2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
- D. Product Test Reports: Based on comprehensive testing of product formulations performed by a qualified testing agency, indicating that sealants comply with requirements.
- E. Preconstruction Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:
 - 1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
 - 2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
- F. Warranties: Special warranties specified in this Section.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized Installer who is approved or licensed for installation of elastomeric sealants required for this Project.

- B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.
- C. Product Testing: Test joint sealants using a qualified testing agency.
 - 1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.
 - 2. Test according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C 920 for adhesion and cohesion under cyclic movement, adhesion-in-peel, and indentation hardness.
- D. Mockups: Build mockups incorporating sealant joints, as follows, to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution:
 - 1. Joints in mockups of assemblies specified in other Sections that are indicated to receive elastomeric joint sealants, which are specified by reference to this Section.
 - 2. Each type of sealant and joint substrate indicated.
- E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.8 PROJECT CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
 - 2. When joint substrates are wet.
 - 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
 - 4. Contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.9 WARRANTY

- A. Special Installer's Warranty: Installer's standard form in which Installer agrees to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer's standard form in which elastomeric sealant manufacturer agrees to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period for Urethane: Five years from date of Substantial Completion.
 - 2. Warranty Period for Silicone: 20 years from date of Substantial Completion.
- C. Special warranties specified in this Article exclude deterioration or failure of elastomeric joint sealants from the following:
 - 1. Movement of the structure resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression caused by structural settlement or errors attributable to design or construction.

2. Disintegration of joint substrates from natural causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- B. VOC Content of Interior Sealants: Provide sealants and sealant primers for use inside the weatherproofing system that comply with the following limits for VOC content when calculated according to 40 CFR 59, Part 59, Subpart D (EPA Method 24):
 1. Architectural Sealants: 250 g/L.
 2. Sealant Primers for Nonporous Substrates: 250 g/L.
 3. Sealant Primers for Porous Substrates: 775 g/L.
- C. Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
- D. Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
- E. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.
- F. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 SILICONE JOINT SEALANTS

- A. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use NT.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Dow Corning Corporation; 790.
 - b. Pecora Corporation; 890 NST.
 - c. Tremco Incorporated; Spectrem 1.
- B. Mildew Resistant, Single-Component, Nonsag, Acid-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Dow Corning Corporation; 786 Mildew Resistant.
 - b. GE Silicones; Sanitary SCS1700.
 - c. Tremco; Tremsil 200 Sanitary.

2.3 URETHANE JOINT SEALANTS

- A. Multicomponent, Pourable, Traffic-Grade, Urethane Joint Sealant: ASTM C 920. Type M, Grade P, Class 25, for Use T and I.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. BASF Corporation-Construction Systems; MasterSeal SL 2.
 - b. Pecora Corporation; Dynatrol II-SG.
 - c. Sherwin Williams; Loxon 2K SL.
 - d. Tremco; THC-900.

2.4 LATEX JOINT SEALANTS

- A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. American Sealants, Inc.; ASI 174.
 - b. Pecora Corporation; AC-20+.
 - c. Sherwin Williams; 950A.
 - d. Tremco; Tremflex 834.

2.5 ACOUSTICAL JOINT SEALANTS

- A. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 and the following:
1. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Green Glue; Green Glue Noiseproofing Sealant.
 - b. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.
 - c. Sherwin Williams; 950A.
 - d. United States Gypsum Co.; SHEETROCK Acoustical Sealant.

2.6 JOINT-SEALANT BACKING

- A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin) as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.7 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 - 2. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
 - a. Concrete.
 - b. Masonry.
 - c. Unglazed surfaces of ceramic tile.
 - 3. Remove laitance and form-release agents from concrete.
 - 4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
 - a. Metal.
 - b. Glass.
 - c. Porcelain enamel.
 - d. Glazed surfaces of ceramic tile.

- B. Joint Priming: Prime joint substrates, where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of sealant backings.
 - 2. Do not stretch, twist, puncture, or tear sealant backings.
 - 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 - 1. Remove excess sealant from surfaces adjacent to joints.
 - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 - 3. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.
- G. Acoustical Sealant Installation: At sound-rated assemblies and elsewhere as indicated, seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations.

3.4 CLEANING

- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.6 JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces.
 - 1. Joint Locations:
 - a. Control and expansion joints in unit masonry.
 - b. Perimeter joints between materials listed above and frames of doors and windows.
 - c. Control and expansion joints in ceilings and other overhead surfaces.
 - d. Other joints as indicated.
 - 2. Silicone Joint Sealant: Single component, nonsag, neutral curing, Class 100/50.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors, for each material.
- B. Joint-Sealant Application: Interior joints in horizontal traffic surfaces.
 - 1. Joint Locations:
 - a. Isolation joints in cast-in-place concrete slabs.
 - 2. Urethane Joint Sealant: Multicomponent, pourable, traffic grade, Class 25.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors, for each material.
- C. Joint-Sealant Application: Interior joints in all other vertical surfaces and horizontal nontraffic surfaces.
 - 1. Joint Locations:
 - a. Control and expansion joints on exposed interior surfaces of exterior walls.
 - b. Perimeter joints of exterior openings where indicated.
 - c. Vertical joints on exposed surfaces of interior unit masonry walls and partitions.
 - d. Perimeter joints between interior wall surfaces and frames of interior doors and windows.
 - e. Other joints as indicated.
 - 2. Joint Sealant: Latex.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

- D. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces.
1. Joint Sealant Location:
 - a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
 - b. Other joints as indicated.
 2. Joint Sealant: Single component, nonsag, mildew resistant, acid curing silicone.
 3. Joint-Sealant Color: White.
- E. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces at counters and backsplashes.
1. Joint Sealant Location:
 - a. Joints between counters and walls.
 - b. Joints between backsplashes and walls.
 - c. Joints between counters and backsplashes.
 - d. Other joints as indicated.
 2. Joint Sealant: Single component, nonsag, mildew resistant, acid curing silicone.
 3. Joint-Sealant Color: Clear.
- F. Joint-Sealant Application: Interior acoustical joints in vertical surfaces and horizontal nontraffic surfaces.
1. Joint Location:
 - a. Acoustical joints where indicated.
 - b. Other joints as indicated.
 2. Joint Sealant: Acoustical.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

END OF SECTION 079200

SECTION 079201 – SPRAY FOAM SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes polyurethane spray foam sealant.
- B. Related Sections include the following:
 - 1. Division 07 Section "Joint Sealants" for sealants installed in interior and exterior surfaces.

1.3 PERFORMANCE REQUIREMENTS

- A. Provide spray foam sealant engineered to fill voids and seal gaps without deteriorating substrates.

1.4 SUBMITTALS

- A. Product Data: For spray foam sealant.
- B. Product Certificates: For spray foam sealant and accessories, signed by product manufacturer.
- C. Evaluation Reports: For spray foam sealant, from ICC-ES.
- D. Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:
 - 1. Materials forming sealant substrates have been tested for compatibility and adhesion with spray from sealant, including all types of aluminum framing systems, and fluid-applied membrane air barriers.
- E. Certification from sealant manufacturer that products supplied comply with State of New York regulations controlling the use of volatile organic compounds (VOC's).

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain spray foam sealant through one source from a single manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store materials in original containers in cool, dry area at room temperature between 60 and 70 deg. F. Do not store materials above 90 deg. F.

1.7 PROJECT CONDITIONS

- A. Do not proceed with installation of spray foam sealant under the following conditions:
1. When ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or are below 45 deg. F.
 2. When joint substrates are wet.
 3. Contaminants capable of interfering with adhesion have not yet been removed from substrate.

PART 2 - PRODUCTS

2.1 SPRAY FOAM SEALANTS

- A. Polyurethane Spray Foam Sealant: Single or two-component, polyurethane foam sealant packaged in self-contained pressurized containers, gun-grade, containing no urea formaldehyde, and UL Classified.
1. In accordance with ASTM E 84, provide products with a flame spread of 25 and smoke developed of 450.
 2. Properties:
 - a. Cure Time: 8-24 hours at 75 deg. F, 50% relative humidity.
 - b. Air infiltration at 6.24 psf pressure per in 1 cm wide gap: ASTM E 283, less than 0.01 cfm/ft².
 - c. Water Vapor Transmission, per inch thickness: ASTM E 96, less than 4 perms.
 - d. R-Value: 4 to 5 per inch, minimum.
 - e. Closed Cell Content: ASTM D 2856, 70% or greater.
 - f. Core Density: Minimum 1.7 lbs./cu.ft.
 - g. Pressure Build: Comply with AAMA 812-04.
 3. Products: Subject to compliance with requirements, provide one of the following:
 - a. Dow Building Solutions; Great Stuff Pro Window & Door.
 - b. Fomo Products, Inc.; Handi-Seal Window and Door Sealant.
 - c. Hilti; CF 812 Window and Door Low-Pressure Filler Foam.
- B. Cleaner: Manufacturer's standard for cleaning substrates and to clean up foam spills, overspray, tools and nozzles before foam cures.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine voids and substrates to receive spray foam sealant, with Installer present, for compliance with requirements and conditions affecting foam sealant performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected. Commencement of work indicates acceptance of substrates.

3.2 PREPARATION

- A. Remove foreign material that could interfere with adhesion of spray foam sealant, including dust, oil, grease, water, repellants, water, and surface dirt.
 - 1. Remove laitance and form-release agents from concrete.
 - 2. Clean nonporous surfaces with cleaner that does not stain, harm substrate, or leave residue capable of interfering with adhesion of spray foam sealants.

3.3 INSTALLATION

- A. General: Comply with spray foam sealant manufacturer's written instructions for products and applications indicated.
- B. Install foam sealant at exterior frames of aluminum storefront and entrance frames, and glazed aluminum curtain walls.
 - 1. Fill cavities 30-40%, allowing foam to expand approximately three times its original dispensed volume.

3.4 CLEANING AND PROTECTING

- A. Protect adjacent surfaces from overspray. If required, clean spills before product cures.
- B. Protect spray foam from exposure to sunlight.
- C. Proceed with installation of joint sealants by Division 07 Section "Joint Sealants."

END OF SECTION 079201

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes hollow-metal work.
- B. Related Requirements:
 - 1. Division 08 Section "Door Hardware" for door hardware for hollow metal doors.
 - 2. Division 08 Section "Glazing" for glazed lites in hollow metal doors and frames.
 - 3. Division 09 Section "Painting" for field painting hollow metal doors and frames.
 - 4. Division 26 Sections for electrical connections including conduit and wiring for door controls and operators.

1.3 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

1.4 COORDINATION

- A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Meet with Architect, electrical contractor, security systems supplier, and hardware installers whose work interfaces with or affects hollow metal doors and frames.
 - 2. Review requirements for type of cut-out and back-box as part of the door and frame assembly.
 - 3. Document proceedings, including receipt of samples and approved shop drawings of security contact devices which accurately represent the installation of the device, back-box, and conduit terminations required.
 - 4. Distribute an installation book, including all manuals and instructions.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, and finishes.
- B. Shop Drawings: Include the following:
 - 1. Elevations of each door type.
 - 2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
 - 3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 - 4. Locations of reinforcement and preparations for hardware.
 - 5. Details of each different wall opening condition.
 - 6. Details of anchorages, joints, field splices, and connections.
 - 7. Details of accessories.
 - 8. Details of moldings, removable stops, and glazing.
 - 9. Details of conduit and preparations for power, signal, and control systems.
- C. Schedule: Provide a schedule of hollow-metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final Door Hardware Schedule.

1.7 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each type of hollow-metal door and frame assembly, for tests performed by a qualified testing agency.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow-metal work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
 - 1. Provide additional protection to prevent damage to factory-finished units.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow-metal work vertically under cover at Project site with head up. Place on minimum 4-inch-high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

PART 2 - PRODUCTS

2.1 REGULATORY REQUIREMENTS

- A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

2.2 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Ceco Door; ASSA ABLOY.
 - 2. Curries Company; ASSA ABLOY.
 - 3. DE LA FONTAINE.
 - 4. Steelcraft; an Allegion brand.
- B. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.

2.3 INTERIOR DOORS AND FRAMES

- A. Construct interior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Heavy-Duty Doors and Frames: SDI A250.8, Level 2.
 - 1. Physical Performance: Level B according to SDI A250.4.
 - 2. Doors:
 - a. Type: As indicated in the Door and Frame Schedule.
 - b. Thickness: 1-3/4 inches.
 - c. Face: Uncoated, cold-rolled steel sheet, minimum thickness of 0.042 inch (18 gauge).
 - 1) Provide 16 gauge face sheets for doors over 3'-0" wide.
 - d. Edge Construction: Model 2, Seamless.
 - e. Core: Vertical steel stiffener with fiberglass insulation.
 - f. Fire Rated Core: Mineral fiber.
 - 3. Frames:
 - a. Materials: Uncoated steel sheet, minimum thickness of 0.053 inch (16 gauge).
 - b. Construction: Face welded.
 - 4. Exposed Finish: Prime.

2.4 FRAME ANCHORS

- A. Jamb Anchors:
 - 1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
 - 2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
 - 3. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch-diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.

- B. Floor Anchors: Formed from same material as frames, minimum thickness of 0.042 inch, and as follows:
 - 1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

2.5 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.
- C. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- D. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.
- E. Glazing: Comply with Division 08 Section "Glazing."

2.6 FABRICATION

- A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Hollow-Metal Doors:
 - 1. Steel-Stiffened Door Cores: Provide minimum thickness 0.026 inch, steel vertical stiffeners of same material as face sheets extending full-door height, with vertical webs spaced not more than 6 inches apart. Spot weld to face sheets no more than 5 inches o.c. Fill spaces between stiffeners with glass- or mineral-fiber insulation.
 - 2. Fire Door Cores: As required to provide fire-protection ratings indicated.
 - 3. Vertical Edges for Single-Acting Doors: Bevel edges 1/8 inch in 2 inches.
 - 4. Top Edge Closures: Close top edges of doors with inverted closures.
 - 5. Bottom Edge Closures: Close bottom edges of doors where required for attachment of weather stripping with end closures or channels of same material as face sheets.
 - 6. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.
- C. Hollow-Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
 - 1. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 - 2. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.
 - 3. Jamb Anchors: Provide number and spacing of anchors as follows:

- a. Masonry Type: Locate anchors not more than 16 inches from top and bottom of frame. Space anchors not more than 32 inches o.c., to match coursing, and as follows:
 - 1) Three anchors per jamb from 60 to 90 inches high.
 - b. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - 1) Four anchors per jamb from 60 to 90 inches high.
 - c. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.
4. Head Anchors: Two anchors per head for frames more than 42 inches wide and mounted in metal-stud partitions.
 5. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
 - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
- D. Fabricate concealed stiffeners and edge channels from either cold- or hot-rolled steel sheet.
- E. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.
1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
 2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.
 3. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.
- F. Hardware Reinforcement: Fabricate reinforcement plates from same material as frames to comply with manufacturer's standard gauges and sizes, but not less than the following minimum sizes.
1. Hinges: Minimum 10 gauge by 1-1/2 inches wide by 6 inches longer than hinge, secured by not less than 6 spot welds.
 2. Lock Face, Flush and Surface Bolts, Closers, and Concealed Holders: Minimum 14 gauge.
 3. Pull Plates and Bar: Minimum 16 gauge.
- G. Stops and Moldings: Provide stops and moldings around glazed lites and louvers where indicated. Form corners of stops and moldings with mitered hairline joints.
1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow-metal work.
 2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
 3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
 4. Provide loose stops and moldings on inside of hollow-metal work.
 5. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.

2.7 STEEL FINISHES

- A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
 - 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

- A. General: Install hollow-metal work plumb, rigid, properly aligned, and securely fastened in place. Comply with Drawings and manufacturer's written instructions.
- B. Hollow-Metal Frames: Install hollow-metal frames for doors, transoms, sidelites, borrowed lites, and other openings, of size and profile indicated. Comply with SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.
 - 1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - a. At fire-rated openings, install frames according to NFPA 80.
 - b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
 - c. Install frames with removable stops located on secure side of opening.
 - d. Install door silencers in frames before grouting.
 - e. Remove temporary braces necessary for installation only after frames have been properly set and secured.

- f. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
 - g. Field apply bituminous coating to backs of frames that will be filled with grout containing antifreezing agents.
 - 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
 - a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
 - 3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation inside frames.
 - 4. In-Place Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
 - 5. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.
- C. Hollow-Metal Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.
 - 1. Non-Fire-Rated Steel Doors:
 - a. Between Door and Frame Jambs and Head: 1/8 inch plus or minus 1/32 inch.
 - b. Between Edges of Pairs of Doors: 1/8 inch to 1/4 inch plus or minus 1/32 inch.
 - c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
 - d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.
 - e. Between Door Face and Stop: 1/16 inch to 1/8 inch plus or minus 1/32 inch.
 - 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80, and the following:
 - a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
 - b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
 - c. Between Bottom of Door and Top of noncombustible Threshold: Maximum 3/8 inch.
 - d. Between Bottom of Door and Top of noncombustible Finish Floor (No Threshold): Maximum 3/4 inch.
 - e. Between Bottom of Door and all other Finish Floor Coverings: Maximum 1/2 inch.
- D. Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow-metal manufacturer's written instructions.
 - 1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.
- B. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- C. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in Division 09 Section "Painting."

END OF SECTION 081113

SECTION 083113 – ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Access doors and frames for walls and ceilings.
- B. Related Sections include the following:
 - 1. Division 04 Section "Unit Masonry" for anchoring and grouting access door frames in masonry construction.
 - 2. Division 08 Section "Door Hardware" for mortise or rim cylinder locks and master keying.
 - 3. Division 09 Section "Painting" for field finishing factory-primed access doors and frames.
 - 4. Division 23 Section for heating and air-conditioning duct access doors.

1.3 SUBMITTALS

- A. Product Data: For each type of access door and frame indicated. Include construction details, fire ratings, materials, individual components and profiles, and finishes.
- B. Shop Drawings: Show fabrication and installation details of access doors and frames for each type of substrate. Include plans, elevations, sections, details, and attachments to other work.
- C. Samples: For each door face material, at least 3 by 5 inches in size, in specified finish.
- D. Access Door and Frame Schedule: Provide complete access door and frame schedule, including types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

1.4 QUALITY ASSURANCE

- A. Size Variations: Obtain Architect's acceptance of manufacturer's standard-size units, which may vary slightly from sizes indicated.

1.5 COORDINATION

- A. Verification: Determine specific locations and sizes for access doors needed to gain access to concealed plumbing, mechanical, or other concealed work, and indicate in the schedule specified in "Submittals" Article.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 that are identical to access door and frame assemblies tested for fire-test-response characteristics per the following test method and that are listed and labeled by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
1. NFPA 252 or UL 10B for vertical access doors and frames.
 2. ASTM E 119 or UL 263 for horizontal access doors and frames.

2.2 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

- A. Source Limitations: Obtain access doors and frames through one source from a single manufacturer.
- B. Basis of Design Product: Subject to compliance with requirements, provide product indicated, or comparable product by one of the following:
1. J. L. Industries, Inc.
 2. Karp Associates, Inc.
 3. Larsen's Manufacturing Company.
 4. Milcor Inc.
 5. Nystrom, Inc.
- C. Flush Access Doors with Exposed Flanges:
1. **Basis-of-Design Product: Babcock Davis; Model BNT.**
 2. Assembly Description: Fabricate door to fit flush to frame. Provide manufacturer's standard-width exposed flange, proportional to door size.
 3. Locations: Wall and ceiling, gypsum board and masonry walls.
 4. Uncoated Steel Sheet for Door: Nominal 14 gage.
 - a. Finish: Factory prime.
 5. Frame Material: Nominal 16 gauge, factory prime.
 6. Hinges: concealed pivoting rod hinge.
 7. Hardware: Mortise cylinder preparation.
 8. Door Size: 12x12.
- D. Flush Access Doors with Exposed Flanges:
1. **Basis-of-Design Product: Babcock Davis; Model BNT.**
 2. Assembly Description: Fabricate door to fit flush to frame. Provide manufacturer's standard-width exposed flange, proportional to door size.
 3. Locations: Wall, gypsum board and masonry walls with ceramic tile finish.
 4. Stainless-Steel Sheet for Door: Nominal 14 gage.
 - a. Finish: No. 4.
 5. Frame Material: Nominal 16 gauge, stainless steel.
 6. Hinges: concealed pivoting rod hinge.

7. Hardware: Mortise cylinder preparation.
8. Door Size: 12x12.

E. Fire-Rated, Flush Access Doors with Exposed Flanges:

1. **Basis-of-Design Product: Babcock Davis; BU-Series Model BUT.**
2. Assembly Description: Fabricate door to fit flush to frame, uninsulated. Provide self-latching door with automatic closer and interior latch release. Provide manufacturer's standard-width exposed flange, proportional to door size.
3. Locations: Wall and ceiling, gypsum board.
4. Fire-Resistance Rating: Not less than 1 hour.
5. Uncoated Steel Sheet for Door: Nominal 14 gage.
 - a. Finish: Factory prime.
6. Frame Material: Nominal 16 gauge, factory prime.
7. Hinges: concealed pivoting rod hinge.
8. Hardware: Mortise cylinder preparation.
9. Door Size: 12x12.

F. Hardware:

1. Lock: Mortise cylinder.
 - a. Lock Preparation: Prepare door panel to accept cylinder specified in Division 08 Section "Door Hardware."

2.3 MATERIALS

- A. Steel Sheet: Uncoated cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.
- B. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 304. Remove tool and die marks and stretch lines or blend into finish.
- C. Drywall Beads: Edge trim formed from 0.0299-inch zinc-coated steel sheet formed to receive joint compound and in size to suit thickness of gypsum board.

2.4 FABRICATION

- A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.
- B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of supports indicated.
 1. Exposed Flanges: As indicated.
 2. Provide mounting holes in frames for attachment of units to metal framing.

D. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.

1. For cylinder lock, furnish two keys per lock and key all locks alike.

2.5 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Steel and Metallic-Coated-Steel Finishes:

1. Factory Prime: Apply manufacturer's standard, fast-curing, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.

E. Stainless-Steel Finishes:

1. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

2. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.

a. Run grain of directional finishes with long dimension of each piece.

b. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

c. Directional Satin Finish: No. 4.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with manufacturer's written instructions for installing access doors and frames.

B. Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finish surfaces.

C. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

3.2 ADJUSTING AND CLEANING

A. Adjust doors and hardware after installation for proper operation.

B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION 083113

SECTION 084113 – ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Interior storefront framing.
 - 2. Interior and exterior manual-swing entrance doors and door-frame units.

- B. Related Sections:

- 1. Division 06 Section "Miscellaneous Rough Carpentry" for wood blocking.
 - 2. Division 07 Section "Sheet Metal Flashing and Trim."
 - 3. Division 07 Section "Joint Sealants" for installation of joint sealants installed with aluminum-framed systems and for sealants to the extent not specified in this Section.
 - 4. Division 07 Section "Spray Foam Sealants" for spray foam sealant furnished and installed by this Section.
 - 5. Division 08 Section "Glazed Aluminum Curtain Walls."
 - 6. Division 08 Section "Door Hardware" for hardware to the extent not specified in this Section.
 - 7. Division 08 Section "Glazing" for glazing requirements to the extent not specified in this Section.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for aluminum-framed systems.

- B. Shop Drawings: For aluminum-framed systems. Include plans, elevations, sections, details, and attachments to other work.

- 1. Include details of provisions for system expansion and contraction and for drainage of moisture in the system to the exterior.
 - 2. For entrance doors, include hardware schedule and indicate operating hardware types, functions, quantities, and locations.
 - a. With the exception of weatherstripping, hardware is furnished under Division 08 Section "Door Hardware."
 - b. Indicate coordination of security door contacts with security system requirements.

- 1) Do not prepare doors and frames without an approved security systems shop drawing and sample of the Contract.
- C. Delegated-Design Submittal: For aluminum-framed systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 1. Detail fabrication and assembly of aluminum-framed systems.
 2. Include design calculations.
- D. Samples for Initial Selection: For units with factory-applied color finishes.
- E. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
- F. Fabrication Sample: Of each vertical-to-horizontal intersection of aluminum-framed systems, made from 12-inch lengths of full-size components and showing details of the following:
 1. Joinery, including concealed welds.
 2. Anchorage.
 3. Expansion provisions.
 4. Glazing.
 5. Flashing and drainage.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Seismic Qualification Certificates: For aluminum-framed systems, accessories, and components, from manufacturer.
 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
- C. Welding certificates.
- D. Preconstruction Test Reports: For sealant.
- E. Product Test Reports: Based on evaluation of comprehensive tests performed within the last four years by a qualified testing agency, for aluminum-framed systems, indicating compliance with performance requirements.
- F. Source quality-control reports.
- G. Warranties: Sample of special warranties.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For aluminum-framed systems to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Engineering Responsibility: Prepare data for aluminum-framed systems, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in systems similar to those indicated for this Project.
- C. Product Options: Information on Drawings and in Specifications establishes requirements for systems' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, and in-service performance.
 - 1. Do not revise intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If revisions are proposed, submit comprehensive explanatory data to Architect for review.
- D. Accessible Entrances: Comply with applicable provisions in 2010 ADA Standards and ICC/ANSI A117.1.
- E. Source Limitations for Aluminum-Framed Systems: Obtain glazed aluminum curtain walls and aluminum-framed entrance and storefront systems from a single source from a single manufacturer.
- F. Welding Qualifications: Qualify procedures and personnel according to AWS D1.2, "Structural Welding Code - Aluminum."
- G. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 - 1. Build mockup of typical wall area as directed by the Architect.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of structural supports for aluminum-framed systems by field measurements before fabrication and indicate measurements on Shop Drawings.

1.9 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including, but not limited to, excessive deflection.
 - b. Noise or vibration caused by thermal movements.

- c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - d. Adhesive or cohesive sealant failures.
 - e. Water leakage through fixed glazing and framing areas.
 - f. Failure of operating components.
2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Aluminum-framed systems shall withstand the effects of the following performance requirements without exceeding performance criteria or failure due to defective manufacture, fabrication, installation, or other defects in construction:
 1. Movements of supporting structure indicated on Drawings including, but not limited to, story drift and deflection from uniformly distributed and concentrated live loads.
 2. Dimensional tolerances of building frame and other adjacent construction.
 3. Failure includes the following:
 - a. Deflection exceeding specified limits.
 - b. Thermal stresses transferring to building structure.
 - c. Framing members transferring stresses, including those caused by thermal and structural movements to glazing.
 - d. Glazing-to-glazing contact.
 - e. Noise or vibration created by wind and by thermal and structural movements.
 - f. Loosening or weakening of fasteners, attachments, and other components.
 - g. Sealant failure.
 - h. Failure of operating units.
- B. Delegated Design: Design aluminum-framed systems, including comprehensive engineering analysis by a qualified professional engineer licensed in the State of New York, using performance requirements and design criteria indicated.
- C. Structural Loads:
 1. Wind Loads: Provide entrance systems capable of withstanding wind-load design pressures calculated using a "design wind pressure" as determined from the New York State Building Code, and as determined by the Fabricator's design engineer.
 - a. Basic Wind Speed: 130 mph.
 - b. Risk Category: III.
 - c. Exposure Category: B.
 2. Seismic Loads: Provide entrance systems capable of withstanding the effects of earthquake motions calculated according to the New York State Building Code, as determined by the Fabricator's design engineer.

D. Deflection of Framing Members:

1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6 inches and to 1/240 of clear span plus 1/4 inch for spans greater than 13 feet 6 inches or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
2. Deflection Parallel to Glazing Plane: Limited to amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components directly below them to less than 1/8 inch and clearance between members and operable units directly below them to less than 1/16 inch.

E. Structural-Test Performance: Provide aluminum-framed systems tested according to ASTM E 330 as follows:

1. When tested at positive and negative wind-load design pressures, systems do not evidence deflection exceeding specified limits.
2. When tested at 150 percent of positive and negative wind-load design pressures, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
3. Test Durations: As required by design wind velocity, but not fewer than 10 seconds.

F. Air Infiltration: Provide aluminum-framed systems with maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq. ft. of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure difference of 6.24 lbf/sq. ft.

G. Water Penetration under Dynamic Pressure: Test according to AAMA 501.1 as follows:

1. No evidence of water penetration through fixed glazing and framing areas when tested at dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 15 lbf/sq. ft.
2. Maximum Water Leakage: No uncontrolled water penetrating assemblies or water appearing on assemblies' normally exposed interior surfaces from sources other than condensation. Water leakage does not include water controlled by flashing and gutters, or water that is drained to exterior.

H. Thermal Movements: Provide aluminum-framed systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
2. Test Performance: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.

I. Condensation Resistance: Provide aluminum-framed systems with fixed glazing and framing areas having condensation-resistance factor (CRF) of not less than 55 when tested according to AAMA 1503.

J. Thermal Conductance: Provide aluminum-framed systems with fixed glazing and framing areas having an average U-factor of **0.36** and not more than **0.38** Btu/sq. ft. x h x deg F when tested according to AAMA 1503, and glazed with 1-inch insulated glass units.

K. Thermal Conductance of Doors: Provide aluminum-framed doors with fixed glazing having an average U-factor of not more than **0.77** Btu/sq. ft. x h x deg F when tested according to AAMA 1503, and glazed with 1-inch insulated glass units.

2.2 INTERIOR FRAMING SYSTEMS

- A. Basis of Design Product: Subject to compliance with requirements, provide **Kawneer; Trifab VG 451** or one of the following:
 - 1. EFCO; Series 402NT.
 - 2. Wausau Window and Wall Systems; 14000 I/O Series.
- B. Framing Members: Manufacturer's standard extruded-aluminum framing members, minimum wall thickness of .080", and reinforced as required to support imposed loads.
 - 1. Construction: Non-thermal.
 - 2. Glazing System: Retained mechanically with gaskets on four sides.
 - 3. Glazing Plane: Center.
 - 4. Depth of Frame: Not less than 4-1/2".
 - 5. Face of Frame: Not less than 2".

2.3 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - 1. Sheet and Plate: ASTM B 209.
 - 2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
 - 3. Extruded Structural Pipe and Tubes: ASTM B 429.
 - 4. Structural Profiles: ASTM B 308/B 308M.
 - 5. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.
- B. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer, complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.
 - 1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
 - 2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
 - 3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

2.4 FRAMING SYSTEMS, GENERAL

- A. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
- B. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
 - 1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
 - 2. Reinforce members as required to receive fastener threads.
 - 3. Use exposed fasteners with countersunk Phillips screw heads to install hardware only, finished to match framing system.
- C. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts, complying with ASTM A 123/A 123M or ASTM A 153/A 153M.

- D. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.
- E. Framing System Gaskets and Sealants: Manufacturer's standard, recommended by manufacturer for joint type.
- F. Provide UL listed electrical back boxes of suitable size to allow termination of 1/2-inch EMT or 3/4-inch flexible metallic conduit at the following locations:
 - 1. Openings to receive security system devices.
 - 2. Openings to receive electrified locksets.
 - 3. Openings to receive electrified power transfer hinges.

2.5 GLAZING SYSTEMS

- A. Glazing: As specified in Division 08 Section "Glazing."
- B. Glazing Gaskets: Manufacturer's standard compression types; replaceable, molded or extruded, of profile and hardness required to maintain watertight seal.
- C. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.
- D. Bond-Breaker Tape: Manufacturer's standard TFE-fluorocarbon or polyethylene material to which sealants will not develop adhesion.

2.6 EXTERIOR ENTRANCE DOOR SYSTEMS

- A. General: Provide exterior entrance door systems at all exterior doors and interior vestibule doors.
- B. Basis of Design Product: Subject to compliance with requirements, provide **Kawneer; 500 Heavy Duty Entrance Door** or one of the following
 - 1. EFCO; D518 Heavy Duty Entrance Door.
 - 2. Wausau Window and Wall Systems; Monumental Doors.
- C. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.
 - 1. Door Construction: 2-inch overall thickness, with minimum 0.188-inch- thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.
 - 2. Door Design: Wide stile; 5-inch nominal width, with custom top and bottom rails in sizes indicated.
 - a. Accessible Doors: Smooth surfaced for width of door in area within 10 inches above floor or ground plane.
 - 3. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets.
 - a. Provide nonremovable glazing stops on outside of door.

4. Provide an integral 1/2-inch diameter wire tube in doors to receive electrified locksets, panic bars, mortised electric locksets, or electric strikes in the inactive leaf of pairs of doors to accommodate wiring associated with power transfer hinges, knuckles, and electrified hardware within the door.

2.7 ENTRANCE DOOR HARDWARE

- A. Entrance Door Hardware: For hardware other than that furnished by this Section, as specified in Division 08 Section "Door Hardware" and in the hardware sets included in the Door and Hardware Schedule.
- B. Weather Stripping: Manufacturer's standard replaceable components.
 1. Compression Type: Made of ASTM D 2000, molded neoprene, or ASTM D 2287, molded PVC.
- C. Weather Sweeps: Manufacturer's standard exterior-door bottom sweep with concealed fasteners on mounting strip.
- D. Silencers: BHMA A156.16, Grade 1.

2.8 ACCESSORIES

- A. Interior Trim: Extruded-aluminum profiles in sizes and configurations indicated on Drawings.
- B. Panning Trim: Extruded-aluminum profiles in sizes and configurations indicated on Drawings.
 1. Comply with requirements in Division 07 Section "Sheet Metal Flashing and Trim" for aluminum sheet. Provide custom color to match aluminum framing.
- C. Receptor System: Two-piece, snap-together, thermally broken, extruded-aluminum receptor system that anchors windows in place.

2.9 ACCESSORY MATERIALS

- A. Joint Sealants: For installation at perimeter of aluminum-framed systems, furnished and installed by Division 07 Section "Joint Sealants."
- B. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos; formulated for 30-mil thickness per coat.

2.10 FABRICATION

- A. Form or extrude aluminum shapes before finishing.
- B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- C. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:
 1. Profiles that are sharp, straight, and free of defects or deformations.

2. Accurately fitted joints with ends coped or mitered.
 3. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
 4. Physical and thermal isolation of glazing from framing members.
 5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
 6. Provisions for field replacement of glazing from exterior.
 7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.
- E. Storefront Framing: Fabricate components for assembly using screw-spline system.
1. Mullions: Provide mullions and cover plates as shown, matching curtainwall units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of curtainwall units due to thermal expansion and building deflections, as indicated. Provide mullions and cover plates capable of withstanding design loads of curtainwall units.
- F. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
1. At exterior doors, provide compression weather stripping at fixed stops.
 2. At interior doors, provide silencers at stops to prevent metal-to-metal contact. Install three silencers on strike jamb of single-door frames and two silencers on head of frames for pairs of doors.
- G. Entrance Doors: Reinforce doors as required for installing entrance door hardware.
1. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
 2. At exterior doors, provide weather sweeps applied to door bottoms.
- H. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.
- I. Prepare doors and frames to receive security systems hardware in accordance with final security systems shop drawings and templates provided by security systems hardware supplier.
- J. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.
- 2.11 ALUMINUM FINISHES
- A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected. Commencement of work indicates acceptance of substrates.

3.2 INSTALLATION

- A. General:
 - 1. Comply with manufacturer's written instructions.
 - 2. Do not install damaged components.
 - 3. Fit joints to produce hairline joints free of burrs and distortion.
 - 4. Rigidly secure nonmovement joints.
 - 5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.
 - 6. Seal joints watertight unless otherwise indicated.
- B. Metal Protection:
 - 1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or applying sealant or tape, or by installing nonconductive spacers as recommended by manufacturer for this purpose.
 - 2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.
- D. Set continuous sill members and flashing in full sealant bed as specified in Division 07 Section "Joint Sealants" to produce weathertight installation.
- E. Install components plumb and true in alignment with established lines and grades, and without warp or rack.
- F. Furnish and install glazing as specified in Division 08 Section "Glazing."
- G. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.
 - 1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
 - 2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.
- H. Furnish and install spray foam sealant at frame locations indicated.
- I. Install joint sealants specified in Division 07 Section "Joint Sealants", to produce weathertight installation.

3.3 ERECTION TOLERANCES

- A. Install aluminum-framed systems to comply with the following maximum erection tolerances:
 - 1. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet; 1/4 inch over total length.
 - 2. Alignment:
 - a. Where surfaces abut in line, limit offset from true alignment to 1/16 inch.
 - b. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch.
- B. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 inch.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Testing Services: Testing and inspecting of installed storefronts shall take place as follows:
 - 1. Water-Spray Test: Before installation of interior finishes has begun, areas designated by Commissioning Authority shall be tested according to AAMA 501.2 and shall not evidence water penetration.
 - a. Perform a minimum of three tests in areas as directed by Commissioning Authority.
 - b. Perform tests in each test area as directed by Commissioning Authority. Perform at least three tests, initial installation and prior to 25 and 75 percent completion.
 - 2. Air Infiltration: ASTM E 783 at 1.5 times the rate specified for laboratory testing in "Performance Requirements" Article but not more than 0.09 cfm/sq. ft. at a static-air-pressure differential of 6.24 lbf/sq. ft.
 - a. Perform a minimum of three tests in areas as directed by Commissioning Authority.
 - b. Perform tests in each test area as directed by Commissioning Authority. Perform at least three tests, initial installation and prior to 25 and 75 percent completion.
 - 3. Water Penetration: ASTM E 1105 at a minimum cyclic static-air-pressure differential at 100 percent of the static-air-pressure differential specified for laboratory testing in "Performance Requirements" Article, but not less than 6.24 lbf/sq. ft. and shall not evidence water penetration.
- C. Repair or remove work if test results and inspections indicate that it does not comply with specified requirements.
- D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- E. Aluminum-framed assemblies will be considered defective if they do not pass tests and inspections.
- F. Prepare test and inspection reports.

3.5 ADJUSTING, CLEANING, AND PROTECTION

- A. Adjust operating entrance door hardware to function smoothly as recommended by manufacturer.
 - 1. For entrance doors indicated to be accessible to people with disabilities, adjust closers to provide a 3-second closer sweep period for doors to move from a 70-degree open position to 3 inches from the latch, measured to the leading door edge.
- B. Clean aluminum surfaces immediately after installing aluminum-framed systems. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.
- C. Clean glass immediately after installation. Comply with manufacturer's written recommendations for final cleaning and maintenance. Remove nonpermanent labels, and clean surfaces.
- D. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.
- E. Protect aluminum framed surfaces from contact with contaminating substances resulting from construction operations. In addition, monitor surfaces adjacent to and below exterior concrete and masonry surfaces during construction for presence of dirt, scum, alkaline deposits, stains, or other contaminants. If contaminating substances do contact surfaces, remove contaminants immediately according to manufacturer's written recommendations.

END OF SECTION 084113

SECTION 084413 – GLAZED ALUMINUM CURTAIN WALLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes:
 - 1. Glazed aluminum curtain walls.
- B. Related Sections:
 - 1. Division 06 Section "Miscellaneous Rough Carpentry" for wood blocking.
 - 2. Division 07 Section "Sheet Metal Flashing and Trim" for formed aluminum plate assemblies furnished and installed by this Section.
 - 3. Division 07 Section "Joint Sealants" for installation of joint sealants installed with aluminum-framed systems and for sealants to the extent not specified in this Section.
 - 4. Division 07 Section "Spray Foam Sealants" for spray foam sealant furnished and installed by this Section.
 - 5. Division 08 Section "Aluminum-Framed Entrances and Storefronts" for aluminum entrance doors installed in glazed aluminum curtain walls.
 - 6. Division 08 Section "Glazing" for glazing requirements to the extent not specified in this Section.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design glazed aluminum curtain walls, including comprehensive engineering analysis by a qualified professional engineer licensed in the State of New York using performance requirements and design criteria indicated.
- B. General Performance: Comply with performance requirements specified, as determined by preconstruction testing of manufacturer's standard glazed aluminum curtain walls representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
 - 1. Glazed aluminum curtain walls shall withstand movements of supporting structure indicated on Drawings including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
 - 2. Failure also includes the following:

- a. Thermal stresses transferring to building structure.
- b. Glass breakage.
- c. Noise or vibration created by wind and thermal and structural movements.
- d. Loosening or weakening of fasteners, attachments, and other components.

C. Structural Loads:

1. Wind Loads: Provide glazed aluminum curtain wall systems capable of withstanding wind-load design pressures calculated using a "design wind pressure" as determined from the New York State Building Code, and as determined by the Fabricator's design engineer.
 - a. Basic Wind Speed: 130 mph.
 - b. Risk Category: III.
 - c. Exposure Category: B.
2. Seismic Loads: Provide glazed aluminum curtain wall systems capable of withstanding the effects of earthquake motions calculated according to the New York State Building Code, as determined by the Fabricator's design engineer.

D. Structural-Test Performance: Test according to ASTM E 330 as follows:

1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
3. Test Durations: As required by design wind velocity, but not less than 10 seconds.

E. Deflection of Framing Members: At design wind pressure, as follows:

1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6 inches and to 1/240 of clear span plus 1/4 inch for spans greater than 13 feet 6 inches or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
2. Deflection Parallel to Glazing Plane: Limited to amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components directly below them to less than 1/8 inch and clearance between members and operable units directly below them to less than 1/16 inch.
3. Cantilever Deflection: Where framing members overhang an anchor point, limit deflection to two times the length of cantilevered member, divided by 175.

F. Water Penetration under Dynamic Pressure: Test according to AAMA 501.1 as follows:

1. No evidence of water penetration through fixed glazing and framing areas when tested at dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 15 lbf/sq. ft.
2. Maximum Water Leakage: No uncontrolled water penetrating assemblies or water appearing on assemblies' normally exposed interior surfaces from sources other than condensation. Water leakage does not include water controlled by flashing and gutters, or water that is drained to exterior.

G. Thermal Movements: Allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures:

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
2. Test Performance: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.

- H. Energy Performance: Glazed aluminum curtain walls shall have certified and labeled energy performance ratings in accordance with NFRC.
1. Thermal Transmittance (U-factor): Fixed glazing and framing areas shall have U-factor of not more than **0.38** Btu/sq. ft. x h x deg F as determined according to NFRC 102.
 2. Solar Heat Gain Coefficient: Fixed glazing and framing areas shall have a solar heat gain coefficient of no greater than **0.40** as determined according to NFRC 200.
 3. Air Infiltration: Maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq. ft. of fixed wall area as determined according to ASTM E 283 at a minimum static-air-pressure differential of 6.24 lbf/sq. ft.
 4. Condensation Resistance: Fixed glazing and framing areas shall have an NFRC- certified condensation resistance rating of no less than 79 at frame and 76 at glass as determined according to NFRC 500.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For glazed aluminum curtain walls. Include plans, elevations, sections, full-size details, and attachments to other work.
1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
 2. Include full-size isometric details of each vertical-to-horizontal intersection of glazed aluminum curtain walls, showing the following:
 - a. Joinery, including concealed welds.
 - b. Anchorage.
 - c. Expansion provisions.
 - d. Glazing.
 - e. Flashing and drainage.
- C. Samples for Initial Selection: For units with factory-applied color finishes.
- D. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
1. Sheet Metal Flashing: 12 inches long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
 2. Trim, Metal Closures, Expansion Joints, Joint Intersections, and Miscellaneous Fabrications: 12 inches long and in required profile. Include fasteners and other exposed accessories.
 3. Accessories and Miscellaneous Materials: Full-size Sample.
- E. Fabrication Sample: Of each vertical-to-horizontal intersection of assemblies, made from 12-inch lengths of full-size components and showing details of the following:
1. Joinery, including concealed welds.
 2. Anchorage.
 3. Expansion provisions.
 4. Glazing.
 5. Flashing and drainage.

- F. Delegated-Design Submittal: For glazed aluminum curtain walls indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Seismic Qualification Certificates: For glazed aluminum curtain walls, accessories, and components, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
- C. Welding certificates.
- D. Energy Performance Certificates: For glazed aluminum curtain walls, accessories, and components, from manufacturer.
 - 1. Basis for Certification: NFRC-certified energy performance values for each glazed aluminum curtain wall.
- E. Product Test Reports: Based on evaluation of comprehensive tests performed within the last four years by a qualified testing agency, for glazed aluminum curtain walls, indicating compliance with performance requirements.
- F. Warranties: Sample of special warranties.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For glazed aluminum curtain walls to include in maintenance manuals.

1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A manufacturer capable of fabricating glazed aluminum curtain walls that meet or exceed energy performance requirements indicated and of documenting this performance by certification, labeling, and inclusion in lists.
- B. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- C. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.
 - 1. Do not revise intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If revisions are proposed, submit comprehensive explanatory data to Architect for review.

- D. Source Limitations for Aluminum-Framed Systems: Obtain glazed aluminum curtain walls and aluminum-framed entrance and storefront systems from a single source from a single manufacturer.
- E. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
- F. Energy Performance Standards: Comply with NFRC for minimum standards of energy performance, materials, components, accessories, and fabrication. Comply with more stringent requirements if indicated.
 - 1. Provide NFRC-certified glazed aluminum curtain walls with an attached label.
- G. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 - 1. Build mockup of typical wall area as directed by the Architect.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of structural supports for glazed aluminum curtain walls by field measurements before fabrication and indicate measurements on Shop Drawings.

1.10 WARRANTY

- A. Special Assembly Warranty: Standard form in which manufacturer agrees to repair or replace components of glazed aluminum curtain walls that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including, but not limited to, excessive deflection.
 - b. Noise or vibration created by wind and thermal and structural movements.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - d. Water penetration through fixed glazing and framing areas.
 - e. Failure of operating components.
 - 2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 FRAMING

- A. Basis of Design Product: Subject to compliance with requirements, provide **Kawneer North America; 1600 Wall System 1** or comparable product by one of the following:
 - 1. EFCO Corporation; XTherm 5600.
 - 2. Wausau Window and Wall Systems; SuperWall.
- B. Framing Members: Manufacturer's standard extruded- or formed-aluminum framing members of minimum wall thickness of 0.093-inch to 0.125-inch and reinforced as required to support imposed loads.
 - 1. Construction: Thermally improved.
 - 2. Glazing System: Retained mechanically with gaskets on four sides.
 - 3. Glazing Plane: Front.
 - 4. Depth of Frame: Not less than 6 inches.
 - 5. Face of Frame: Not less than 2-1/2".
- C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
- D. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
 - 1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
 - 2. Reinforce members as required to receive fastener threads.
 - 3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system, fabricated from 300 series stainless steel.
- E. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.
 - 1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.
- F. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.
- G. Framing Sealants: Manufacturer's standard sealants.

2.2 GLAZING

- A. Glazing: Furnish and install insulated glazing as specified in Division 08 Section "Glazing."
- B. Glazing Gaskets: Glazing gaskets shall comply with ASTM C 864 and be extruded of a silicone compatible EPDM rubber that provides for silicone adhesion.
- C. Glazing Sealants: As recommended by manufacturer.

2.3 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - 1. Sheet and Plate: ASTM B 209.
 - 2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
 - 3. Extruded Structural Pipe and Tubes: ASTM B 429.
 - 4. Structural Profiles: ASTM B 308/B 308M.
 - 5. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.
- B. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.
 - 1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
 - 2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
 - 3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

2.4 OPERABLE UNITS

- A. Doors: Comply with Division 08 Section "Aluminum-Framed Entrances and Storefronts."

2.5 ACCESSORY MATERIALS

- A. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil thickness per coat.

2.6 FABRICATION

- A. Form or extrude aluminum shapes before finishing.
- B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- C. Fabricate components that, when assembled, have the following characteristics:
 - 1. Profiles that are sharp, straight, and free of defects or deformations.
 - 2. Accurately fitted joints with ends coped or mitered.
 - 3. Physical and thermal isolation of glazing from framing members.
 - 4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
 - 5. Provisions for field replacement of glazing from exterior.
 - 6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- D. Fabricate components that, when assembled, have the following characteristics:
 - 1. Internal guttering system or other means to drain water passing joints, condensation occurring within framing members, and moisture migrating within glazed aluminum curtain wall to exterior.

2. Pressure-equalized system or double barrier design with primary air and vapor barrier at interior side of glazed aluminum curtain wall and secondary seal weeped and vented to exterior.
- E. Curtain-Wall Framing: Fabricate components for assembly using screw-spline system.
- F. Mullions: Provide mullions and cover plates as shown, matching curtainwall units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of curtainwall units due to thermal expansion and building deflections, as indicated. Provide mullions and cover plates capable of withstanding design loads of curtainwall units.
- G. Factory-Assembled Frame Units:
 1. Rigidly secure nonmovement joints.
 2. Seal joints watertight unless otherwise indicated.
 3. Install glazing to comply with requirements in Division 08 Section "Glazing."
- H. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.7 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General:
 1. Comply with manufacturer's written instructions.
 2. Do not install damaged components.
 3. Fit joints to produce hairline joints free of burrs and distortion.
 4. Rigidly secure nonmovement joints.
 5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
 6. Weld components in concealed locations to minimize distortion or discoloration of finish. Protect glazing surfaces from welding.
 7. Seal joints watertight unless otherwise indicated.

B. Metal Protection:

1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape or installing nonconductive spacers as recommended by manufacturer for this purpose.
 2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within glazed aluminum curtain wall to exterior.
- D. Install components plumb and true in alignment with established lines and grades.
- E. Install glazing as specified in Division 08 Section "Glazing."
- F. Furnish and install spray foam sealant at frame locations indicated.
- G. Install joint sealants specified in Division 07 Section "Joint Sealants", to produce weathertight installation.

3.3 ERECTION TOLERANCES

- A. Erection Tolerances: Install glazed aluminum curtain walls to comply with the following maximum tolerances:
1. Plumb: 1/8 inch in 10 feet; 1/4 inch in 40 feet.
 2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.
 3. Alignment:
 - a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch wide, limit offset from true alignment to 1/16 inch.
 - b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch wide, limit offset from true alignment to 1/8 inch.
 - c. Where surfaces are separated by reveal or protruding element of 1 inch wide or more, limit offset from true alignment to 1/4 inch.
 4. Location: Limit variation from plane to 1/8 inch in 12 feet; 1/2 inch over total length.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Test Area: Perform tests on representative areas of glazed aluminum curtain walls.
- C. Field Quality-Control Testing: Perform the following test on representative areas of glazed aluminum curtain walls:
1. Water-Spray Test: Before installation of interior finishes has begun, areas designated by Commissioning Authority shall be tested according to AAMA 501.2 and shall not evidence water penetration.
 - a. Perform a minimum of three tests in areas as directed by Commissioning Authority.

- b. Perform tests in each test area as directed by Commissioning Authority. Perform at least three tests, initial installation and prior to 25 and 75 percent completion.
- 2. Air Infiltration: ASTM E 783 at 1.5 times the rate specified for laboratory testing in "Performance Requirements" Article but not more than 0.09 cfm/sq. ft. at a static-air-pressure differential of 6.24 lbf/sq. ft.
 - a. Perform a minimum of three tests in areas as directed by Commissioning Authority.
 - b. Perform tests in each test area as directed by Commissioning Authority. Perform at least three tests, initial installation and prior to 25 and 75 percent completion.
- 3. Water Penetration: ASTM E 1105 at a minimum cyclic static-air-pressure differential at 100 percent of the static-air-pressure differential specified for laboratory testing in "Performance Requirements" Article, but not less than 6.24 lbf/sq. ft. and shall not evidence water penetration.
- D. Glazed aluminum curtain walls will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports.

3.5 ADJUSTING, CLEANING, AND PROTECTION

- A. Clean aluminum surfaces immediately after installing curtain wall systems. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.
- B. Clean glass immediately after installation. Comply with manufacturer's written recommendations for final cleaning and maintenance. Remove nonpermanent labels, and clean surfaces.
- C. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.
- D. Protect curtain wall surfaces from contact with contaminating substances resulting from construction operations. In addition, monitor surfaces adjacent to and below exterior concrete and masonry surfaces during construction for presence of dirt, scum, alkaline deposits, stains, or other contaminants. If contaminating substances do contact surfaces, remove contaminants immediately according to manufacturer's written recommendations.

END OF SECTION 084413

SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Commercial door hardware for the following:
 - a. Swinging doors.
 - b. Other doors to the extent indicated.
 - 2. Cylinders for doors specified in other Sections.
 - 3. Electrified door hardware.
- B. Related Sections include the following:
 - 1. Division 08 Section "Hollow Metal Doors and Frames" for astragals provided as part of fire-rated labeled assemblies.
 - 2. Division 08 Section "Access Doors and Frames" for access door hardware, except cylinders.
 - 3. Division 08 Section "Aluminum-Framed Entrances and Storefronts" for entrance door hardware to the extent not specified in this section.
 - 4. Division 26 Sections for connections to electrical power system and for low-voltage wiring work.
 - 5. Division 28 Section "Access Control" for access control devices installed at door openings and provided as part of a security access system.
 - 6. Division 28 Section "Intrusion Detection" for detection devices installed at door openings and provided as part of an intrusion detection system.
 - 7. Division 28 Section "Fire Detection and Alarm" for connections to building fire alarm system.

1.3 SUBMITTALS

- A. Product Data: Include construction and installation details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: Details of electrified door hardware, indicating the following:
 - 1. Wiring Diagrams: Power, signal, and control wiring. Include the following:
 - a. System schematic.
 - b. Point-to-point wiring diagram.
 - c. Riser diagram.
 - d. Elevation of each door.

2. Detail interface between electrified door hardware and fire alarm, access control, and/or security systems. Coordinate installation details for electrified door hardware with approved shop drawings for these systems.
 3. Operation Narrative: Describe the operation of doors controlled by electrified door hardware.
- C. Samples for Verification: For exposed door hardware of each type, in specified finish, full size. Tag with full description for coordination with the door hardware sets. Submit Samples before, or concurrent with, submission of the final door hardware sets.
1. Samples will be returned to Contractor. Units that are acceptable and remain undamaged through submittal, review, and field comparison process may, after final check of operation, be incorporated into the Work, within limitations of keying requirements.
- D. Product Certificates: For electrified door hardware, signed by product manufacturer.
1. Certify that door hardware approved for use on types and sizes of labeled fire doors complies with listed fire door assemblies.
- E. Qualification Data: For Architectural Hardware Consultant.
- F. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for locks, latches, delayed-egress locks, and closers.
- G. Maintenance Data: For each type of door hardware to include in maintenance manuals. Include the following:
1. Final hardware schedule, as-built.
 2. Keying schedule.
 3. Product cut sheets for each item installed.
 4. Parts list and numbers for each item installed.
 5. Maintenance information for each item installed.
 6. Name, address and phone number of local representative of each item installed.
- H. Warranty: Special warranty specified in this Section.
- I. Other Action Submittals:
1. Door Hardware Sets: Prepared by or under the supervision of the Architectural Hardware Consultant, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final door hardware sets with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 - a. Format: Use same scheduling sequence and format and use same door numbers as in the Contract Documents.
 - b. Content: Include the following information:
 - 1) Identification number, location, hand, fire rating, and material of each door and frame.
 - 2) Type, style, function, size, quantity, and finish of each door hardware item. Include description and function of each lockset and exit device.
 - 3) Complete designations of every item required for each door or opening including name and manufacturer.
 - 4) Fastenings and other pertinent information.
 - 5) Location of each door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.

- 6) Explanation of abbreviations, symbols, and codes contained in schedule.
 - 7) Mounting locations for door hardware.
 - 8) Door and frame sizes and materials.
 - 9) Description of each electrified door hardware function, including location, sequence of operation, and interface with other building control systems.
 - a) Sequence of Operation: Include description of component functions that occur in the following situations: authorized person wants to enter; authorized person wants to exit; unauthorized person wants to enter; unauthorized person wants to exit.
 - 10) List of related door devices specified in other Sections for each door and frame.
 - 11) Name, address and phone number of local representative of each item installed.
- c. Submittal Sequence: Submit the final door hardware sets at earliest possible date, particularly where approval of the door hardware sets must precede fabrication of other work that is critical in Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the door hardware sets.
2. Keying Schedule: Prepared by or under the supervision of Architectural Hardware Consultant and following Keying Conference, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations.

1.4 QUALITY ASSURANCE

- A. Comply with State University Construction Fund for door hardware requirements in addition to those specified herein.
- B. Installer Qualifications: An employer of workers trained and approved by lock manufacturer.
1. Installer's responsibilities include supplying and installing door hardware, and providing a qualified Architectural Hardware Consultant available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.
 2. Installer shall have warehousing facilities in Project's vicinity.
 3. Scheduling Responsibility: Preparation of door hardware and keying schedules.
 4. Engineering Responsibility: Preparation of data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
- C. Architectural Hardware Consultant Qualifications: A person who is currently certified by DHI as an Architectural Hardware Consultant and who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project.
1. Electrified Door Hardware Consultant Qualifications: A qualified Architectural Hardware Consultant who is experienced in providing consulting services for electrified door hardware installations.
- D. Source Limitations: Obtain each type and variety of door hardware from a single manufacturer, unless otherwise indicated.
1. Provide electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated. Manufacturers that perform electrical modifications and that are listed by a testing and inspecting agency acceptable to authorities having jurisdiction are acceptable.

- E. Fire-Rated Door Assemblies: Where fire-rated door assemblies are indicated, provide door hardware rated for use in assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C, unless otherwise indicated.
- F. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.
- G. Regulatory Requirements: Comply with applicable provisions in ICC/ANSI A117.1 and 2010 ADA Standards.
 - 1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.
 - 2. Comply with the following maximum opening-force requirements:
 - a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf applied perpendicular to door.
 - b. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
 - 3. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch high.
 - 4. Adjust door closer sweep periods so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the leading edge of the door.
- H. Keying Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." In addition to Owner, Owner's Representative, Contractor, and Architect, conference participants shall also include Installer's Architectural Hardware Consultant and Owner's security consultant. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including, but not limited to, the following:
 - 1. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
 - 2. Preliminary key system schematic diagram.
 - 3. Requirements for key control system.
 - 4. Address for delivery of keys.
- I. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." In addition to Owner, Owner's Representative, Contractor, and Architect, a representative of each major hardware category shall be present to instruct installers on the proper installation and adjustment of door hardware. Review methods and procedures related to installation of door hardware including, but not limited to, the following:
 - 1. Inspect and discuss electrical roughing-in and other preparatory work performed by other trades.
 - 2. Review sequence of operation for each type of electrified door hardware.
 - 3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 4. Review required testing, inspecting, and certifying procedures.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.

- B. Tag each item or package separately with identification related to the final door hardware sets, and include basic installation instructions, templates, and necessary fasteners with each item or package.
 - 1. Each item to be individually packaged in manufacturer's original container.
- C. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

1.6 COORDINATION

- A. Templates: Distribute door hardware templates for doors, frames, and other work specified to be factory prepared for installing door hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- B. Electrical System Roughing-in: Coordinate layout and installation of electrified door hardware with connections to power supplies, fire alarm system and detection devices, access control system, and/or security systems.
- C. Existing Openings: Where new hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide for proper operation.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including excessive deflection, cracking, or breakage.
 - b. Faulty operation of operators and door hardware.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
 - 2. Warranty Period: One year from date of Substantial Completion, except as follows:
 - a. Exit Devices: Three years from date of Substantial Completion.
 - b. Manual Closers: 10 years from date of Substantial Completion.
 - c. Hinges: Lifetime.

1.8 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish two complete sets of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware. Furnish two extra fasteners of each type and finish installed.
- B. Maintenance Service: Beginning at Substantial Completion, provide six months' full maintenance by skilled employees of door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door hardware operation. Provide parts and supplies same as those used in the manufacture and installation of original products.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

- A. General: Provide door hardware for each door to comply with requirements in this Section, door hardware sets indicated in door and frame schedule, and door hardware sets indicated in Part 3 "Door Hardware Sets" Article.
 - 1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated.
 - 2. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.
- B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in Part 3 "Door Hardware Sets" Article. Products are identified by descriptive titles corresponding to requirements specified in Part 2.
- C. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 HINGES

- A. Hinges: BHMA A156.1. Provide template-produced hinges for hinges installed on hollow-metal frames.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Hager Companies.
 - b. McKinney Products Company; an ASSA ABLOY Group company.
 - c. Stanley Commercial Hardware.
 - 2. Mounting: Full mortise (butts).
 - 3. Bearing Material: Ball bearing.
 - 4. Grade: Grade 1 (heavy weight).
 - 5. Base and Pin Metal:
 - a. Exterior Hinges: Stainless steel with stainless-steel pin.
 - b. Interior Hinges: Steel with steel pin.
 - c. Hinges for Fire-Rated Assemblies: Steel with steel pin.
 - 6. Pins: Non-rising loose, unless otherwise indicated.
 - a. Outswinging Exterior Doors: Nonremovable.
 - b. Outswinging Corridor Doors with Locks: Nonremovable.
 - 7. Tips: Flat button.
 - 8. Corners: Square.

- B. Quantity: Provide the following, unless otherwise indicated:
1. Three Hinges: For doors with heights 61 to 90 inches.
 2. Four Hinges: For doors with heights 91 to 120 inches.
 3. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.
- C. Fasteners: Comply with the following:
1. Machine Screws: For metal doors and frames. Install into drilled and tapped holes.
 2. Wood Screws: For wood doors and frames.
 3. Threaded-to-the-Head Wood Screws: For fire-rated wood doors.
 4. Screws: Phillips flat-head. Finish screw heads to match surface of hinges.

2.3 CONTINUOUS HINGES

- A. Provide continuous hinges at all exterior doors.
- B. Continuous, Gear-Type Hinges: Extruded-aluminum, pinless, geared hinge leaves; joined by a continuous extruded-aluminum channel cap; with concealed, self-lubricating thrust bearings.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Bommer Industries, Inc.
 - b. Hager Companies; Hager-Roton.
 - c. McKinney Products Company; an ASSA ABLOY Group company.
 - d. Pemko Manufacturing Co.
 2. Grade: Grade 1-150.
 3. Mounting: Full surface, with removable continuous caps over fasteners.
 4. Electric Option: Coordinate with security requirements.

2.4 MECHANICAL LOCKS AND LATCHES

- A. Mortise Locks: Stamped steel case with steel or brass parts; BHMA A156.13, Grade 1, Series 1000, heavy-duty.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Best Access Systems, Div. of The Stanley Works; Series 45H.
 - b. Corbin Russwin Architectural Hardware, an ASSA ABLOY Group company; Series ML2000.
 - c. SARGENT Manufacturing Company, an ASSA ABLOY Group company; Series 8200.
 - d. Schlage Commercial Lock Division, an Allegion Company; Series L.
- B. Lock Functions: As indicated in door hardware schedule.
- C. Lock Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:
1. Mortise Locks: Minimum 3/4-inch latchbolt throw.

- D. Lock Backset: 2-3/4 inches.
- E. Lock Trim:
 - 1. Levers: Solid brass, bronze or stainless steel; cast or forged and through-bolted with a 2-piece spindle.
 - a. Provide tactile warning at hazardous locations.
 - 2. Escutcheons (Roses): Wrought.
 - 3. Dummy Trim: Match lever lock trim and escutcheons.
 - 4. Lockset Designs: Provide design indicated or, if sets are provided by another manufacturer, provide designs that match those designated.
- F. Strikes: Manufacturer's standard strike with strike box for each latchbolt or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, and as follows:
 - 1. Strikes for Mortise Locks and Latches: BHMA A156.13.
 - 2. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
 - 3. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
 - 4. Aluminum-Frame Strike Box: Manufacturer's special strike box fabricated for aluminum framing.
 - 5. Rabbet Front and Strike: Provide on locksets for rabbeted meeting stiles.

2.5 AUTOMATIC AND SELF-LATCHING FLUSH BOLTS

- A. Automatic and Self-Latching Flush Bolts: BHMA A156.16; minimum 3/4-inch throw; designed for mortising into door edge.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Glynn-Johnson.
 - b. Hager Companies.
 - c. IVES Hardware.
 - d. Trimco.
- B. Automatic Flush Bolts: Grade 1, fabricated from steel and brass components, with spring-activated bolts that automatically retract when active leaf is opened and that automatically engage when active door depresses bolt trigger; listed and labeled for fire-rated doors. Provide brass or stainless-steel cover plate, top and bottom dustproof strikes, guides, guide supports, wear plates, and shims.
- C. Dustproof Strikes: Locking type, Grade 1, polished wrought brass, with 3/4-inch- diameter, spring-tension plunger.

2.6 EXIT DEVICES AND AUXILIARY ITEMS

- A. Exit Devices and Auxiliary Items: BHMA A156.3.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Corbin Russwin Architectural Hardware; an ASSA ABLOY Group company; 5000 Series.

- b. Precision Hardware, Inc.; 1100/D-1200 Series.
 - c. SARGENT Manufacturing Company; an ASSA ABLOY Group company; 80 Series.
 - d. Von Duprin; an Allegion Company; 98/99 Series.
- B. Panic Exit Devices: Listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305.
- C. Fire Exit Devices: Devices complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire and panic protection, based on testing according to UL 305 and NFPA 252.
- D. Fire-Exit Removable Mullions: Provide removable mullions for use with fire exit devices complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire and panic protection, based on testing according to UL 305 and NFPA 252. Mullions shall be used only with exit devices for which they have been tested.
- E. Outside Trim: Lever with cylinder; material, design and finish to match locksets, unless otherwise indicated.
 - 1. Provide forged or cast escutcheon plates.
 - 2. Provide knurled outside lever where scheduled.
- F. Provide the following types of exit devices as scheduled:
 - 1. Rim Exit Devices:
 - a. Type: BHMA A156.3, Type 1, rim.
 - b. Actuating Bar: Push pad.
 - c. Material: Brass, Bronze, Stainless steel or Aluminum.
 - 2. Push Pad: Extend push pad a minimum of one-half of the door width. Provide flush mounted end cap with two-point attachment to the door.
 - 3. Provide the following for each device:
 - a. Nylon bearings and stainless steel springs.
 - b. Security dead latching feature.
 - c. Spacers as required for flush mounting of mechanism case.
 - d. Glass bead kits for mounting of hardware on glass doors.
 - 4. Provide all non-fire-rated exit devices with cylinder dogging, except at locations indicated with electric latch retraction or request-for-exit function.
- G. Electrified Exit Device Options (as scheduled): Types and functions indicated as follows:
 - 1. Request-for-Exit Function: Signal initiated when push bar is actuated.
 - 2. Delayed Egress: Depressing push bar for more than 3 seconds initiates irreversible alarm and 15-second delay for egress. Fire alarm voids 15-second delay.
 - 3. Electric Latch Retraction: Remote signal activates continuous-duty solenoid that retracts latch.
 - 4. Power supplies: Furnished by Door Hardware supplier; installed by the Security Contractor.
 - 5. Local Audible Alarms: Furnished and installed by Division 28 Section.
- H. Tube-Steel Removable Mullions: BHMA A156.3, with malleable-iron top and bottom retainers, and prepared for strikes as follows:
 - 1. Strikes: Two standard recessed strikes.

2.7 LOCK CYLINDERS

- A. Lock Cylinders: Tumbler type, constructed from brass or bronze, stainless steel, or nickel silver.
 - 1. All locksets and cylinders shall be keyed into the existing Campus Master Key System for this project. Allow for 100% expansion. For the protection of the Campus, all cylinders shall be keyed at the factory where permanent records shall be established and maintained.
- B. Cylinders: BHMA A156.5, Grade 1, manufacturer's standard tumbler type, constructed from brass, or bronze, stainless steel, or nickel silver, complying with the following:
 - 1. Number of Pins: Seven (7).
 - 2. Bored-Lock Type: Cylinders with tailpieces to suit locks.
 - a. High-Security Grade: BHMA A156.5, Grade 1A, listed and labeled as complying with pick- and drill-resistant testing requirements in UL-437 (SuffixA).
 - 3. Proprietary product to match Campus standard as follows:
 - a. Best Access Systems; Premium Series. (no substitution).
- C. Construction Keying: During construction, all new locksets shall be construction master keyed. Provide temporary construction cores. The Contractor shall receive ten (10) construction master keys. Under no circumstance shall the Contractor receive any permanent building master keys or change keys unless authorized by the Campus Representative.
 - 1. All construction cores will be returned to General Contractor once Campus has received and installed final cores.
- D. Permanent Cores: All permanent cores and keys shall be requested directly by the Campus to the manufacturer. The Contractor shall be responsible for all payments to the manufacturer and shall supply the Campus with all necessary information (account number, etc.), in order for the Campus to order final cores and keys.

2.8 KEYING

- A. Keying System: Factory registered, complying with guidelines in BHMA A156.28, Appendix A. Incorporate decisions made in keying conference, and as follows:
 - 1. Master Key System: Cylinders are operated by a change key and a master key.
 - 2. Existing System: Re-key Campus' existing master key system into new keying system.
 - 3. Keyed Alike: Key all cylinders to same change key.
 - 4. All master keys shall be identified with a registry number, and shall **not** be stamped with MASTER or letter M.
- B. Keys: Nickel silver.
 - 1. Quantity: In addition to two extra key blanks for each lock, provide the following:
 - a. Cylinder Change Keys: Three.
 - b. Master Keys: Two.
 - 2. All keying shall be thoroughly checked with the Campus Representative. Final keying requirements shall be submitted in writing, for final approval by the Campus Representative.

2.9 OPERATING TRIM

- A. Operating Trim: BHMA A156.6; stainless steel.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Burns Manufacturing Incorporated.
 - b. Hager Companies.
 - c. IVES Hardware; an Ingersoll-Rand Company.
 - d. Rockwood Manufacturing Company.
 - e. Trimco.
- B. Flat Push Plates: 0.050 inch thick, 4 inches wide by 16 inches high; with square corners and beveled edges, secured with exposed screws.
- C. Straight Pull-Plate Door Pulls: 0.050-inch- thick plate, 4 inches wide by 16 inches high, with square corners and beveled edges; with minimum clearance of 1-1/2 inches from face of door; fastened at 8 inches o.c.
 - 1. Type: 3/4-inch constant-diameter pull.
 - 2. Mounting: Surface applied with concealed fasteners.
 - 3. Overall Pull Length: 9 inches.

2.10 ACCESSORIES FOR PAIRS OF DOORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Hager Companies.
 - 2. National Guard Products.
 - 3. Pemko Manufacturing Co.
 - 4. Reese Enterprises.
- B. Coordinators: BHMA A156.3; consisting of active-leaf, hold-open lever and inactive-leaf release trigger; fabricated from steel with nylon-coated strike plates; with built-in, adjustable safety release; and with internal override.
- C. Flat Overlapping Astragals: BHMA A156.22; flat zinc-plated steel metal bar, surface mounted on face of door with screws; minimum 1/8 inch thick by 2 inches wide by full height of door.

2.11 SURFACE CLOSERS

- A. Surface Closers: BHMA A156.4; rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves and forged-steel main arm. Comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. LCN Closers; an Allegion Company; 4000 Series.
 - b. Norton Door Controls; an ASSA ABLOY Group company; PR7500/PR7700.

- c. SARGENT Manufacturing Company; an ASSA ABLOY Group company; 351 Series.
- B. Surface Closer with Cover: Grade 1; Modern Type with mechanism enclosed in cover.
 - 1. Mounting: Parallel arm, unless otherwise indicated.
 - 2. Type: Regular arm, heavy-duty.
 - a. Provide delayed action closing where indicated.
 - 3. Backcheck: Adjustable, effective between 60 and 85 degrees of door opening.
 - a. Where indicated, closer must operate at 180 degree opening.
 - 4. Provide all drop plate brackets, shims and angle brackets as required to complete installation of closers on doors and frames.

2.12 MECHANICAL STOPS AND HOLDERS

- A. Wall- and Floor-Mounted Stops: BHMA A156.16; polished cast brass, bronze, or aluminum base metal.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Burns Manufacturing Incorporated.
 - b. Glynn-Johnson.
 - c. Hager Companies.
 - d. IVES Hardware.
 - e. Rockwood Manufacturing Company.
 - f. Trimco.
 - 2. Provide wall stops for doors unless floor or other type stops are scheduled or indicated. Do not mount floor stops where they will impede traffic. Where floor or wall stops are not appropriate, provide overhead holders.
- B. Wall Bumpers: Grade 1; with rubber bumper; 2-1/2-inch diameter, minimum 3/4-inch projection from wall; with backplate for concealed fastener installation; with concave bumper configuration.
- C. Dome-Type Floor Stop: Grade 1; with minimum 1-inch- high bumper for doors without threshold and 1-3/8-inch- high bumper for doors with threshold; provide with extruded aluminum riser for carpet installations.

2.13 OVERHEAD STOPS AND HOLDERS

- A. Overhead Stops and Holders: BHMA A156.8.

2.14 DOOR GASKETING

- A. Door Gasketing: BHMA A156.22; air leakage not to exceed 0.50 cfm per foot of crack length for gasketing other than for smoke control, as tested according to ASTM E 283; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Hager Companies.
 - b. National Guard Products.
 - c. Pemko Manufacturing Co.
 - d. Reese Enterprises.

2.15 THRESHOLDS

- A. Thresholds: BHMA A156.21; fabricated to full width of opening indicated.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Hager Companies.
 - b. National Guard Products.
 - c. Pemko Manufacturing Co.
 - d. Reese Enterprises.
- B. Saddle Thresholds:
 1. Type: Fluted top.
 2. Base Metal: Aluminum.

2.16 METAL PROTECTIVE TRIM UNITS

- A. Metal Protective Trim Units: BHMA A156.6; fabricated from 0.050-inch- thick stainless steel; with manufacturer's standard machine or self-tapping screw fasteners.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Burns Manufacturing Incorporated.
 - b. Hager Companies.
 - c. IVES Hardware; an Ingersoll-Rand Company.
 - d. Rockwood Manufacturing Company.
 - e. Trimco.
- B. Armor Plates: 36 inches high by door width, with allowance for frame stops.
- C. Kick Plates: 12 inches high by door width, with allowance for frame stops.
- D. Mop Plates: 6 inches high by 1 inch less than door width.

2.17 AUXILIARY DOOR HARDWARE

- A. Silencers for Metal Door Frames: Grade 1; neoprene or rubber; minimum diameter 1/2 inch; fabricated for drilled-in application to frame.

2.18 AUXILIARY ELECTRIFIED DOOR HARDWARE

- A. Boxed Power Supplies: Modular unit in NEMA ICS 6, Type 4 enclosure; filtered and regulated; voltage rating and type matching requirements of door hardware served; and listed and labeled for use with fire alarm systems.
- B. Door and Frame Transfer Devices: Steel housing for mortise in hinge stile of door, with flexible tube for wiring bundle; accommodating doors that swing open to 120 degrees.

2.19 FABRICATION

- A. Manufacturer's Nameplate: Do not provide products that have manufacturer's name or trade name displayed in a visible location except in conjunction with required fire-rated labels and as otherwise approved by Architect.
 - 1. Manufacturer's identification is permitted on rim of lock cylinders only.
- B. Base Metals: Produce door hardware units of base metal, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18. Do not furnish manufacturer's standard materials or forming methods if different from specified standard.
- C. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.
 - 1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
 - 2. Fire-Rated Applications:
 - a. Wood or Machine Screws: For the following:
 - 1) Hinges mortised to doors or frames; use threaded-to-the-head wood screws for wood doors and frames.
 - 2) Strike plates to frames.
 - 3) Closers to doors and frames.
 - b. Steel Through Bolts: For the following unless door blocking is provided:
 - 1) Surface hinges to doors.
 - 2) Closers to doors and frames.
 - 3) Surface-mounted exit devices.
 - 3. Spacers or Sex Bolts: For through bolting of hollow-metal doors.
 - 4. Fasteners for Wood Doors: Comply with requirements in DHI WDHS.2, "Recommended Fasteners for Wood Doors."
 - 5. Gasketing Fasteners: Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

2.20 FINISHES

- A. Standard: BHMA A156.18, as indicated in door hardware sets.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.
- B. Wood Doors: Comply with DHI WDHS.5 "Recommended Hardware Reinforcement Locations for Mineral Core Wood Flush Doors."

3.3 INSTALLATION

- A. Mounting Heights: Mount door hardware units at heights indicated on Drawings, and in accordance with the **New York** State Building Code, the 2010 ADA Standards and ICC/ANSI A117.1.
 - 1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
 - 2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
- B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 09 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
 - 1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.

2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- C. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.
- D. Lock Cylinders: Install construction cores to secure building and areas during construction period.
 1. Replace construction cores with permanent cores as indicated in keying schedule.
 2. Furnish permanent cores to Owner for installation.
- E. Boxed Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings. Verify location with Architect.
 1. Configuration: Provide one power supply for each door opening.
- F. Thresholds: Set thresholds for exterior doors in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."
- G. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they will impede traffic.
- H. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
- I. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
- J. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

3.4 FIELD QUALITY CONTROL

- A. Independent Architectural Hardware Consultant: Owner will engage a qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports.
 1. Independent Architectural Hardware Consultant will inspect door hardware and state in each report whether installed work complies with or deviates from requirements, including whether door hardware is properly installed and adjusted.

3.5 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
 1. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
 2. Door Closers: Unless otherwise required by authorities having jurisdiction, adjust sweep period so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the leading edge of the door.

- B. Occupancy Adjustment: Approximately three months after date of Substantial Completion, Installer's Architectural Hardware Consultant shall examine and readjust, including adjusting operating forces, each item of door hardware as necessary to ensure function of doors, door hardware, and electrified door hardware.

3.6 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items as necessary to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

3.7 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION 087100

SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
 - 1. Doors.
 - 2. Glazed entrances.
 - 3. Storefront and curtainwall framing.
- B. Related Sections include the following:
 - 1. Division 08 Section "Hollow Metal Doors and Frames" for installing glazing in hollow metal doors and frames.
 - 2. Division 08 Section "Aluminum-Framed Entrances and Storefronts" for glazing to be furnished and installed with aluminum framing systems.
 - 3. Division 08 Section "Glazed Aluminum Curtain Walls" for glazing to be furnished and installed with aluminum framing systems.

1.3 DEFINITIONS

- A. Manufacturers of Glass Products: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Interspace: Space between lites of an insulating-glass unit that contains dehydrated air or a specified gas.

1.4 PERFORMANCE REQUIREMENTS

- A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Glass Design: Glass thickness designations indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites in the thickness designations indicated for various size openings, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:
 - 1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:

- a. Specified Design Wind Loads: As indicated, but not less than wind loads applicable to Project as required by ASCE 7 "Minimum Design Loads for Buildings and Other Structures": Section 6.0 "Wind Loads", and the New York Island State Building Code.
 - 1) Ultimate Design Wind Speed: 115 mph.
 - b. Probability of Breakage for Vertical Glazing: 8 lites per 1000 for lites set vertically or not more than 15 degrees off vertical and under wind action.
 - 1) Load Duration: 3 seconds or less.
 - c. Thickness of Heat-Absorbing Glass: Provide the same thickness for each tint color indicated throughout Project.
- C. Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
- D. Thermal and Optical Performance Properties: Provide glass with performance properties specified based on manufacturer's published test data, as determined according to procedures indicated below:
1. Center-of-Glass Values: Based on using LBL-35298 WINDOW 5.2 computer program for the following methodologies:
 - a. U-Factors: NFRC 100 expressed as Btu/ sq. ft. x h x deg F.
 - b. Solar Heat Gain Coefficient: NFRC 200.
 - c. Solar Optical Properties: NFRC 300.

1.5 PRECONSTRUCTION TESTING

- A. Preconstruction Adhesion and Compatibility Testing: Submit to elastomeric glazing sealant manufacturers, for testing indicated below, samples of each glazing material type, tape sealant, gasket, glazing accessory, and glass-framing member that will contact or affect elastomeric glazing sealants:
1. Use ASTM C 1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.
 2. Submit not fewer than eight pieces of each type of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
 3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
 4. For materials failing tests, obtain sealant manufacturer's written instructions for corrective measures, including the use of specially formulated primers.
 5. Testing will not be required if elastomeric glazing sealant manufacturers submit data based on previous testing of current sealant products for adhesion to, and compatibility with, glazing materials matching those submitted.

1.6 ACTION SUBMITTALS

- A. Product Data: For each glass product and glazing material indicated.

- B. Samples: For the following products, in the form of 12-inch- square Samples for glass.
 - 1. Fire-resistive (safety) glazing products.
 - 2. Insulating glass for each designation indicated.
- C. Glazing Schedule: Use same designations indicated on Drawings for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.
- D. Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.
 - 1. For solar-control low-e-coated glass, provide documentation demonstrating that manufacturer of coated glass is certified by coating manufacturer.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For installers.
- B. Preconstruction Adhesion and Compatibility Test Report: From glazing sealant manufacturer indicating glazing sealants were tested for adhesion to glass and glazing channel substrates and for compatibility with glass and other glazing materials.
- C. Product Test Reports: For each of the following types of glazing products:
 - 1. Coated float glass.
 - 2. Insulating glass.
 - 3. Glazing sealants.
- D. Warranties: Special warranties specified in this Section.

1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved and certified by coated-glass manufacturer.
- B. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in glass installations with a record of successful in-service performance; and who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.
- C. Source Limitations for Glass: Obtain the following through one source from a single manufacturer for each glass type: clear float glass, coated float glass, laminated glass, and insulating glass.
- D. Source Limitations for Glass Sputter-Coated with Solar-Control Low-E Coatings: Where solar-control low-e coatings of a primary glass manufacturer that has established a certified fabricator program is specified, obtain sputter-coated solar-control low-e-coated glass in fabricated units from a manufacturer that is certified by coated-glass manufacturer.
- E. Source Limitations for Glazing Accessories: Obtain glazing accessories through one source from a single manufacturer for each product and installation method indicated.

- F. Glass Product Testing: Obtain glass test results for product test reports in "Submittals" Article from a qualified testing agency based on testing glass products.
 - 1. Glass Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.
- G. Elastomeric Glazing Sealant Product Testing: Obtain sealant test results for product test reports in "Submittals" Article from a qualified testing agency based on testing current sealant formulations within a 36-month period.
 - 1. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated, as documented according to ASTM E 548.
 - 2. Test elastomeric glazing sealants for compliance with requirements specified by reference to ASTM C 920, and where applicable, to other standard test methods.
- H. Safety Glazing Products: Comply with testing requirements in 16 CFR 1201.
 - 1. Subject to compliance with requirements, obtain safety glazing products permanently marked with certification label of the Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction.
 - 2. Where glazing units, including Kind FT glass and laminated glass, are specified in Part 2 articles for glazing lites more than 9 sq. ft. in exposed surface area of one side, provide glazing products that comply with Category II materials, for lites 9 sq. ft. or less in exposed surface area of one side, provide glazing products that comply with Category I or II materials, except for hazardous locations where Category II materials are required by 16 CFR 1201 and regulations of authorities having jurisdiction.
- I. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
 - 1. IGMA Publication for Insulating Glass: SIGMA TM-3000, "Glazing Guidelines for Sealed Insulating Glass Units."
- J. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the following testing and inspecting agency:
 - 1. Insulating Glass Certification Council.
- K. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Build mockups in the location as directed by Architect.
 - 2. Build glass mockups by installing the following kinds of glass in mockups specified in Division 08 Section "Glazed Aluminum Curtain Walls" to match glazing systems required for Project, including glazing methods:
 - a. Coated insulating glass.
 - 3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- L. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- B. For insulating-glass units that will be exposed to substantial altitude changes, comply with insulating-glass manufacturer's written recommendations for venting and sealing to avoid hermetic seal ruptures.

1.10 PROJECT CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
 - 1. Do not install liquid glazing sealants when ambient and substrate temperature conditions are outside limits permitted by glazing sealant manufacturer or below 40 deg F.

1.11 WARRANTY

- A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form in which coated-glass manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.
 - 1. Warranty Period: 10 years from date of Substantial Completion.
- B. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form in which insulating-glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.
 - 1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GLASS PRODUCTS

- A. Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated.
- B. Heat-Treated Float Glass: ASTM C 1048; Type I (transparent flat glass); Quality-Q3; of class, kind, and condition indicated.
 - 1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed, unless otherwise indicated.
 - 2. For uncoated glass, comply with requirements for Condition A.
 - 3. For coated vision glass, comply with requirements for Condition C (other uncoated glass).

- C. Sputter-Coated Float Glass: ASTM C 1376, float glass with metallic-oxide or -nitride coating deposited by vacuum deposition process after manufacture and heat treatment (if any), and complying with other requirements specified.

2.2 FIRE-RATED SAFETY GLAZING PRODUCTS

- A. Glazing for Fire-Rated Door Assemblies: Glazing for assemblies that comply with NFPA 80 and that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 252, including hose stream test.
- B. Glazing for Fire-Rated Window Assemblies: Glazing for assemblies that comply with NFPA 80 and that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 257, including hose stream test.
- C. Laminated Ceramic Glazing (Fire Rated Safety Glazing): Proprietary Category II safety glazing product in the form of two lites of clear ceramic glazing material laminated together to produce a laminated lite of 5/16-inch nominal thickness; polished on both surfaces, transparent; weighing 4 lb/sq. ft.; complying with testing requirements in 16 CFR 1201 for Category II materials, and as follows:
 - 1. Fire-Protection Rating: 20, 45, 60 and 90 minutes as indicated for the assembly in which glazing material is installed, and permanently labeled by a testing and inspecting agency acceptable to authorities having jurisdiction.
 - 2. Visible Light Transmission: 80 percent minimum.
 - 3. Products: Subject to compliance with requirements, provide one of the following:
 - a. Nippon Electric Glass Co., Ltd. (distributed by Technical Glass Products); FireLite Plus.
 - b. SAFTI *FIRST*; Pyran Platinum L.
 - c. Schott North America, Inc.; Pyran Platinum L.

2.3 INSULATING GLASS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide **Viracon, Inc.; VE 1-2M** or comparable product by one of the following:
 - 1. Guardian Industries Corp; Sun-Guard.
 - 2. PPG Industries, Inc.; Solarban 60.
- B. Insulating-Glass Units, General: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, and complying with ASTM E 774 for Class CBA units and with requirements specified in this Article and in Part 2 "Insulating-Glass Units" Article.
 - 1. Overall Unit Thickness and Thickness of Each Lite: Dimensions indicated for insulating-glass units are nominal and the overall thicknesses of units are measured perpendicularly from outer surfaces of glass lites at unit's edge.
 - 2. Sealing System: Dual seal, with primary and secondary sealants as follows:
 - a. Polyisobutylene and silicone.
 - 3. Spacer Specifications: Manufacturer's standard spacer material and construction complying with the following requirements:
 - a. Spacer Material: Aluminum with mill or clear anodic finish.
 - b. Desiccant: Molecular sieve or silica gel, or blend of both.

- c. Corner Construction: Manufacturer's standard corner construction.

2.4 GLAZING SEALANTS

- A. General: Provide products of type indicated, complying with the following requirements:
 - 1. Compatibility: Select glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
 - 2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
 - 3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.
- B. Elastomeric Glazing Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
 - 1. Neutral-Curing Silicone Glazing Sealants:
 - a. Products:
 - 1) Dow Corning Corporation; 791.
 - 2) GE Silicones; SilPruf NB SCS9000.
 - 3) Pecora Corporation; 895.
 - b. Type and Grade: S (single component) and NS (nonsag).
 - c. Class: 50.
 - d. Use Related to Exposure: NT (nontraffic).
 - e. Uses Related to Glazing Substrates: M, G, A, and, as applicable to glazing substrates indicated, O.
 - 1) Use O Glazing Substrates: Coated glass and aluminum coated with a high-performance coating.
- C. Glazing Sealants for Fire-Resistive Glazing Products: Identical to products used in test assemblies to obtain fire-protection rating.

2.5 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based elastomeric tape with a solids content of 100 percent; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; packaged on rolls with a release paper backing; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
 - 1. AAMA 804.3 tape, where indicated.
 - 2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
 - 3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

- B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; packaged on rolls with release liner protecting adhesive; and complying with AAMA 800 for the following types:
 - 1. Type 1, for glazing applications in which tape acts as the primary sealant.
 - 2. Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.6 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions with a Shore, Type A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.
- G. Perimeter Insulation for Fire-Resistive Glazing: Identical to product used in test assembly to obtain fire-resistance rating.

2.7 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
- B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites in a manner that produces square edges with slight kerfs at junctions with outdoor and indoor faces.
- C. Grind smooth and polish exposed glass edges and corners.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine framing glazing, with Installer present, for compliance with the following:
 - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 - 2. Presence and functioning of weep system.
 - 3. Minimum required face or edge clearances.

4. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Glazing channel dimensions provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.

C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.

E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide spacers for glass lites where length plus width is larger than 50 inches as follows:

1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.

2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

3.4 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until just before each glazing unit is installed.
- F. Apply heel bead of elastomeric sealant.
- G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.6 CLEANING AND PROTECTION

- A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended by glass manufacturer.
- C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.
- D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.
- E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

3.7 MONOLITHIC FLOAT-GLASS UNITS

A. **Glass Type A:** Clear fully tempered float glass.

1. Thickness: 6.0 mm (1/4 inch.).
2. Provide safety glazing labeling.

3.8 FIRE-RESISTANT GLAZING SCHEDULE

A. **Glass Type B:** 45-, 60-, or 90-minute fire-protection-rated glazing; laminated ceramic glazing.

3.9 INSULATING-GLASS UNITS

A. **Glass Types C:** Low-E Insulating-Glass Units for use in aluminum-framed entrances and storefront systems and glazed aluminum curtain walls.

1. Overall Unit Thickness and Thickness of Each Lite: 1-inch unit thickness and 1/4-inch each lite.
2. Interspace Content: Argon.
3. Outdoor Lite: Clear fully tempered float glass.
4. Indoor Lite: Clear fully tempered float glass.
5. Low-E Coating: Sputtered on second surface.
6. Visible Light Transmittance: 70 percent minimum.
7. Winter Nighttime U-Factor: 0.24 maximum.
8. Solar Heat Gain Coefficient: 0.38 maximum.
9. Provide safety glazing labeling.

END OF SECTION 088000

SECTION 088713 – GLAZING FILMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes:
 - 1. Decorative glazing films.
- B. Related Sections:
 - 1. Division 08 Section "Glazing" for standard glass products.

1.3 PERFORMANCE REQUIREMENTS

- A. Fire Performance: Surface burning characteristics with maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E 84.

1.4 SUBMITTALS

- A. Product Data: Submit product data for each product indicated.
- B. Qualification Data: For qualified Installer.
- C. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of film overlay to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer acceptable to the manufacturer.
- B. Preinstallation Conference: Conduct conference at Project site.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect materials according to manufacturer's written instructions and as needed to prevent damage to surfaces and edges.

1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install materials until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
- B. Field Measurements: Verify actual dimensions of openings and construction contiguous with glazing films by field measurements before fabrication.

1.9 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to replace glazing films that deteriorate within specified warranty period.
 - 1. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GLAZING FILMS

- A. Decorative Film (**FIL-001**): Gradient film with small dot pattern.
 - 1. Product: Subject to compliance with requirements, provide the following, or equal:
 - a. **3M Fasara Glass Finishes; SH2FGAR Aerina.**
 - 2. Film Type: Polyester.
 - 3. Thickness: 3.3 mils.
 - 4. Roll Height: 50 inches.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that substrate conditions for existing substrates are acceptable for product installation in accordance with manufacturer's instructions.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install glazing films in accordance with manufacturer's written installation instructions.

3.3 CLEANING AND PROTECTION

- A. Protect glazing films from damage immediately after installation by attaching crossed streamers to framing and held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.
- B. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION 088713

SECTION 092116 - GYPSUM BOARD ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Exterior non-load-bearing wall framing.
 - 2. Non-load-bearing steel framing members for the following applications:
 - a. Interior framing systems (e.g., supports for partition walls, framed soffits, furring, etc.).
 - b. Interior suspension systems (e.g., supports for ceilings, suspended soffits, etc.).
 - 3. Interior gypsum board.
 - 4. Exterior gypsum sheathing.
- B. Related Sections include the following:
 - 1. Division 06 Section "Miscellaneous Rough Carpentry" for wood blocking built into gypsum board assemblies.
 - 2. Division 07 Section "Thermal Insulation" for thermal and sound attenuation insulation installed in assemblies that incorporate gypsum board.
 - 3. Division 07 Section "Fire-Resistive Joint Systems" for head-of-wall assemblies that incorporate gypsum board.
 - 4. Division 09 Section "Tiling" for tile backing panels.
 - 5. Division 09 Section "Painting" for primers applied to gypsum board surfaces.
- C. Products installed, but not furnished, under this Section include the following:
 - 1. Access doors and frames, furnished by Fire Protection, Plumbing, Mechanical, and Electrical Subcontractors in accordance with Division 08 Section "Access Doors and Frames."

1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide interior and exterior non-load-bearing metal framing capable of withstanding design loads within limits and under conditions indicated.
 - 1. Design Loads: In accordance with the New York State Building Code and as indicated on Structural Drawings.
 - 2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
 - a. Exterior Non-Load-Bearing Framing: Horizontal deflection of 1/600 of the wall height.

- b. Interior Framing Systems:
 - 1) Maximum Deflection: $L/240$ at 5 psf, stud spacing at 16 inches o.c.
 - 3. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.
 - 4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:
 - a. Upward and downward movement of 3/4 inch.
 - 5. Design jamb studs, jack studs cripple studs, sills and headers to support weight of wall components (dead load) and horizontal loads.
- B. Cold-Formed Steel Framing, General: Design according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions."
- 1. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.
 - 2. Provide interior framing systems sized to accommodate maximum deflection using limiting heights of metal studs without contribution of gypsum wallboard (non-composite).

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show layout, spacings, sizes, thicknesses, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.
 - 1. For non-load-bearing metal framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer licensed in the State of New York responsible for their preparation.
 - 2. Include calculations for span capabilities of cold-formed metal framing for deflection criteria specified.
- C. Control Joint Locations: Submit plan with proposed locations of control joints for approval. Architect to provide final determination of all locations.
- D. Samples: For the following products:
 - 1. Trim Accessories: Full-size Sample in 12-inch- long length for each trim accessory indicated.
- E. Welding certificates.
- F. Qualification Data: For professional engineer.
- G. Product Test Reports: From a qualified testing agency, unless otherwise stated, indicating that each of the following complies with requirements, based on evaluation of comprehensive tests for current products:

1. Steel sheet.
2. Expansion anchors.
3. Power-actuated anchors.
4. Mechanical fasteners.

H. Research/Evaluation Reports: For cold-formed metal framing.

I. Warranty: Special warranty included in this Section.

1.5 QUALITY ASSURANCE

- A. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.
- B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the State of New York and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent.
- C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated.
- D. Product Tests: Mill certificates or data from a qualified independent testing agency indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.
- E. AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."
- F. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- G. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.
- H. Mockups: Before beginning gypsum board installation, install mockups of at least 100 sq. ft. in surface area to demonstrate aesthetic effects and set quality standards for materials and execution.
 1. Install mockups for the following:
 - a. Each level of gypsum board finish indicated for use in exposed locations.
 2. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.
 3. Simulate finished lighting conditions for review of mockups.
 4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.
- B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.
- C. Store materials inside under cover and keep them dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other causes. Stack gypsum panels flat to prevent sagging.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.
- B. Do not install interior products until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace exterior gypsum sheathing that fails in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 COLD-FORMED STEEL FRAMING, GENERAL

- A. Manufacturers: Subject to compliance with requirements, provide cold-formed metal framing by one of the following:
 - 1. ClarkDietrich Building Systems.
 - 2. MarinoWare; a division of Ware Industries.
 - 3. SCAFCO Steel Stud Company.

2.2 EXTERIOR NON-LOAD-BEARING WALL FRAMING

- A. Structural performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated.

- B. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
 - 1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
 - 2. Protective Coating: ASTM A 653/A 653M, G90, hot-dip galvanized.
- C. Steel Studs: ASTM C 645, manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: As required by structural performance.
 - 2. Flange Width: 1-5/8 inches.
- D. Steel Track: ASTM C 645, manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: As required by structural performance.
 - 2. Flange Width: 1-1/4 inches.
- E. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal and lateral loads and transfer them to the primary structure, and as follows:
 - 1. Minimum Base-Metal Thickness: As required by structural performance.
 - 2. Flange Width: 1 inch plus the design gap for 1-story structures and 1 inch plus twice the design gap for other applications.
- F. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches, wall attachment flange of 7/8 inch, 20 gauge minimum but not less than that required to meet structural performance requirements, and depth required to fit insulation thickness indicated.

2.3 INTERIOR NON-LOAD-BEARING STEEL FRAMING

- A. Interior Framing Members, General: Comply with ASTM C 645 for conditions indicated.
 - 1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
 - 2. Protective Coating: Comply with ASTM C 645; roll-formed from hot-dipped galvanized steel; complying with ASTM A 1003/A 1003M and ASTM A 653/A 653M G40 or having a coating that provides equivalent corrosion resistance. A40 galvanized products are not acceptable.
 - a. Coatings shall demonstrate equivalent corrosion resistance with an evaluation report acceptable to the authority having jurisdiction.
- B. Steel Studs and Runners: ASTM C 645.
 - 1. Non-Structural Studs: Cold-formed galvanized steel C-studs as per ASTM C 645 for conditions indicated below:
 - a. Flange Size: 1-1/4-inch.
 - b. Web Depth: As indicated on Drawings.
 - 1) Minimum Thickness: 0.033 inch.
 - 2) Minimum Design Thickness: 0.0346 inch.

- C. Slip-Type Head Joints: Where indicated, provide the following:
1. Double-Runner System: ASTM C 645 top runners, inside runner with 2-inch- deep flanges in thickness not less than indicated for studs and fastened to studs, and outer runner sized to friction fit inside runner.
- D. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. ClarkDietrich Building Systems; BlazeFrame.
 - b. Fire Trak Corp.; Fire Trak attached to studs with Fire Trak Posi Clips.
 - c. Metal-Lite, Inc.; The System.
 - d. Sliptrack Systems; SLP-TRK.

2.4 SUSPENSION SYSTEM COMPONENTS

- A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch- diameter wire, or double strand of 0.0475-inch- diameter wire.
- B. Hanger Attachments to Concrete:
1. Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching wire hangers and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E 488 by an independent testing agency.
 - a. Type: Postinstalled, expansion anchor.
 2. Powder-Actuated Fasteners: Suitable for application indicated, fabricated from corrosion-resistant materials with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 10 times that imposed by construction as determined by testing according to ASTM E 1190 by an independent testing agency.
- C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.162-inch diameter.
- D. Carrying Channels: Cold-rolled, 16 gauge, commercial-steel sheet with minimum 1/2-inch- wide flanges.
1. Depth: 1-1/2 inches.
- E. Furring Channels (Furring Members): Cold-Rolled Channels: 16 gauge, with minimum 1/2-inch- wide flanges, 3/4 inch deep.
- F. Grid Suspension System for Ceilings: ASTM C 645, direct-hung, double-web suspension system composed of main beams and cross-furring members that interlock.
1. Furring Runners: Manufactured from 0.020 inch thick steel, 1-1/2-inches wide by 1-1/2- inches high.
 2. Furring Tees: Manufactured from 0.020 inch thick steel, 1-1/2-inches wide by 1-1/2- inches high with staked-on clip couplings, factory punched cross tee slots, and hanger holes.

3. Products: Subject to compliance with requirements, provide one of the following:

- a. Armstrong World Industries, Inc.; Drywall Grid Systems.
- b. CertainTeed Corporation; 1-1/2" Drywall Suspension System.
- c. Rockfon; Chicago Metallic 660 Drywall Grid System.
- d. USG Corporation; Drywall Suspension System.

2.5 INTERIOR GYPSUM BOARD

- A. General: Complying with ASTM C 36 or ASTM C 1396, as applicable to type of gypsum board indicated and whichever is more stringent.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. CertainTeed.
- b. Continental Building Products.
- c. G-P Gypsum.
- d. National Gypsum Company.
- e. USG Corporation.

- B. Size: Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

- C. Type X:

- 1. Thickness: 5/8 inch.
- 2. Long Edges: Tapered.

- D. Abuse-Resistant and Moisture- and Mold-Resistant Gypsum Board: Manufactured to produce greater resistance to surface indentation and abrasion than standard, regular-type and Type X gypsum board.

- 1. Core: 5/8 inch, Type X.
- 2. Long Edges: Tapered.
- 3. Mold Resistance: ASTM D 3273, score of 10.
- 4. Abuse-Resistant Performance: Comply with ASTM C 1629 and the following:
 - a. Surface Abrasion: ASTM D 4977 modified with 25 lbs of additional weight, 0.059" maximum (Level 2 minimum).
 - b. Surface Indentation: ASTM D 5420, 0.10" maximum (Level 1).
 - c. Soft-Body Impact: ASTM E 695, surface failure at 195 ft.-lbs minimum (Level 2).
 - d. Hard-Body Impact: ASTM E 1629 Annex A.1, surface failure at 50 ft.-lbs minimum (Level 1).
- 5. Products: Subject to compliance with requirements, provide one of the following:
 - a. CertainTeed; AirRenew Extreme Abuse Resistant Gypsum Board.
 - b. Continental Building Products; Protecta AR 100.
 - c. National Gypsum Company; Gold Bond Hi-Abuse Brand XP Gypsum Board.
 - d. USG Corporation; Mold Tough AR Panels.

2.6 EXTERIOR SHEATHING

A. Glass-Mat Gypsum Wall Sheathing: ASTM C 1177.

1. Product: Subject to compliance with requirements, provide one of the following:

- a. CertainTeed; GlasRoc Sheathing.
- b. Continental Building Products; Weather Defense Platinum Sheathing.
- c. G-P Gypsum Corporation; Dens-Glass Fireguard Sheathing.
- d. National Gypsum; Gold Bond Brand e²XP Sheathing.
- e. USG Corporation; Securock Glass-Mat Sheathing Panels.

2. Type and Thickness: Type X, 5/8 inch thick.

B. Sheathing Tape for Glass-Mat Gypsum Sheathing Board: Self-adhering glass-fiber tape, minimum 2 inches wide, 10 by 10 or 10 by 20 threads/inch, of type recommended by sheathing and tape manufacturers for use with sealant in sealing joints in glass-mat gypsum sheathing board and with a history of successful in-service use.

2.7 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized steel sheet.

2. Shapes:

- a. Cornerbead.
- b. LC-Bead: J-shaped; exposed long flange receives joint compound.
- c. U-Bead: J-shaped; exposed short flange does not receive joint compound.
- d. Expansion (control) joint.

2.8 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

1. Interior Gypsum Wallboard: Paper.

C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.

a. Use setting-type compound for installing paper-faced metal trim accessories.

3. Fill Coat: For second coat, use drying-type, all-purpose compound.
4. Finish Coat: For third coat, use drying-type, all-purpose compound.

2.9 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Sound Attenuation Blankets: As specified in Division 07 Section "Thermal Insulation."
 - 1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
- C. Acoustical Sealant: As specified in Division 07 Section "Joint Sealants."
- D. Thermal Insulation: As specified in Division 07 Section "Thermal Insulation."
- E. Isolation Strip at Exterior Walls: Provide one of the following:
 - 1. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

2.10 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
 - 1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
- B. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
 - 1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
- C. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing board to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.
 - 1. For steel framing less than 0.0329 inch thick, attach sheathing to comply with ASTM C 1002.
 - 2. For steel framing from 0.033 to 0.112 inch thick, attach sheathing to comply with ASTM C 954.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected. Commencement of work indicates acceptance of areas and substrates.

3.2 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C 754, except comply with framing sizes and spacing indicated.
 - 1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.
- B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- C. Install bracing at terminations in assemblies.
- D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.3 INSTALLING SUSPENSION SYSTEMS

- A. Install suspension system components in sizes and spacings indicated on Drawings, but not less than those required by referenced installation standards for assembly types and other assembly components indicated.
- B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
- C. Suspend hangers from building structure as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
 - a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
 - a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
 - 3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 - 4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 - 5. Do not attach hangers to steel roof deck.
 - 6. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
 - 7. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
 - 8. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

- E. Seismic Bracing: Sway-brace suspension systems with hangers used for support.
- F. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.
- G. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

3.4 INTERIOR NON-LOAD-BEARING WALL INSTALLATION

- A. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- B. Install studs so flanges within framing system point in same direction.
 - 1. Space studs for all applications at 16 inches o.c., unless otherwise indicated.
- C. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.
 - 1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
 - 2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
 - a. Install two studs at each jamb, unless otherwise indicated.
 - b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
 - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
 - 3. Other Framed Openings: Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
 - 4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
 - a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
 - 5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
- D. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

3.5 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.
- B. Fasten both flanges of studs to top and bottom track, and to bottom track only where deflection track is indicated. Space studs as follows:
 - 1. Stud Spacing: 16 inches o.c.
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.
- D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
 - 1. Install single-leg deflection tracks and anchor to building structure, where indicated.
- E. Install horizontal bridging in wall studs, spaced in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.
 - 1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches of single deflection track. Install a combination of flat, taut, steel sheet straps of width and thickness indicated and stud or stud-track solid blocking of width and thickness matching studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
 - a. Install solid blocking at 96-inch centers.
- F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable wall-framing system.

3.6 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
 2. Fit gypsum panels around ducts, pipes, and conduits.
 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- wide spaces at these locations, and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

3.7 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
1. Type X: Ceilings and soffits.
 2. Abuse-Resistant Type: Typical, at walls.
 3. Tile Backing Panels: Wall locations to receive tile, specified in Division 09 Section "Tiling."
- B. Single-Layer Application:
1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing, unless otherwise indicated.
 2. On partitions/walls, apply gypsum panels either vertically (parallel to framing) or horizontally (perpendicular to framing), unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - b. At high walls, install panels horizontally, unless otherwise indicated or required by fire-resistance-rated assembly.
 3. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

3.8 GYPSUM SHEATHING INSTALLATION, GENERAL

- A. Apply panels perpendicular to supports, with end joints staggered and located over supports.
1. Install with 1/4-inch open space where panels abut other construction or structural penetrations.
 2. Fasten with corrosion-resistant screws.

- B. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- C. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction, unless otherwise indicated.
- D. Securely attach to substrate by fastening as indicated, complying with the following:
 - 1. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."
- E. Coordinate wall sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
- G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.9 GYPSUM SHEATHING INSTALLATION

- A. Comply with GA-253 and with manufacturer's written instructions.
 - 1. Fasten gypsum sheathing to cold-formed metal framing with screws.
 - 2. Install boards with a 3/8-inch gap where non-load-bearing construction abuts structural elements.
 - 3. Install boards with a 1/4-inch gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.
- B. Apply fasteners so heads bear tightly against face of sheathing boards but do not cut into facing.
- C. Horizontal Installation: Install sheathing with V-grooved edge down and tongue edge up. Interlock tongue with groove to bring long edges in contact with edges of adjacent boards without forcing. Abut ends of boards over centers of studs, and stagger end joints of adjacent boards not less than one stud spacing. Attach boards at perimeter and within field of board to each steel stud.
 - 1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of boards.
- D. Vertical Installation: Install board vertical edges centered over studs. Abut ends and edges of each board with those of adjacent boards. Attach boards at perimeter and within field of board to each stud.
 - 1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of boards.

3.10 SHEATHING JOINT-AND-PENETRATION TREATMENT

- A. Seal exterior gypsum sheathing joints according to sheathing manufacturer's written instructions and to comply with Division 07 Section "Water Resistive Membrane Air Barriers" for exterior gypsum sheathing to receive membrane air barrier.

1. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing board joints, and apply and trowel silicone emulsion sealant to embed entire face of tape in sealant. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

3.11 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints at locations indicated on Drawings, or if not indicated, according to ASTM C 840 and in specific locations approved by Architect for visual effect.
- C. Interior Trim: Install in the following locations:
 1. Cornerbead: Use at outside corners.
 2. LC-Bead: Use at exposed panel edges.

3.12 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 2. Level 4: At panel surfaces that will be exposed to view, unless otherwise indicated.

3.13 PROTECTION

- A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- B. Remove and replace panels that are wet, moisture damaged, and mold damaged.
 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092116

SECTION 093100 - TILING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Quarry tile.
 - 2. Ceramic wall tile.
 - 3. Porcelain wall tile.
 - 4. Tile backing panels.
 - 5. Crack-suppression membrane for thin-set tile installations.
 - 6. Metal edge strips installed as part of tile installations.
- B. Related Sections include the following:
 - 1. Division 02 Section "Selective Demolition" for removal of existing flooring materials.
 - 2. Division 03 Section "Cast-in-Place Concrete" for monolithic slab finishes specified for tile substrates.
 - 3. Division 07 Section "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.

1.3 DEFINITIONS

- A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.
- B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in its "Specifications for Installation of Ceramic Tile."
- C. Module Size: Actual tile size (minor facial dimension as measured per ASTM C 499) plus joint width indicated.
- D. Facial Dimension: Nominal tile size as defined in ANSI A137.1.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

1.5 PERFORMANCE REQUIREMENTS

- A. Coefficient of Friction: For tile installed on walkway surfaces, provide products with the following values as determined by testing identical products per the DCOF AcuTest in accordance with ANSI A137.1 – 2012 standard.

1. Level Surfaces: Minimum 0.42 wet.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.
- C. Samples for Initial Selection: For each type of tile and grout indicated. Include Samples of accessories involving color selection.
- D. Samples for Verification:
1. Full-size units of each type and composition of tile and for each color and finish required.
 2. Full-size units of each type of trim and accessory for each color and finish required.
 3. Metal edge strips in 6-inch lengths.

1.7 INFORMATIONAL SUBMITTALS

- A. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.
- B. Product Certificates: For each type of product, signed by product manufacturer.
- C. Qualification Data: For Installer.
- D. Material Test Reports: For each tile-setting and -grouting product.

1.8 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed, for each type, composition, color, pattern, and size indicated.

1.9 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution.
1. Build mockup of each type of floor tile installation.
 2. Build mockup of each type of wall tile installation.

3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- B. Preconstruction Testing Services: Engage a qualified independent testing agency to perform moisture vapor emission testing on existing slabs, indicated below.
 1. ASTM F 1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
 2. ASTM F 2170, Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in Situ Probes.
 - a. Test floor following installation of floor leveling compounds in accordance with ASTM F 2170. Do not test leveling compound surface for moisture or pH level.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirement in ANSI A137.1 for labeling sealed tile packages.
- B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Store liquid latexes and emulsion adhesives in unopened containers and protected from freezing.
- E. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.11 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Tile: Obtain all tile of same type and color or finish from one source or producer.
 1. Obtain tile from same production run and of consistent quality in appearance and physical properties for each contiguous area.
- B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from a single manufacturer and each aggregate from one source or producer.

- C. Source Limitations for Other Products: Obtain each of the following products specified in this Section through one source from a single manufacturer for each product:

1. Tile backing panels.
2. Crack isolation membrane.
3. Metal edge strips.

2.2 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1, "Specifications for Ceramic Tile," for types, compositions, and other characteristics indicated.
1. Provide tile complying with Standard grade requirements, unless otherwise indicated.
 2. For facial dimensions of tile, comply with requirements relating to tile sizes specified in Part 1 "Definitions" Article.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI standards referenced in "Setting and Grouting Materials" Article.
- C. ISO 13007 Standards for Ceramic Tile, Adhesives and Grouts.
- D. Colors, Textures, and Patterns: Where manufacturer's standard products are indicated for tile, grout, and other products requiring selection of colors, surface textures, patterns, and other appearance characteristics, provide specific products or materials complying with the following requirements:
1. As indicated by manufacturer's designations.
- E. Factory Blending: For tile exhibiting color variations within ranges selected during Sample submittals, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.
- F. Factory-Applied Temporary Protective Coating: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by precoating with continuous film of petroleum paraffin wax, applied hot. Do not coat unexposed tile surfaces.

2.3 TILE PRODUCTS

- A. Quarry Tile (**TIL-001**): Flat tile as follows:
1. Basis-of-Design Product: Subject to compliance with requirements, provide **Daltile; Quarry Textures**, or a comparable product by the following:
 - a. American Olean.
 - b. Summitville.
 2. Facial Dimensions: 6 by 6 inches.
 3. Thickness: 1/2 inch.
 4. Wearing Surface: Nonabrasive, smooth.
 5. Finish: Matte.
 6. Color: As indicated on Finish Material List.
 7. Grout Color: As indicated on Finish Material List.

8. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes and colors:
 - a. Base: A-3565, coved with surface bullnose top edge, face size 5 by 6 inches.
 - b. Cove Base Inside Corner: QB-3565, 1 by 5 inches.
 - c. Cove Base Outside Corner: QCRL-3565, 5 by 6 inches.
- B. Ceramic Wall Tile (**TIL-002A, 002B**): Flat tile as follows:
 1. Basis-of-Design Product: Subject to compliance with requirements, provide **Daltile; Modern Dimensions**, or a comparable product by the following:
 - a. American Olean.
 - b. Crossville.
 2. Module Sizes: 4-1/4 by 12-7/8 inches.
 3. Thickness: 5/16 inch.
 4. Face: Plain with cushion edges.
 5. Finish: Semi-gloss.
 6. Colors: As indicated on Finish Material List.
 7. Grout Color: As indicated on Finish Material List.
- C. Ceramic Wall Tile (**TIL-003**): Flat tile as follows:
 1. Basis-of-Design Product: Subject to compliance with requirements, provide **Daltile; Florentine**, or a comparable product by the following:
 - a. American Olean.
 - b. Crossville.
 2. Module Sizes: 12 by 24 inches.
 3. Thickness: 3/8 inch.
 4. Face: Plain with cushion edges.
 5. Finish: Gloss.
 6. Color: As indicated on Finish Material List.
 7. Grout Color: As indicated on Finish Material List.
- D. Porcelain Wall Tile (**TIL-004**): Flat tile as follows:
 1. Basis-of-Design Product: Subject to compliance with requirements, provide **Daltile; Valor**, or a comparable product by the following:
 - a. American Olean.
 - b. Crossville.
 2. Module Sizes: 12 by 24 inches.
 3. Thickness: 3/8 inch.
 4. Face: Plain with cushion edges.
 5. Finish: Natural.
 6. Color: As indicated on Finish Material List.
 7. Grout Color: As indicated on Finish Material List.

- E. Porcelain Wall Tile (**TIL-005, 006, 008, 009**): Flat tile as follows:
1. Basis-of-Design Product: Subject to compliance with requirements, provide **Stone Source; Mutina Azulej** or equal.
 2. Module Sizes: 8 by 8 inches.
 3. Thickness: 10 mm.
 4. Face: Plain with cushion edges.
 5. Finish: Matte.
 6. Colors: As indicated on Finish Material List.
 7. Grout Color: As indicated on Finish Material List.
- F. Ceramic Wall Tile (**TIL-007**): Flat tile as follows:
1. Basis-of-Design Product: Subject to compliance with requirements, provide **Fireclay Tile; Vintage Leather** or equal.
 2. Module Sizes: 3 by 3 inches.
 3. Thickness: 5/16 inch.
 4. Face: Plain with cushion edges.
 5. Finish: Matte.
 6. Colors: As indicated on Finish Material List.
 7. Grout Color: As indicated on Finish Material List.

2.4 CRACK-SUPPRESSION MEMBRANES FOR THIN-SET TILE INSTALLATIONS

- A. General: Manufacturer's standard product, selected from the following, that complies with ANSI A118.12 for standard performance and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
- B. Fabric-Reinforced, Fluid-Applied Product: System consisting of liquid-latex rubber and fabric reinforcement.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Custom Building Products; Custom 9240 Waterproofing and Anti-Fracture Membrane.
 - b. Laticrete International, Inc.; Laticrete 9235 Waterproof Membrane.
 - c. MAPEI Corporation; Mapelastic AquaDefense.

2.5 TILE BACKING PANELS

- A. Cementitious Backer Units: ANSI A118.9 or ASTM C 1325, Type A, in maximum lengths available to minimize end-to-end butt joints.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. National Gypsum; PermaBase Cement Board.
 - b. USG Corporation; DUROCK Cement Board.
 2. Thickness: 5/8 inch.

2.6 SETTING AND GROUTING MATERIALS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Custom Building Products.
 2. LATICRETE International Inc.
 3. MAPEI Corporation.
- B. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4 and ISO 13007 C2EP1, consisting of the following:
1. Prepackaged dry-mortar mix containing dry, redispersible, ethylene vinyl acetate additive to which only water must be added at Project site.
 - a. Product: Subject to compliance with requirements, provide one of the following:
 - 1) Custom Building Products; Versa Bond.
 - 2) LATICRETE International, Inc.; 253 Gold.
 - 3) MAPEI Corporation; Ultraflex 2.
 2. For wall applications, provide nonsagging mortar that complies with Paragraph F-4.6.1 in addition to the other requirements in ANSI A118.4 and ISO 13007 C2TES1.
 - a. Product: Subject to compliance with requirements, provide one of the following, or equal:
 - 1) Custom Building Products; LFT.
 - 2) MAPEI Corporation; Ultraflex LFT.
- C. Epoxy Based Tile Grout: ANSI A118.3, color as selected by Architect from manufacturer's full range.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Custom Building Products; Ceg-Lite.
 - b. LATICRETE International Inc.; Laticrete SpectraLOCK Pro.
 - c. MAPEI Corporation; MAPEI Kerapoxy CQ.
- D. Industrial Grade Epoxy Based Tile Grout: ANSI A118.3, color as selected by Architect from manufacturer's full range. For use in food service/kitchen areas.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Custom Building Products; Ceg-IG.
 - b. LATICRETE International Inc.; Laticrete SpectraLOCK 2000 IG.
 - c. MAPEI Corporation; MAPEI Kerapoxy IEG CQ.

2.7 ELASTOMERIC SEALANTS

- A. General: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer and characteristics indicated that comply with applicable requirements in Division 07 Section "Joint Sealants."
- B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints, unless otherwise indicated.

2.8 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
- B. Metal Edge Strips: Angle or L-shape, height to match tile and setting-bed thickness, metallic, designed specifically for flooring and wall applications, exposed-edge material as indicated.
 - 1. Basis of Design Products: Provide products indicated by **Schluter Systems**, or equal.
 - 2. Provide the following metal edge strips at all conditions indicated:
 - a. Quarry tile to resilient:
 - 1) Schlüter-RENO-U, stainless steel.
 - a) Height: As required to suit tile thickness.
 - b. Tile to concrete:
 - 1) Schlüter-RENO-RAMP, stainless steel.
 - a) Height: As required to suit tile thickness.
- C. Temporary Protective Coating: Either product indicated below that is formulated to protect exposed surfaces of tile against adherence of mortar and grout; compatible with tile, mortar, and grout products; and easily removable after grouting is completed without damaging grout or tile.
 - 1. Petroleum paraffin wax, fully refined and odorless, containing at least 0.5 percent oil with a melting point of 120 to 140 deg F per ASTM D 87.
 - 2. Grout release in form of manufacturer's standard proprietary liquid coating that is specially formulated and recommended for use as temporary protective coating for tile.
- D. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

2.9 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
 - 1. Verify that substrates for setting tile are firm; dry; clean; free of oil, waxy films, and curing compounds; and within flatness tolerances required by referenced ANSI A108 Series of tile installation standards for installations indicated.
 - 2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed before installing tile.
 - 3. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.
 - 4. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
 - 5. Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed with installation only after substrates pass testing.
 - a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
 - b. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have maximum 75 percent relative humidity level measurement.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove coatings, including curing compounds and other substances that contain soap, wax, oil, or silicone, that are incompatible with tile-setting materials.
- B. Provide concrete substrates for tile floors installed with thin-set mortar that comply with flatness tolerances specified in referenced ANSI A108 Series of tile installation standards.
 - 1. Fill cracks, holes, and depressions with trowelable leveling and patching compound according to tile-setting material manufacturer's written instructions. Use product specifically recommended by tile-setting material manufacturer.
 - 2. Remove protrusions, bumps, and ridges by sanding or grinding.
- C. Blending: For tile exhibiting color variations within ranges selected during Sample submittals, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.
- D. Field-Applied Temporary Protective Coating: Where indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, precoat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

3.3 INSTALLATION, GENERAL

- A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
- B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions, unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- D. Jointing Pattern: Lay tile in grid pattern, unless otherwise indicated. Align joints when adjoining tiles on floor, base, walls, and trim are same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise indicated.
- E. Lay out tile wainscots to next full tile beyond dimensions indicated.
- F. Expansion Joints: Locate expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
 - 1. Locate joints in tile surfaces directly above joints in concrete substrates.
 - 2. Comply with requirements in TCNA EJ171.
 - 3. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."
- G. Grout tile to comply with requirements of the following tile installation standards:
 - 1. For ceramic tile grouts (sand-portland cement; dry-set, commercial portland cement; and latex-portland cement grouts), comply with ANSI A108.10.

3.4 TILE BACKING PANEL INSTALLATION

- A. Install panels and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated. Use latex-portland cement mortar for bonding material unless otherwise directed in manufacturer's written instructions.

3.5 CRACK-SUPPRESSION MEMBRANE INSTALLATION

- A. Install crack-suppression membrane to comply with manufacturer's written instructions to produce membrane of uniform thickness bonded securely to substrate.

3.6 FLOOR TILE INSTALLATION

- A. General: Install tile to comply with requirements in the Floor Tile Installation Schedule, including those referencing TCA installation methods and ANSI A108 Series of tile installation standards.
- B. Joint Widths: Install tile on floors with the following joint widths.
 - 1. Quarry Tile: 1/4 inch.
- C. Metal Edge Strips: Install at locations indicated, and where exposed edge of tile flooring meets other flooring that finishes flush with top of tile.

3.7 WALL TILE INSTALLATION

- A. Install types of tile designated for wall installations to comply with requirements in the Wall Tile Installation Schedule, including those referencing TCA installation methods and ANSI setting-bed standards.
- B. Joint Widths: Install tile on walls with the following joint widths:
 - 1. Wall Tile: 1/16 inch.

3.8 CLEANING AND PROTECTING

- A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
 - 1. Remove epoxy and latex-portland cement grout residue from tile as soon as possible.
 - 2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions, but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
 - 3. Remove temporary protective coating by method recommended by coating manufacturer that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent it from clogging drains.
- B. When recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear.
- C. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.
- D. Protect all installed floor tile work with heavy duty kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.
 - 1. Remove coverings at Substantial Completion for final review by Architect. Reinstall protective coverings following review and correction of punch list items as required.

3.9 FLOOR TILE INSTALLATION SCHEDULE

A. Interior Floor Installations, Concrete Subfloor:

1. Quarry Tile Installation: TCNA F125A; interior floor installation on crack-suppression membrane over concrete; thin-set mortar.
 - a. Tile Type: Quarry Tile.
 - a. Thin-Set Mortar: Latex-portland cement mortar.
 - b. Grout: Chemical resistant furan grout.

3.10 WALL TILE INSTALLATION SCHEDULE

A. Interior Wall Installations, Metal Studs:

1. Tile Installation: TCNA W244C; thinset mortar on cementitious backer units.
 - a. Tile Type: Porcelain and ceramic wall tile.
 - b. Thin-Set Mortar: Latex-portland cement mortar.
 - c. Grout: Epoxy based grout.

END OF SECTION 093100

SECTION 095113 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes:
 - 1. Acoustical panels and exposed suspension systems for ceilings.
- B. Related Sections include the following:
 - 1. Division 07 Section "Joint Sealants" for acoustical sealants furnished and installed by this Section in acoustical panel ceiling assemblies.
 - 2. Division 09 Section "Gypsum Board Assemblies" for drywall suspension system for suspended gypsum board ceilings.

1.3 DEFINITIONS

- A. CAC: Ceiling Attenuation Class.
- B. LR: Light Reflectance coefficient.
- C. NRC: Noise Reduction Coefficient.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
 - 1. Ceiling suspension system members.
 - 2. Method of attaching hangers to building structure.
 - 3. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
 - 4. Minimum Drawing Scale: 1/8 inch = 1 foot.
- C. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.
 - 1. Acoustical Panel: Set of 6-inch- square Samples of each type, color, pattern, and texture.

- 2. Exposed Suspension System Members, Moldings, and Trim: Set of 12-inch- long Samples of each type, finish, and color.
- D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each acoustical panel ceiling.
- E. Research/Evaluation Reports: For each acoustical panel ceiling and components.
- F. Maintenance Data: For finishes to include in maintenance manuals.
- G. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- B. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.8 COORDINATION

- A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, and partition assemblies.

1.9 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Acoustical Ceiling Panels: Full-size panels equal to 2 percent of quantity installed, for each ceiling panel type.
 - 2. Suspension System Components: Quantity of each exposed component equal to 2 percent of quantity installed, for each suspension system type.

1.10 WARRANTY

- A. Special Warranty for Acoustical Panel Ceilings and Suspension Systems: Manufacturer's standard form in which manufacturer agrees to replace acoustical panel ceilings and suspension systems that fail in materials or workmanship within specified warranty period.
 - 1. Failure of ceiling panels includes sagging and warping, and growth of mold, mildew and stain causing bacteria.
 - 2. Failure of suspension systems includes rusting.
 - 3. Warranty does not cover damages that may occur from vibrations, fire, water, freezing temperatures, accident or any form of abuse or exposure to abnormal conditions.
 - 4. Warranty Period: 30 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Acoustical ceiling shall withstand the effects of earthquake motions determined according to ASCE/SEI 7 and the New York State Building Code.
- B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: Comply with ASTM E 1264 for Class A materials.
 - 2. Smoke-Developed Index: 450 or less.

2.2 ACOUSTICAL PANELS, GENERAL

- A. Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system from single source from single manufacturer.
- B. Glass-Fiber-Based Panels: Made with binder containing no urea formaldehyde.
- C. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.
 - 1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches away from test surface per ASTM E 795.

- D. Antimicrobial Fungicide Treatment: Provide acoustical panels with face and back surfaces coated with antimicrobial treatment consisting of manufacturer's standard formulation with fungicide added to inhibit growth of mold and mildew and showing no mold or mildew growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.

2.3 ACOUSTICAL PANELS FOR ACOUSTICAL PANEL CEILING

- A. Basis-of-Design Product: Subject to compliance with requirements, provide products as indicated by **Armstrong World Industries, Inc.** or a comparable product by one of the following:

1. CertainTeed, Inc.
2. USG Interiors, Inc.

- B. Classification: Provide panels complying with ASTM E 1264 for type, form, and pattern as follows:

1. Ceiling Type CLG-01:

- a. Basis of Design Product: **Armstrong World Industries, Inc.; Fine Fissured #1728.**

- 1) Type and Form: Type IV, mineral base with membrane-faced overlay; Form 1, nodular; with glass-fiber cloth overlay.
- 2) Pattern: E (lightly textured)
- 3) Color: Tech Black.
- 4) NRC: Not less than 0.55.
- 5) CAC: Not less than 35.
- 6) Edge/Joint Detail: Square.
- 7) Thickness: 5/8 inch.
- 8) Modular Sizes: 24 x 24 inches.
- 9) Antimicrobial Treatment: BioBlock + and HumiGuard Plus.

2. Ceiling Type CLG-02:

- a. Basis of Design Product: **Armstrong World Industries, Inc.; Ultima Health Zone #1935.**

- 1) Type and Form: Type IV, mineral base with membrane-faced overlay; Form 2, water felted; with acoustically transparent membrane.
- 2) Pattern: E (lightly textured)
- 3) Color: White.
- 4) LR: Not less than 0.86.
- 5) NRC: Not less than 0.70.
- 6) CAC: Not less than 38.
- 7) Edge/Joint Detail: Square.
- 8) Thickness: 3/4 inch.
- 9) Modular Size: 24 x 24 inches.
- 10) Antimicrobial Treatment: BioBlock + and HumiGuard Plus.

3. Ceiling Feature:

- a. Basis of Design Product: **Armstrong World Industries, Inc.; MetalWorks Blades – Classics.**

- 1) Size: Vertical panel with end caps at ends of rows; 4" wide by 1" thick, various lengths as indicated.
- 2) Perforation: M1 Unperforated.
- 3) Color: Effects Maple.
- 4) Provide attachment clips and alignment devices for a complete system installation.

- C. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical panels treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.

2.4 METAL SUSPENSION SYSTEMS, GENERAL

- A. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.
- B. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.
- C. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
- D. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
 2. Size: Select wire diameter so its stress at 3 times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106-inch-diameter wire.
- E. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.
- F. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.
- G. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.
- H. Seismic Clips: Manufacturer's standard seismic clips designed and spaced to secure acoustical panels in-place.

2.5 METAL SUSPENSION SYSTEM FOR ACOUSTICAL PANEL CEILING

- A. Wide-Face, Capped, Double-Web, Hot-Dip Galvanized, G60, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, hot-dip galvanized according to ASTM A 653/A 653M, G30 coating designation, with prefinished, cold-rolled, 15/16-inch- wide, metal caps on flanges.

1. Basis-of-Design Product: Subject to compliance with requirements, provide **Armstrong World Industries, Inc.; Prelude XL 15/16" Exposed Tee System** or a comparable product by one of the following:
 - a. CertainTeed; 15/16" Classic Stab System.
 - b. USG Interiors, Inc.; Donn DX/DXL.
2. Structural Classification: Intermediate duty system.
3. Face Design: Flat, flush.
4. Face Finish: White.

2.6 METAL EDGE MOLDINGS AND TRIM

- A. Products: Subject to compliance with requirements, provide products by one of the following:
 1. Armstrong World Industries, Inc.
 2. CertainTeed.
 3. USG Interiors, Inc.
- B. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension system runners.
 1. Provide manufacturer's standard edge moldings that fit acoustical panel edge details and suspension systems indicated and that match width and configuration of exposed runners, unless otherwise indicated.

2.7 ACOUSTICAL SEALANT

- A. Products: Comply with Division 07 Section "Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.
 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

- A. General: Install acoustical panel ceilings to comply with ASTM C 636 and seismic design requirements indicated, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
- B. Suspend ceiling hangers from building's structural members and as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 - 2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
 - 4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 - 5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both structure to which hangers are attached and type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
 - 6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
 - 7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
 - 8. Do not attach hangers to steel deck tabs.
 - 9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
 - 10. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
 - 11. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
- C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.
- D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
 - 1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
 - 2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
 - a. Install moldings in one piece at all walls 12 feet or less in length. Minimize quantity of pieces at longer walls.
 - b. Use factory edges where joining lengths of molding. Abut moldings where joined; do not overlap.
 - 3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

- E. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- F. Install acoustical panels with undamaged edges and fit accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
 - 1. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension system runners and moldings.

3.4 CLEANING

- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095113

SECTION 096513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Resilient base.
- B. Related Sections:
 - 1. Division 09 Section "Resilient Tile Flooring" for resilient tile flooring and flooring preparation requirements.
 - 2. Division 09 Section "Tile Carpeting."

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Initial Selection: For each type of product indicated.
- C. Samples for Verification: For each type of product indicated, in manufacturer's standard-size Samples but not less than 12 inches long, of each resilient product color, texture, and pattern required.

1.4 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
 - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.
- B. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to flooring installation including, but not limited to, the following:
 - 1. Review substrate conditions, moisture and pH test results, manufacturer's installation instructions, and warranty requirements.
 - 2. Document proceedings, including required corrective measures.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.6 PROJECT CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive resilient products during the following time periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.
- B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Install resilient products after other finishing operations, including painting, have been completed.

1.7 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Furnish not less than 10 percent (50 linear feet for every 500 linear feet) or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.8 WARRANTY

- A. General Warranty: Special warranties specified in this Section shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Limited Warranty: Written warranty, signed by manufacturer agreeing to repair or replace resilient flooring, installed according to manufacturer's written recommendations, that fails in performance, materials, or workmanship within specified warranty period.
 - 1. Warranty Period: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 RESILIENT BASE

A. Resilient Base: ASTM F 1861.

1. Basis-of-Design Product (**CVB-001**): Subject to compliance with requirements, provide **Johnsonite; Rubber Wall Base** or a comparable product by one of the following:
 - a. Mannington; Premium Edge.
 - b. Roppe Corporation, 700 Series Base.
2. Resilient Base Standard: ASTM F 1861.
 - a. Material Requirement: Type TP (rubber, thermoplastic).
 - b. Manufacturing Method: Group I (solid, homogeneous).
 - c. Style and Location: Style B, Cove.
3. Minimum Thickness: 0.125 inch.
4. Height: 4 inches.
5. Lengths: Coils in manufacturer's standard length.
6. Inside and Outside Corners: Job formed.
7. Colors: As indicated on Finish Legend.

2.2 INSTALLATION MATERIALS

- #### A. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.
1. Adhesives shall have a VOC content of 50 g/L or less except that adhesive for rubber stair treads shall have a VOC content of 60 g/L or less.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- #### A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

- B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
- C. Do not install resilient products until they are same temperature as the space where they are to be installed.
 - 1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
- D. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.3 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.
- F. Preformed Corners: Install preformed corners before installing straight pieces.
- G. Job-Formed Corners:
 - 1. Outside Corners: Use straight pieces of maximum lengths possible. Form without producing discoloration (whitening) at bends.
 - 2. Inside Corners: Use straight pieces of maximum lengths possible.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.
- B. Perform the following operations immediately after completing resilient product installation:
 - 1. Remove adhesive and other blemishes from exposed surfaces.
 - 2. Sweep and vacuum surfaces thoroughly.
 - 3. Damp-mop surfaces to remove marks and soil.
- C. Protect resilient products from marks, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Cover resilient products until Substantial Completion.

END OF SECTION 096513

SECTION 096519 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Luxury vinyl tile.
 - 2. Floor preparation requirements.
- B. Related Sections:
 - 1. Division 02 Section "Selective Demolition" for removal of existing floor finishes.
 - 2. Division 03 Section "Concrete Moisture Vapor Reduction Admixture" for integral waterproofing installed in new concrete slabs.
 - 3. Division 03 Section "Cast-in-Place Concrete" for monolithic slab finishes specified for substrates.
 - 4. Division 09 Section "Resilient Base and Accessories" for resilient base and reducer strips installed with resilient floor coverings.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For each type of floor tile. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
 - 1. Show details of special patterns.
- C. Samples for Initial Selection: For each type of floor tile indicated.
- D. Samples for Verification: Full-size units of each color and pattern of floor tile required.
- E. Product Schedule: For floor tile. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of floor tile to include in maintenance manuals.

- B. Warranty: Special warranties specified in this Section.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for floor tile installation indicated.
1. Engage an installer who employs workers for this Project who are trained or certified by manufacturer for installation techniques required. Provide one Master Installer for each product specified.
- B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Build mockups for each type of floor tile including resilient base and accessories.
 - a. Size: Minimum 100 sq. ft. for each type, color, and pattern in locations directed by Architect.
 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- C. Preconstruction Testing Service: Moisture testing on new concrete slabs on grade to be performed by manufacturer of moisture vapor reduction admixture in accordance with Division 03 Section "Concrete Moisture Vapor Reduction Admixture."
- D. Preconstruction Testing Service: Engage a qualified independent testing agency to perform testing indicated below.
1. ASTM F 2170, Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in Situ Probes.
 2. ASTM F 3191, Standard Practice for Field Determination of Substrate Water Absorption (Porosity) for Substrates to Receive Resilient Flooring.
- E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to flooring installation including, but not limited to, the following:
1. Review substrate conditions, moisture and pH test results, manufacturer's installation instructions, and warranty requirements.
 2. Document proceedings, including required corrective measures.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store floor tiles on flat surfaces.

1.8 PROJECT CONDITIONS

- A. Maintain temperatures within range recommended by manufacturer, but not less than 65 deg F or more than 85 deg F , in spaces to receive floor tile during the following time periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.
- B. After postinstallation period, maintain temperatures within range recommended by manufacturer, but not less than 65 deg F or more than 85 deg F.
- C. Close spaces to traffic during floor covering installation.
- D. Close spaces to traffic for 48 hours after floor covering installation.
- E. Install resilient products after other finishing operations, including painting, have been completed.

1.9 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Floor Tile: Furnish 1 box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

1.10 WARRANTY

- A. General Warranty: Special warranties specified in this Section shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Manufacturer Warranty: Written warranty, signed by manufacturer agreeing to repair or replace resilient flooring and adhesives that fails in performance, materials, or workmanship within specified warranty period.
 - 1. Warranty Period: Commencing from date of Substantial Completion:
 - a. Luxury Vinyl Tile: 20 years.
 - 2. Exclusions from warranty include the following:
 - a. Problems caused by moisture, hydrostatic pressure, or alkali in the subfloor.
 - b. Damage to flooring products from high heels or spiked shoes.
- C. Installer Warranty: Written warranty, signed by Installer agreeing to repair or replace resilient flooring, installed according to manufacturer's written recommendations, that fails in performance, materials, or workmanship within specified warranty period.
 - 1. Warranty Period: One year from date of Substantial Completion.
 - 2. Exclusions from warranty include the following:
 - a. Problems caused by moisture, hydrostatic pressure, or alkali in the subfloor.

- b. Damage to flooring products from high heels or spiked shoes.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For resilient tile flooring, as determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.

- 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

2.2 LUXURY VINYL TILE

- A. Vinyl Plank:

- 1. Basis of Design Product (**LVT-001,002**): Subject to compliance with requirements, provide the following, or equal:

- a. **Mannington Commercial; Amtico Wood.**

- 2. Tile Standard: ASTM F 1700.

- a. Type: B, Embossed Surface.
 - b. Class: III Printed Film Vinyl Tile.

- 3. Thickness: 0.098 inch (2.5 mm).
 - 4. Wear Layer: 40 mil (1 mm).
 - 5. Static Load Limit: ASTM F 970, 1000 psi.
 - 6. Size: 6" x 36".
 - 7. Colors: As indicated on Finish Material List.

- B. Vinyl Tile:

- 1. Basis of Design Product (**LVT-003**): Subject to compliance with requirements, provide the following, or equal:

- a. **Mannington Commercial; Amtico Abstract.**

- 2. Tile Standard: ASTM F 1700.

- a. Type: B, Embossed Surface.
 - b. Class: III Printed Film Vinyl Tile.

- 3. Thickness: 0.098 inch (2.5 mm).
 - 4. Wear Layer: 40 mil (1 mm).
 - 5. Static Load Limit: ASTM F 970, 1000 psi.
 - 6. Size: 18" x 18".
 - 7. Colors: As indicated on Finish Material List.

2.3 INSTALLATION MATERIALS

- A. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.

1. Adhesives shall comply with the following limits for VOC content:

- a. Vinyl Tile Adhesives: 50 g/L or less.

2.4 SUBSTRATE PREPARATION

- A. Primer: ASTM C1059, Type I, latex formulation for use with underlayments.

1. Product: Subject to compliance with requirements, provide one of the following:

- a. Ardex; P 51 Primer.
- b. Laticrete; Admix & Primer for underlayments.
- c. MAPEI Corporation; Primer T for underlayments.

- B. Underlayment: ASTM A118.4, 5000 psi compressive strength at 28 days; trowel applied cementitious underlayment for filling holes, depressions, and damaged areas of concrete slabs in excess of 1/2-inch depth.

1. Product: Subject to compliance with requirements, provide one of the following:

- a. Ardex; SD-P.
- b. Laticrete; 816 Latipatch Rapid Underlayment.
- c. MAPEI Corporation; Planipatch.

- C. Self-Leveling Underlayment: ASTM C109, 4300 psi compressive strength at 28 days; cementitious powder mixed with water to produce a free-flowing self-leveling underlayment for rapid leveling of concrete slabs that have been shot-blasted and/or with depressions of up to 1-inch depth.

1. Product: Subject to compliance with requirements, provide one of the following:

- a. Ardex; K 15.
- b. Laticrete; 86 LatiLevel Self Leveling Underlayment.
- c. MAPEI Corporation; Ultraplan 1 Plus.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.
- C. Proceed with installation only after unsatisfactory conditions have been corrected. Commencement of work indicates acceptance of substrates.

3.2 PREPARATION FOR NEW CONCRETE SLABS

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates: Prepare according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
 - 4. Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed with installation only after substrates pass testing.
 - a. Perform relative humidity test using in situ probes, in accordance with ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement, or up to the manufacturer's allowed limit for the installed products.
 - b. Concrete slab substrates for testing should be at service temperature and relative humidity expected during normal use or at the conditions required for installation of a floor covering material in accordance with manufacturer's written installation instructions for at least 48 hours before making relative humidity measurements.
 - c. Perform three tests for the first 1,000 square feet and at least one additional test for each additional 1,000 square feet.
 - 5. Porosity Testing: Perform tests as follows prior to installation of flooring.
 - a. Perform water absorption testing in accordance with ASTM F 3191 to determine if the substrate surface is porous or non-porous.
 - b. Substrate and ambient temperature: 75 +/- 10 degrees F.
 - c. Ambient humidity: 50 +/- 10 percent relative humidity.
 - 6. Moisture testing for new concrete slabs on grade that contain integral waterproofing in accordance with Division 03 Section "Concrete Moisture Vapor Reduction System."
 - a. Drilled sample cores of concrete slabs on grade will be tested for permeability and test results provided by the integral waterproofing manufacturer.
 - b. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound ("underlayment") and remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install floor tiles until they are same temperature as space where they are to be installed.
 - 1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
- E. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.3 PREPARATION FOR EXISTING CONCRETE SLABS

- A. Prepare existing substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates: Prepare according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
- C. Prime all existing concrete surfaces. Allow primer to dry for 2 to 3 hours at 70 deg F, but not more than 24 hours before installation of underlayment. Areas of primer that have dried for more than 24 hours must be re-primed prior to application of underlayment. Comply with manufacturer's written recommendations and the following:
 - 1. Primer: Pour, mop or spray primer onto the surface. Apply an even thickness of primer to the prepared substrate using a bristle broom. Remove any puddles or thick areas.
 - 2. Underlayment: Apply underlayment to existing holes, depressions, and cracks in substrate as required for preparation of installation of self-leveling underlayment.
 - 3. Self-Leveling Underlayment: Prime surface and install self-leveling underlayment within 24 hours. Pour or pump self-leveling underlayment over the primed substrate and spread with a spike roller or gauging rake. Use a smoothing paddle to combine pours and to obtain a flat smooth surface.
 - a. Furnish and install self-leveling underlayment on all existing slabs to receive new flooring, including those that have had existing VAT, VCT and/or mastic removed by the shot-blast method.
 - 1) Floor preparation work includes installation of underlayment as required and self-leveling underlayment in 1/4-inch thickness, unless otherwise indicated.
 - 2) Additional floor preparation work required in excess of 1/4-inch thickness for self-leveling underlayment, will be included in a Unit Price.
- D. Test concrete slabs for moisture following installation of underlayment(s), but do not test surface of self-leveling underlayment for moisture or pH.
 - 1. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
 - 2. Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed with installation only after substrates pass testing.
 - a. Perform relative humidity test using in situ probes, in accordance with ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement, or up to the manufacturer's allowed limit for the installed products.
 - b. Concrete slab substrates for testing should be at service temperature and relative humidity expected during normal use or at the conditions required for installation of a floor covering material in accordance with manufacturer's written installation instructions for at least 48 hours before making relative humidity measurements.
 - c. Perform three tests for the first 1,000 square feet and at least one additional test for each additional 1,000 square feet.

3. Porosity Testing: Perform tests as follows prior to installation of flooring.
 - a. Perform water absorption testing in accordance with ASTM F 3191 to determine if the substrate surface is porous or non-porous.
 - b. Substrate and ambient temperature: 75 +/- 10 degrees F.
 - c. Ambient humidity: 50 +/- 10 percent relative humidity.
- E. Do not install floor tiles until they are same temperature as space where they are to be installed.
 1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
- F. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.4 FLOOR TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor tile.
 1. Installation is not to be begin until the HVAC system is operational, and the following conditions are maintained for at least 48 hours before, during and 72 hours after completion:
 - a. Ambient Temperature: Between 65 and 85 degrees F, unless otherwise stated by installed products manufacturer.
 - b. Ambient Humidity: Between 35 and 55 percent, unless otherwise stated by installed products manufacturer.
 - c. Substrate Temperature: Not less than 65 degrees F or more than 85 degrees F before, during and after installation, unless otherwise stated by installed products manufacturer.
 - 1) Do not install flooring unless substrate temperature is at least 5 degrees above dew point with temperature rising.
- B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
 1. Lay vinyl tiles with grain direction alternating in adjacent tiles (basket-weave pattern).
 2. Lay vinyl planks in staggered rows.
- C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
- D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.
- G. Patterns: Install patterns in solid vinyl tile flooring as indicated. Waterjet cut all patterns and numerals prior to installation.

- H. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.5 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protection of floor tile.
- B. Perform the following operations immediately after completing floor tile installation:
 - 1. Remove adhesive and other blemishes from exposed surfaces.
 - 2. Sweep and vacuum surfaces thoroughly.
 - 3. Damp-mop surfaces to remove marks and soil.
- C. Protect floor tile products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Cover floor tile until Substantial Completion.

END OF SECTION 096519

SECTION 096723 - RESINOUS FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes:
 - 1. High-performance resinous flooring systems.
 - 2. Metal edge strips.
 - 3. Floor preparation.
- B. Related Sections include the following:
 - 1. Division 02 Section "Selective Demolition" for removal of existing floor coverings.
 - 2. Division 07 Section "Joint Sealants" for sealants installed at joints in resinous flooring systems.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include manufacturer's technical data, application instructions, and recommendations for each resinous flooring component required.
- B. Samples for Initial Selection: For each type of exposed finish required.
- C. Samples for Verification: For each resinous flooring system required, 6 inches square, applied to a rigid backing by Installer for this Project.
- D. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.
- E. Material Test Reports: For each resinous flooring component.
- F. Material Certificates: For each resinous flooring component, signed by manufacturer.
- G. Maintenance Data: For resinous flooring to include in maintenance manuals.
- H. Warranty: Special warranty included in this Section.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer (applicator) who is experienced in applying resinous flooring systems similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance, and who is acceptable to resinous flooring manufacturer.
 - 1. Engage an installer who employs only persons trained and approved by resinous flooring manufacturer for applying resinous flooring systems indicated.
 - 2. Engage an installer who is certified in writing by resinous flooring manufacturer as qualified to apply resinous flooring systems indicated.
- B. Mockups: Apply mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Apply full-thickness mockups on 48-inch- square floor area selected by Architect.
 - a. Include 48-inch length of integral cove base.
 - 2. Simulate finished lighting conditions for Architect's review of mockups.
 - 3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- C. Preconstruction Testing Service: Engage a qualified independent testing agency to perform testing indicated below.
 - 1. ASTM F 2170, Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in Situ Probes.
 - 2. ASTM F 3191, Standard Practice for Field Determination of Substrate Water Absorption (Porosity) for Substrates to Receive Resilient Flooring.
- D. Preinstallation Conference: Prior to installation of resinous flooring, conduct preinstallation meeting at Project site in accordance with Division 01 Section "Project Management and Coordination."
 - 1. Review substrate conditions, moisture testing reports, manufacturer's installation instructions, and warranty requirements.
 - 2. Document proceedings, including corrective measures or actions required, and furnish copy to each participant.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage and mixing with other components.
- B. Store materials to prevent deterioration from moisture, heat, cold, direct sunlight, or other detrimental effects.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring application.

- B. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring application.
- C. Close spaces to traffic during resinous flooring application and for not less than 24 hours after application, unless manufacturer recommends a longer period.

1.7 WARRANTY

- A. General Warranty: Special warranties specified in this Section shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Limited Warranty: Written warranty, signed by manufacturer agreeing to repair or replace resinous flooring, installed according to manufacturer's written recommendations, that fails in performance, materials, or workmanship within specified warranty period.
 - 1. Warranty Period: One year from date of Substantial Completion.
 - 2. Exclusions from warranty include the following:
 - a. Problems caused by moisture, hydrostatic pressure, or alkali in the subfloor.
 - b. Damage to flooring products from high heels or spiked shoes.

PART 2 - PRODUCTS

2.1 RESINOUS FLOORING, GENERAL

- A. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, from single source from single manufacturer. Obtain secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from manufacturer recommended in writing by manufacturer of primary materials.
- B. System Chemical Resistance: Test specimens of cured resinous flooring system are unaffected when tested according to ASTM C 267 for immersion in the following reagents for not less than 7 days:
 - 1. Acetic Acid 5 percent
 - 2. Acetone
 - 3. Amonimum Hydroxide 10 percent
 - 4. Citric Acid 10 percent
 - 5. Cola
 - 6. Ethylene Glycol
 - 7. Formaldehyde 10 percent
 - 8. Gasoline
 - 9. Hydrochloric Acid 10 percent and 20 percent
 - 10. Lactic Acid 10-50 percent
 - 11. Mineral Spirits
 - 12. Nitric Acid 10 percent
 - 13. Phosphoric Acid 10-80 percent
 - 14. Salad Oil
 - 15. Sodium Carbonate 2 percent and 20 percent
 - 16. Sodium Chloride 10 percent
 - 17. Syrup
 - 18. Urine

19. Xylene

2.2 RESINOUS FLOORING

- A. Basis of Design Product (**SEF-001**): Subject to compliance with requirements, provide the following:
1. **Stonhard; Stoneclad UT.**
- B. System Characteristics: Resinous flooring system with urethane body.
1. Color: As indicated on Finish Material List.
 2. Wearing Surface: Light texture.
 3. Integral Cove Base: 4 inches high.
 4. Overall System Thickness: 3/16 inch to 1/4 inch.
- C. System Components:
1. Mortar:
 - a. Material design basis: Stoneclad UT
 - b. Resin: Urethane.
 - c. Formulation Description: (4) four-component, 100 percent solids.
 - d. Application Method: Screed, Trowel.
 - 1) Thickness of Coats: 3/16".
 - 2) Number of Coats: One.
 - 3) Broadcast texture into wet mortar base.
 - e. Aggregates: Pigmented Blended aggregate.
 2. Top coat:
 - a. Material design basis: UT Sealer
 - b. Resin: Urethane.
 - c. Formulation Description: (2) two-component, 100 percent solids.
 - d. Type: pigmented.
 - e. Finish: standard.
 - f. Number of Coats: One.
- D. System Physical Properties: Provide resinous flooring system with the following minimum physical property requirements when tested according to test methods indicated:
1. Compressive Strength: 7,700 psi after 7 days per ASTM C 579.
 2. Tensile Strength: 1,000 psi per ASTM C 307.
 3. Flexural Strength: 2,400 psi per ASTM C 580.
 4. Water Absorption: < 1% per ASTM C 413.
 5. Impact Resistance: > 160 in. lbs. per ASTM D 2794.
 6. Flammability: Class 1 per ASTM E-648.
 7. Hardness: 80 to 84, Shore D per ASTM D 2240.

2.3 ACCESSORY MATERIALS

- A. Patching and Fill Material: Resinous product of or approved by resinous flooring manufacturer and recommended by manufacturer for application indicated.
 - B. Joint Sealant: Type recommended or produced by resinous flooring manufacturer for type of service and joint condition indicated.
 - C. Metal Edge Strips: Height to match flooring and setting-bed thickness, metallic, designed specifically for flooring applications, exposed-edge material as indicated.
- 1. Basis of Design Product: Subject to compliance with requirements, provide the following:
 - a. **Schluter Systems; RENO RAMP.**
 - 2. Finish: Satin Anodized Aluminum.
 - 3. Thickness: To match flooring thickness.
 - 4. Transition: Resinous to concrete, and resinous to resilient.

PART 3 - EXECUTION

3.1 PREPARATION

- A. General: Prepare and clean substrates according to resinous flooring manufacturer's written instructions for substrate indicated. Provide clean, dry, and neutral Ph substrate for resinous flooring application.
 - B. Concrete Substrates: Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring.
- 1. Roughen new concrete substrates as follows:
 - a. Shot-blast surfaces with an apparatus that abrades the concrete surface, contains the dispensed shot within the apparatus, and recirculates the shot by vacuum pickup.
 - b. Comply with ASTM C 811 requirements, unless manufacturer's written instructions are more stringent.
 - 2. Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed with installation only after substrates pass testing.
 - a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 to 5 lb. of water/1000 sq. ft. in 24 hours, as required by manufacturer's written recommendation for maximum moisture content.
 - b. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
 - 3. Repair damaged and deteriorated concrete according to resinous flooring manufacturer's written recommendations.
 - 4. Verify that concrete substrates have neutral Ph and that resinous flooring will adhere to them. Perform tests recommended by manufacturer. Proceed with application only after substrates pass testing.

- C. Resinous Materials: Mix components and prepare materials according to resinous flooring manufacturer's written instructions.
- D. Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.
- E. Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer's written recommendations.

3.2 APPLICATION

- A. General: Apply components of resinous flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.
 - 1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.
 - 2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.
 - 3. At substrate expansion and isolation joints, provide joint in resinous flooring to comply with resinous flooring manufacturer's written recommendations.
 - a. Apply joint sealant to comply with manufacturer's written recommendations.
- B. Resinous Flooring:
 - 1. Primer: Mix and apply primer over properly prepared substrate with strict adherence to manufacturer's installation procedures and coverage rates. Coordinate timing of primer application with application of troweled mortar to ensure optimum adhesion between resinous flooring materials and substrate.
 - 2. Troweled Mortar: Mix mortar material according to manufacturer's recommended procedures. Uniformly spread mortar over substrate using manufacturer's specially designed screed rake adjusted to manufacturer's recommended height. Hand trowel apply mixed material over freshly primed substrate using steel finishing trowels or power trowel material using manufacturer's specially designed power trowel blades.
 - 3. Finish Sealer: Remove surface irregularities and unbonded granules by lightly grinding and vacuuming the floor surface. Mix and apply sealer with strict adherence to manufacturer's installation procedures.
- C. Integral Cove Base: Apply cove base mix, 4 inches high, to wall surfaces before applying flooring. Apply according to manufacturer's written instructions and details including those for taping, mixing, priming, troweling, sanding, and topcoating of cove base. Round internal and external corners.

3.3 CLEANING AND PROTECTING

- A. Protect resinous flooring from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by resinous flooring manufacturer.

END OF SECTION 096723

SECTION 096813 –TILE CARPETING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes:
 - 1. Modular carpet tile entrance mats.
- B. Related Sections include the following:
 - 1. Division 02 Section "Selective Demolition" for removal of existing floor finishes.
 - 2. Division 03 Section "Concrete Moisture Vapor Reduction Admixture" for integral waterproofing installed in new concrete slabs.
 - 3. Division 03 Section "Cast-in-Place Concrete" for monolithic slab finishes specified for substrates.
 - 4. Division 09 Section "Resilient Tile Flooring" for underlayment and floor preparation requirements.
 - 5. Division 09 Section "Resilient Base and Accessories" for resilient wall base and molding accessories installed with carpet tile.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include manufacturer's written data on physical characteristics, durability, and fade resistance. Include installation recommendations for each type of substrate.
- B. Shop Drawings: Show the following:
 - 1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
 - 2. Carpet tile type, color, and dye lot.
 - 3. Type of subfloor.
 - 4. Type of installation.
 - 5. Pattern of installation.
 - 6. Pattern type, location, and direction.
 - 7. Pile direction.
 - 8. Type, color, and location of insets and borders.
 - 9. Type, color, and location of edge, transition, and other accessory strips.
 - 10. Transition details to other flooring materials.
- C. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.

1. Carpet Tile: Full-size Sample.
- D. Product Schedule: For carpet tile. Use same designations indicated on Drawings.
- E. Qualification Data: For Installer.
- F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency.
- G. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:
 1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
 2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.
- H. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is certified by the Floor Covering Installation Board or who can demonstrate compliance with its certification program requirements.
- B. Fire-Test-Response Characteristics: Provide products with the critical radiant flux classification indicated in Part 2, as determined by testing identical products per ASTM E 648 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.
- C. Mockups: Before installing carpet tile, build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 1. Approved mockups may become part of the completed Work if undamaged at time of Substantial Completion.
- D. Preconstruction Testing Service: Engage a qualified independent testing agency to perform testing indicated below.
 1. ASTM F 2170, Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in Situ Probes.
 2. ASTM F 3191, Standard Practice for Field Determination of Substrate Water Absorption (Porosity) for Substrates to Receive Resilient Flooring.
- E. Preconstruction Testing Service: Moisture testing on new concrete slabs on grade to be performed by manufacturer of moisture vapor reduction admixture in accordance with Division 03 Section "Concrete Moisture Vapor Reduction Admixture."
- F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to carpet tile installation including, but not limited to, the following:
 1. Review delivery, storage, and handling procedures.
 2. Review ambient conditions and ventilation procedures.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Comply with CRI 104, Section 5, "Storage and Handling."
- B. Indoor Air Quality Management Plan: The following practices shall be implemented in accordance with the Construction Indoor Air Quality Management Plan as required in Division 01 Section "Indoor Air Quality Requirements."
 - 1. Carpeting to be stored per manufacturer's recommendations for allowable temperature and humidity range. Products shall not be allowed to become damp.
 - 2. Where feasible, remove carpeting from packaging and store in unoccupied, ventilated areas (100% outside air supply, minimum of 1.5 air changes per hour, and no recirculation) for 24-72 hours prior to installation. Carpeting shall not be stored with materials which have high emissions of VOCs or other contaminants. Materials with high short-term emissions include, but are not limited to: adhesives, sealants and glazing compounds (specifically those with petrochemical vehicles or carriers); paint, wood preservatives, and finishes; control and/or expansion joint fillers; hard finishes requiring adhesive installation; gypsum board (with associated finish processes and products); and composite or engineered wood products with formaldehyde binders.

1.6 PROJECT CONDITIONS

- A. Comply with CRI 104, Section 7.2, "Site Conditions; Temperature and Humidity" and Section 7.12, "Ventilation."
- B. Environmental Limitations: Do not install carpet tiles until wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.

1.7 WARRANTY

- A. Special Warranty for Carpet Tile: Manufacturer's standard form in which manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.
 - 1. Warranty does not include deterioration or failure of carpet due to unusual traffic, failure of substrate, vandalism, or abuse.
 - 2. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling, snags, runs, loss of tuft bind strength, excess static discharge, and delamination.
 - 3. Warranty Period: Lifetime.

1.8 EXTRA MATERIALS

- A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd.

PART 2 - PRODUCTS

2.1 CARPET TILE

- A. Basis of Design Products: Subject to compliance with all requirements, provide products indicated or comparable product by one of the following:
1. Mannington Commercial.
 2. Tandus.
- B. Performance Characteristics:
1. Critical Radiant Flux Classification: Not less than 0.45 W/sq. cm.
 2. Dimensional Tolerance: Within 1/32 inch of specified size dimensions, as determined by physical measurement.
 3. Dimensional Stability: 0.2 percent or less per ISO 2551 (Aachen Test).
 4. Colorfastness to Crocking: Not less than 4, wet and dry, per AATCC 165.
 5. Colorfastness to Light: Not less than 4 after 60 AFU (AATCC fading units) per AATCC 16, Option E.
 6. Antimicrobial Activity: Not less than 2-mm halo of inhibition for gram-positive bacteria; not less than 1-mm halo of inhibition for gram-negative bacteria; no fungal growth; per AATCC 174.
 7. Electrostatic Propensity: Less than 3.0 kV per AATCC 134.
 8. Environmental Requirements: Provide carpet tile that complies with testing and product requirements of Carpet and Rug Institute's "Green Label Plus" program.
- C. **Carpet Type CPT-001:**
1. Manufacturer: Mohawk Group.
 2. Style: Taped Off GT197.
 3. Color: As indicated on Finish Material List.
 4. Pile Characteristic: Textured Patterened Loop.
 5. Fiber Type: Duracolor Premium Nylon.
 6. Dye Method: solution dyed / yarn dyed.
 7. Face Weight: 23 oz/sq. yd.
 8. Pile Thickness: 0.103 inches.
 9. Stitches: 11.0 per inch.
 10. Gage: 1/12 inch.
 11. Backing: EcoFlex NXT.
 12. Average Density: 8038
 13. Size: 24" x 24"
 14. Applied Soil-Resistance Treatment: Sentry Soil Protection.

2.2 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer. Comply with requirements in Division 09 Section "Resilient Tile Flooring" for floor preparation requirements.
- B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and is recommended by carpet tile manufacturer for releasable installation.

1. Adhesives shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance. Examine carpet tile for type, color, pattern, and potential defects.
- B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:
 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
 3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
 4. Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed with installation only after substrates pass testing.
 - a. Perform relative humidity test using in situ probes, in accordance with ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement, or up to the manufacturer's allowed limit for the installed products.
 - b. Concrete slab substrates for testing should be at service temperature and relative humidity expected during normal use or at the conditions required for installation of a floor covering material in accordance with manufacturer's written installation instructions for at least 48 hours before making relative humidity measurements.
 - c. Perform three tests for the first 1,000 square feet and at least one additional test for each additional 1,000 square feet.
 5. Porosity Testing: Perform tests as follows prior to installation of flooring.
 - a. Perform water absorption testing in accordance with ASTM F 3191 to determine if the substrate surface is porous or non-porous.
 - b. Substrate and ambient temperature: 75 +/- 10 degrees F.
 - c. Ambient humidity: 50 +/- 10 percent relative humidity.
 6. Moisture testing for new concrete slabs on grade that contain integral waterproofing in accordance with Division 03 Section "Concrete Moisture Vapor Reduction System."
 - a. Drilled sample cores of concrete slabs on grade will be tested for permeability and test results provided by the integral waterproofing manufacturer.
 - b. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile installation.
 - 1. Comply with Division 09 Section "Resilient Tile Flooring" for floor underlayment and floor preparation for new and existing slabs.
- B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider and protrusions more than 1/32 inch, unless more stringent requirements are required by manufacturer's written instructions.
- C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet tile manufacturer.
- D. Clean metal substrates of grease, oil, soil and rust, and prime if directed by adhesive manufacturer. Rough sand painted metal surfaces and remove loose paint. Sand aluminum surfaces, to remove metal oxides, immediately before applying adhesive.
- E. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

- A. General: Comply with CRI 104, Section 14, "Carpet Modules," and with carpet tile manufacturer's written installation instructions.
- B. Installation Method: As recommended in writing by carpet tile manufacturer.
- C. Maintain dye lot integrity. Do not mix dye lots in same area.
- D. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.
- E. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.
- G. Install pattern parallel to walls and borders.

3.4 CLEANING AND PROTECTION

- A. Perform the following operations immediately after installing carpet tile:
 - 1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet tile manufacturer.
 - 2. Remove yarns that protrude from carpet tile surface.
 - 3. Vacuum carpet tile using commercial machine with face-beater element.

- B. Protect installed carpet tile to comply with CRI 104, Section 16, "Protection of Indoor Installations."
- C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION 096813

SECTION 099100 - PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes surface preparation and the application of paint systems on the following substrates:

- 1. Steel.
- 2. Hollow metal doors and frames.
- 3. Interior wood trim.
- 4. Wood handrail.
- 5. Gypsum board.
- 6. Corner guards.
- 7. Exposed structure.

- B. Paint exposed surfaces, except where these Specifications indicate that the surface or material is not to be painted or is to remain natural. If an item or a surface is not specifically mentioned, paint the item or surface the same as similar adjacent materials or surfaces. If a color of finish is not indicated, Architect will select from standard colors and finishes available.

- 1. Painting includes field painting of exposed bare and covered pipes and ducts, hangers, exposed steel and iron supports, and surfaces of mechanical and electrical equipment that do not have a factory-applied final finish.

- C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.

- 1. Prefinished items include the following factory-finished components:

- a. Architectural casework.
- b. Finished mechanical and electrical equipment.
- c. Light fixtures and wiring devices.
- d. Switchgear.
- e. Distribution cabinets in closets or equipment rooms.

- 2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:

- a. Furred areas.
- b. Ceiling plenums.
- c. Pipe spaces.
- d. Duct shafts.

- 3. Finished metal surfaces include the following:

- a. Anodized or coated aluminum.

- b. Stainless steel.
 - c. Chromium plate.
 - d. Copper and copper alloys.
 - e. Bronze and brass.
 - 4. Operating parts include moving parts of operating equipment and the following:
 - a. Valve and damper operators.
 - b. Linkages.
 - c. Sensing devices.
 - d. Motor and fan shafts.
 - 5. Labels: Do not paint over UL, FMG, or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.
- D. Related Sections include the following:
- 1. Division 05 Section "Structural Steel" for shop priming structural steel.
 - 2. Division 06 Section "Interior Architectural Woodwork" for items indicated to be field finished by this Section.
 - 3. Division 08 Section "Hollow Metal Doors and Frames" for factory priming steel doors and frames.
 - 4. Division 09 Section "Gypsum Board Assemblies" for surface preparation of gypsum board.
 - 5. Division 10 Section "Wall Protection" for corner guards to be field finished by this Section.
 - 6. Divisions 23 and 26 Sections for painting of mechanical and electrical equipment.

1.3 DEFINITIONS

- A. General: Standard coating terms defined in ASTM D 16 apply to this Section.
- 1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
 - 2. Eggshell refers to low-sheen finish with a gloss range between 20 and 35 when measured at a 60-degree meter.
 - 3. Semigloss refers to medium-sheen finish with a gloss range between 35 and 70 when measured at a 60-degree meter.
 - 4. Full gloss refers to high-sheen finish with a gloss range more than 70 when measured at a 60-degree meter.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- 1. Material List: An inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
 - 2. Manufacturer's Information: Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material.
 - 3. Certification by the manufacturer that products supplied comply with State of New York Ozone Transportation Commission (OTC) regulations controlling use of volatile organic compounds (VOCs).
- B. Samples for Verification: For each type of paint system and in each color and gloss of topcoat indicated.
- 1. Submit Samples on rigid backing, 8 inches square.

2. Step coats on Samples to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.
5. Submit 2 Samples on the following substrates for Architect's review of color and texture only:
 - a. Stained Wood: 4-by-8-inch. Samples of natural- or stained-wood finish on representative wood surfaces.

C. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of Architects and Owners, and other information specified.

D. Product List: For each product indicated, include the following:

1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
2. VOC content.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For coatings to include in maintenance manuals. Include the following:

1. Area summary with Finish Schedule and area detail designating where each product, color, and finish is used.
2. Product data pages.
3. Material safety data sheets.
4. Care and cleaning instructions.
5. Touch-up procedures.
6. Color samples of each color and finish (gloss level) used.

B. Manual: Provide Sherwin Williams; "Custodian Project Color and Product Information" manual, or equal.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.

1. Quantity: Furnish an additional 1 gallon of each material and color applied.

1.7 QUALITY ASSURANCE

A. Applicator Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.

B. Mockups: Apply benchmark samples of each paint system indicated and each color and finish selected to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.

- a. Wall Surfaces: Provide samples of at least 100 sq. ft. for each color and accent color.
2. Apply benchmark samples after permanent lighting and other environmental services have been activated.
3. Final approval of color selections will be based on benchmark samples.
 - a. If preliminary color selections are not approved, apply additional benchmark samples of additional colors selected by Architect at no added cost to Owner.
4. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
5. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
 1. Maintain containers in clean condition, free of foreign materials and residue.
 2. Remove rags and waste from storage areas daily.

1.9 PROJECT CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Benjamin Moore & Co., including affiliate the following affiliate brands:
 - a. Coronado Paint.
 - b. Insl-X and Corotech.
 2. PPG Architectural Finishes, Inc.; Pittsburgh Paints.
 3. Sherwin-Williams Co.

2.2 PAINT, GENERAL

- A. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

B. VOC Content for Interior Paints and Coatings:

1. All interior paints and coatings shall comply with the VOC content regulations of the Ozone Transportation Commission (OTC) effective in the State of New York. For interior paints and coatings applied at Project site, the following VOC limits, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - a. Flat Coatings: 100 g/L.
 - b. Nonflat Coatings: 150 g/L.
 - c. Nonflat-High Gloss Coatings: 250 g/L.
 - d. Primers, sealers and undercoaters: 200 g/L.
 - e. Anti-corrosive and Anti-rust Paints Applied to Ferrous Metals: 250 g/L.
 - f. Dry-Fog Coatings: 400 g/L.
 - g. Clear Wood Finish: Sanding Sealer: 350g/L.
 - h. Clear Wood Finish: Varnish: 350 g/L.
 - i. Stain: 250 g/L.

C. Colors: As indicated on Finish Schedule.

2.3 INTERIOR PRIMERS

A. General: Provide tinted primers as required for dark colors.

B. Interior Gypsum Board Primer: Factory-formulated latex-based primer for interior application (**100 g/L**).

1. Benjamin Moore, Ultra Spec 500 Interior Latex Primer N534: Applied at a dry film thickness of not less than 1.8 mils.
2. Pittsburgh Paints; 6-2 Speedhide Interior Latex Sealer Quick-Drying: Applied at a dry film thickness of not less than 1.0 mil.
3. Sherwin-Williams; ProMar 200 Zero VOC Primer B28W2600: Applied at a dry film thickness of not less than 1.5 mils.

C. Interior Metal Primer: Factory-formulated metal primer (**250 g/L**).

1. Benjamin Moore; Super Spec Acrylic Metal Primer No. P04: Applied at a dry film thickness of not less than 1.7 mils.
2. Pittsburgh Paints; 90-712 Series Pitt-Tech Interior/Exterior Primer/Finish DTM Industrial Enamel: Applied at a dry film thickness of not less than 2.0 mils.
3. Sherwin-Williams; Pro Industrial Pro-Cryl Universal Acrylic Primer B66 Series: Applied at a dry film thickness of not less than 2.0 mils.

2.4 INTERIOR PAINTS

- A. Interior Flat Acrylic Paint: Factory-formulated flat acrylic-emulsion latex paint for interior application ceilings and soffits **(50 g/L)**.
1. Benjamin Moore, Ultra Spec 500 Interior Flat N536: Applied at a dry film thickness of not less than 1.8 mils.
 2. Pittsburgh Paints; 6-70 Series Speedhide Interior Latex Flat: Applied at a dry film thickness of not less than 1.3 mils.
 3. Sherwin-Williams; ProMar 200 Zero VOC Interior Latex Flat Wall Paint B30-2600 Series: Applied at a dry film thickness of not less than 1.6 mils.
- B. Interior Low-Luster Acrylic Enamel: Factory-formulated eggshell acrylic-latex interior enamel for walls **(100 g/L)**.
1. Benjamin Moore, Ultra Spec 500 Interior Eggshell N538: Applied at a dry film thickness of not less than 1.8 mils.
 2. Pittsburgh Paints; 6-411 Series Speedhide Interior Enamel Latex Eggshell: Applied at a dry film thickness of not less than 1.5 mils.
 3. Sherwin-Williams; ProMar 200 Zero VOC Interior Latex Egg-Shell Enamel B20-2600 Series: Applied at a dry film thickness of not less than 1.6 mils.
- C. Interior Semi-Gloss Acrylic Enamel for Metal Surfaces: Factory-formulated semi-gloss acrylic interior enamel **(250 g/L)**.
1. Benjamin Moore; Super Spec HP DTM Acrylic Semi-Gloss Enamel P29: Applied at a dry film thickness of not less than 1.5 mils.
 2. Pittsburgh Paints; 90-1210 Series Pitt-Tech Plus Interior/Exterior Semi-Gloss DTM Industrial Enamel: Applied at a dry film thickness of not less than 2.0 mils.
 3. Sherwin-Williams; Pro Industrial Acrylic B66-650 Series Semi-Gloss: Applied at a dry film thickness of not less than 2.5 mils.
- D. Interior Acrylic Enamel (Flat Dryfall): Factory-formulated enamel for overhead interior application ceilings and structural framing **(150 g/L)**.
1. Coronado Paint; Super Kote 5000 Latex Flat Dry Fall 110 Line: Applied at a dry film thickness of not less than 1.5 mils.
 2. Pittsburgh Paints; SpeedHide Super Tech WB Interior Dry-Fog Flat Latex 6-725XI: Applied at a dry film thickness of not less than 2.2 mils.
 3. Sherwin-Williams; Low VOC Waterborne Acrylic Dryfall Flat B42W00081: Applied at a dry film thickness of not less than 1.7 mils.

2.5 INTERIOR WOOD STAINS AND VARNISHES

- A. Interior Wood Stain: Factory-formulated water-based penetrating wood stain for interior application applied at spreading rate recommended by manufacturer **(250 g/L)**.
1. Lenmar; Waterborne Interior Wood Stain 1WB1300.
 2. Pittsburgh Paints; Olympic Premium Interior Oil Based Wood Stain, Tint Base 44500.
 3. Sherwin-Williams; Minwax Wood Finish 250 VOC Stains.
- B. Clear Sanding Sealer: Factory-formulated fast-drying acrylic polyurethane clear wood sealer applied at spreading rate recommended by manufacturer. **(350 g/L)**
1. Benjamin Moore; Benwood Stays Clear Acrylic Polyurethane Gloss N422.

2. Pittsburgh Paints; Olympic Premium Interior Water Based Sanding Sealer 41061.
 3. Sherwin-Williams; Wood Classics Waterborne Polyurethane A68 Series
- C. Interior Polyurethane-Based Clear Varnish: Factory- formulated polyurethane-based clear varnish **(350 g/L)**.
1. Benjamin Moore; Benwood Stays Clear Acrylic Polyurethane Low Lustre N423.
 2. Pittsburgh Paints; Olympic Premium Interior Water Based Polyurethane Clear Satin 42786.
 3. Sherwin-Williams; Wood Classics Waterborne Polyurethane A68 Series.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 1. Wood: 15 percent.
 2. Gypsum Board: 12 percent.
- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- D. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
 1. Notify Construction Manager about anticipated problems when using the materials specified over substrates primed by others.
- E. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
 1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.
- B. Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
 2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- C. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.
- D. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.
- E. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- F. Wood Substrates:
 1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
 2. Sand surfaces that will be exposed to view, and dust off.
 3. Prime edges, ends, faces, undersides, and backsides of wood.
 4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.
- G. Gypsum Board Substrates: Do not begin paint application until finishing compound is dry and sanded smooth.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions.
 1. Use applicators and techniques suited for paint and substrate indicated.
 2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- E. Painting Mechanical and Electrical Work: Paint items exposed in equipment rooms and occupied spaces including, but not limited to, the following:
 1. Mechanical Work:
 - a. Uninsulated metal piping.
 - b. Uninsulated plastic piping.
 - c. Pipe hangers and supports.
 - d. Mechanical equipment that is indicated to have a factory-primed finish for field painting.

2. Electrical Work:
 - a. Switchgear.
 - b. Panelboards.
 - c. Electrical equipment that is indicated to have a factory-primed finish for field painting.

3.4 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.5 INTERIOR PAINTING SCHEDULE

- A. Gypsum Board: Provide the following finish systems over interior gypsum board surfaces:
 1. Flat Acrylic Finish (ceilings): Two finish coats over a primer.
 - a. Primer: Interior gypsum board primer.
 - b. Finish Coats: Interior flat acrylic paint.
 2. Low-Luster Acrylic-Enamel Finish (Walls): Two finish coats over a primer.
 - a. Primer: Interior gypsum board primer.
 - b. Finish Coats: Interior low-luster acrylic enamel.
- B. Ferrous and Zinc-Coated Metal: Provide the following finish systems over ferrous metal:
 1. Semi-Gloss Acrylic-Enamel Finish: Two finish coats.
 - a. Primer: Metal primer, including surfaces with factory prime coat.
 - b. Finish Coats: Interior semi-gloss acrylic enamel for metal surfaces.
- C. Exposed Structure: Provide the following finish system over exposed metal roof deck, steel structure:
 1. Flat Dryfall Acrylic-Enamel Finish: One finish coat.
 - a. Finish Coat: Interior acrylic dryfall.

3.6 INTERIOR STAIN AND NATURAL-FINISH WOODWORK SCHEDULE

A. Stained Woodwork: Provide the following stained finishes over new interior woodwork:

1. Stain Satin-Varnish Finish: Two finish coats of alkyd-based clear satin varnish over a sealer coat and interior wood stain. Wipe wood filler before applying stain.
 - a. Stain Coat: Interior wood stain.
 - b. Sealer Coat: Clear sanding sealer.
 - c. Finish Coats: Interior polyurethane-based clear satin varnish.

END OF SECTION 099100

SECTION 102600 - WALL PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Impact-resistant wall panels.
 - 2. Corner guards.
- B. Related Sections:
 - 1. Division 08 Section "Door Hardware" for metal kick, mop, and push plates.
 - 2. Division 09 Section "Painting" for field finishing corner guards.

1.3 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, impact strength, fire-test-response characteristics, dimensions of individual components and profiles, and finishes for each impact-resistant wall protection unit.
- B. Shop Drawings: For each impact-resistant wall protection unit showing locations and extent. Include sections, details, and attachments to other work.
- C. Samples for Initial Selection: For each type of impact-resistant wall protection unit indicated.
- D. Samples for Verification: For each type of exposed finish required.
 - 1. Abuse-Resistant Wall Covering: 6 by 6 inches square.
 - 2. Corner Guards: 12 inches long. Include examples of joinery, corners, top caps, and field splices.
- E. Qualification Data: For qualified Installer.
- F. Material Certificates: For each impact-resistant plastic material, from manufacturer.
- G. Material Test Reports: For each impact-resistant plastic material.
- H. Maintenance Data: For each impact-resistant wall protection unit to include in maintenance manuals.
 - 1. Include recommended methods and frequency of maintenance for maintaining optimum condition of plastic covers under anticipated traffic and use conditions. Include precautions against using cleaning materials and methods that may be detrimental to plastic finishes and performance.

- I. Warranty: Special warranty included in this Section.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Corner-Guard Covers: Full-size plastic covers of maximum length equal to 2 percent of each type, color, and texture of units installed, but no fewer than two, full length units.

1.5 QUALITY ASSURANCE

- A. Product Options: Drawings indicate size, profiles, and dimensional requirements of impact-resistant wall protection units and are based on the specific system indicated. Refer to Division 01 Section "Quality Requirements."
 - 1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.
- B. Preinstallation Conference: Conduct conference at Project site.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store impact-resistant wall protection units in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.
 - 1. Maintain room temperature within storage area at not less than 70 deg F during the period plastic materials are stored.
 - 2. Keep plastic materials out of direct sunlight.
 - 3. Store plastic wall protection components for a minimum of 72 hours, or until plastic material attains a minimum room temperature of 70 deg F.
 - a. Store corner-guard covers in a vertical position.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install impact-resistant wall protection units until building is enclosed and weatherproof, wet work is complete and dry, and HVAC system is operating and maintaining temperature at 70 deg F for not less than 72 hours before beginning installation and for the remainder of the construction period.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of impact-resistant wall protection units that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:

- a. Structural failures.
 - b. Deterioration of plastic and other materials beyond normal use.
2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain wall-protection products of each type from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Surface Burning Characteristics: Comply with ASTM E 84 or UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 1. Flame-Spread Index: 25 or less.
 2. Smoke-Developed Index: 450 or less.

2.3 MATERIALS

- A. Adhesive: As recommended by protection product manufacturer.
- B. Plastic Sheet Wallcovering Material: Textured, chemical- and stain-resistant, high-impact, acrylic modified vinyl plastic sheets, thickness as indicated. Comply with specified requirements of ASTM D 256 for impact resistance, ASTM E 84 for flame spread and smoke developed characteristics.

2.4 IMPACT-RESISTANT WALL COVERINGS

- A. Impact-Resistant Sheet Wall Panels (**FRP-001**): Fabricated from fiberglass reinforced plastic.
 1. Basis-of-Design Product: Subject to compliance with requirements, provide **Crane Composites; Glasbord**, or one of the following:
 - a. Marlite; Standard FRP Panels.
 - b. Nudo; FiberLite FRP.
 - c. Panolam; FRP.
 2. Size: 48 by 96 inches for sheet.
 3. Sheet Thickness: 0.090 inch minimum.
 4. Color: As indicated on Finish Material List.
 5. Texture: Embossed.
 6. Height: As indicated.
 7. Trim and Joint Moldings: Extruded rigid plastic that matches sheet wall covering color.
 8. Mounting: Adhesive.

2.5 CORNER GUARDS

- A. Surface-Mounted, Opaque-Plastic Corner Guards: Fabricated as one piece from paintable textured vinyl; with formed edges; fabricated with 90- or 135-degree turn to match wall condition.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide the following, or equal:
 - a. **Koffler Sales Company; Wallprotex Vinyl Corner Guard.**
 - 2. Wing Size: Nominal 1-1/8 by 1-1/8 inches.
 - 3. Mounting: Self adhered tape.
 - 4. Color: Manufacturer's standard.
 - 5. Provide 48-inch high corner guard at all exposed gypsum board corners.

2.6 FABRICATION

- A. Fabricate impact-resistant wall protection units to comply with requirements indicated for design, dimensions, and member sizes, including thicknesses of components.
- B. Fabricate components with tight seams and joints with exposed edges rolled. Provide surfaces free of wrinkles, chips, dents, uneven coloration, and other imperfections. Fabricate members and fittings to produce flush, smooth, and rigid hairline joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls to which impact-resistant wall protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.
 - 1. For impact-resistant wall protection units attached with adhesive or foam tape, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- B. Proceed with installation only after unsatisfactory conditions have been corrected. Commencement of work indicates acceptance of substrates.

3.2 PREPARATION

- A. Complete finishing operations, including painting, before installing impact-resistant wall protection system components.
- B. Before installation, clean substrate to remove dust, debris, and loose particles.

3.3 INSTALLATION

- A. General: Install impact-resistant wall protection units level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.
 - 1. Install impact-resistant wall protection units in locations and at mounting heights indicated on Drawings.
- B. Abuse-Resistant Wall Covering: Install top and edge moldings, corners, and divider bars as required for a complete installation.

3.4 CLEANING

- A. Immediately after completion of installation, clean plastic covers and accessories using a standard, ammonia-based, household cleaning agent.

END OF SECTION 102600

SECTION 104400 - FIRE PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes the following:
 - 1. Fire protection cabinets.
 - 2. Portable fire extinguishers.
- B. Related Sections:
 - 1. Division 21 Sections for fire suppression systems.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review methods and procedures related to fire extinguishers including, but not limited to, the following:
 - a. Schedules and coordination requirements.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire protection cabinets and fire extinguishers.
 - 1. Fire Protection Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.
- B. Shop Drawings: For fire protection cabinets. Include plans, elevations, sections, details, and attachments to other work.
- C. Samples for Initial Selection: For each type of fire protection cabinet indicated.
- D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:
 - 1. Size: 6 by 6 inches square.

- E. Product Schedule: For fire protection cabinets. Coordinate final fire protection cabinet schedule with fire extinguisher schedule to ensure proper fit and function. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For fire protection cabinets and extinguishers to include in maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

- 1. Cam Lock: Three cam locks per cabinet.

1.8 QUALITY ASSURANCE

- A. Source Limitations: Provide fire extinguishers and cabinets from a single source and a single manufacturer.
- B. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
- C. Fire Extinguishers: Listed and labeled for type, rating, and classification.
 - 1. Provide fire extinguishers approved, listed, and labeled by UL.

1.9 COORDINATION

- A. Coordinate size of fire protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.
- B. Coordinate sizes and locations of fire protection cabinets with wall depths.

1.10 SEQUENCING

- A. Apply decals on field-painted, fire protection cabinets after painting is complete.

1.11 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:

- a. Failure of hydrostatic test according to NFPA 10.
 - b. Faulty operation of valves or release levers.
2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 FIRE PROTECTION CABINET

- A. Cabinet Type: Suitable for fire extinguisher.
 1. Basis of Design Product: Subject to compliance with requirements, provide **Larsen's Manufacturing Company; Architectural Series** or comparable product by one of the following:
 - a. J. L. Industries, Inc., a division of Activar Construction Products Group.
 - b. Potter Roemer LLC.
- B. Cabinet Construction: Nonrated.
- C. Cabinet Material: Steel sheet.
 1. Shelf: Same metal and finish as cabinet.
- D. Semi-Recessed Cabinet: Cabinet box partially recessed in walls of sufficient depth to suit style of trim indicated; with one-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend). Provide where walls are of insufficient depth for recessed cabinets but are of sufficient depth to accommodate semi-recessed cabinet installation.
 1. Rolled-Edge Trim: 2-1/2-inch backbend depth.
- E. Cabinet Trim Material: Stainless-steel sheet.
- F. Door Material: Stainless-steel sheet.
- G. Door Style: Vertical duo panel with frame.
- H. Door Glazing: Tempered float glass (clear).
- I. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
 1. Provide projecting lever handle with cam-action latch.
 2. Provide continuous hinge, of same material and finish as trim, permitting door to open 180 degrees.
- J. Accessories:
 1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
 2. Door Lock: Spring catch.

3. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated.
 - a. Identify fire extinguisher in fire protection cabinet with the words "FIRE EXTINGUISHER."
 - 1) Location: Applied to cabinet door.
 - 2) Application Process: Die cut lettering.
 - 3) Lettering Color: Red.
 - 4) Orientation: Vertical.

K. Materials:

1. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.
2. Stainless-Steel Sheet: ASTM A 666, Type 304.
3. Tempered Float Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 6 mm thick, Class 1 (clear).

L. Finishes:

1. Interior: Manufacturer's standard baked-enamel paint.
2. Exterior: Stainless Steel: No. 4.

2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

- A. Fire Extinguishers: Type, size, and capacity for each fire protection cabinet and mounting bracket indicated.
 1. Valves: Manufacturer's standard.
 2. Handles and Levers: Manufacturer's standard.
 3. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B.
- B. Multipurpose Dry-Chemical Type in Steel Container: UL-rated 4-A:80-B:C, 10-lb. nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.
- C. Regular Dry-Chemical Type in Steel Container: UL-rated 40-B:C, 5.5-lb nominal capacity, with sodium bicarbonate-based dry chemical in enameled-steel container.
 1. Provide regular dry-chemical type in Mechanical and Electrical Rooms.
- D. Wet-Chemical Type: UL-rated 2-A:1-B:C:K, 2.5-gal. nominal capacity, with potassium carbonate-based chemical in stainless-steel container; with pressure-indicating gage.
 1. Provide K-type extinguisher in kitchens and similar rooms where cooking media is used.
 2. Include a Class K placard at each location in size and wording defined in NFPA 10.

2.3 FABRICATION

- A. Fire Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.
 1. Weld joints and grind smooth.
 2. Provide factory-drilled mounting holes.

3. Prepare doors and frames to receive locks.
 4. Install door locks at factory.
- B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles selected.
1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch thick.
 2. Miter and weld perimeter door frames.
- C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.4 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces of fire protection cabinets from damage by applying a strippable, temporary protective covering before shipping.
- C. Finish fire protection cabinets after assembly.
- D. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.5 STEEL FINISHES

- A. Surface Preparation: Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning."
- B. Baked-Enamel or Powder-Coat Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils.
1. Color: selected by Architect from manufacturer's full range.

2.6 STAINLESS-STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
1. Run grain of directional finishes with long dimension of each piece.
 2. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
 3. Directional Satin Finish: No. 4.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls and partitions for suitable framing depth and blocking where semirecessed cabinets will be installed.
- B. Examine fire extinguishers for proper charging and tagging.
 - 1. Remove and replace damaged, defective, or undercharged fire extinguishers.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare recesses for semirecessed fire protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

- A. General: Install fire protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights indicated below:
 - 1. Fire Protection Cabinets: 48 inches above finished floor to top of cabinet.
- B. Fire Protection Cabinets: Fasten cabinets to structure, square and plumb.
 - 1. Provide inside latch and lock for break-glass panels.
 - 2. Fasten mounting brackets to inside surface of fire protection cabinets, square and plumb.
- C. Identification: Apply decals at locations indicated.

3.4 ADJUSTING AND CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as fire protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. Adjust fire protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.
- C. On completion of fire protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.
- D. Touch up marred finishes, or replace fire protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire protection cabinet and mounting bracket manufacturers.
- E. Replace fire protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 104400

SECTION 123631 – SIMULATED STONE COUNTERTOPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Quartz agglomerate countertops and backsplashes.
- B. Related Section:
 - 1. Division 06 Section "Interior Architectural Woodwork."
 - 2. Division 22 Section for non-integral sinks and plumbing fittings.

1.3 SUBMITTALS

- A. Product Data: For countertop materials.
- B. Shop Drawings: For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.
- C. Samples for Verification:
 - 1. Countertop material, 6 inches square.
- D. Qualification Data: For Installer and fabricator.
- E. Sealant Compatibility Test Report: From sealant manufacturer, complying with requirements in Division 07 Section "Joint Sealants" and indicating that sealants will not stain or damage simulated stone.
- F. Maintenance Data: For countertops to include in maintenance manuals. Include Product Data for stone-care products used or recommended by Installer, and names, addresses, and telephone numbers of local sources for products.
- G. Warranty: Sample of special warranty.

1.4 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate simulated stone countertops similar to that indicated for this Project and whose products have a record of successful in-service performance.
- B. Installer Qualifications: Fabricator of products, or installer approved by fabricator, and a certified participant in AWI's Quality Certification Program.

- C. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Woodwork Quality Standards" for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.
 - 1. Contractor shall register the work of this Section with the AWI Quality Certification Program.
 - 2. Provide AWI Quality Certification labels and certificates indicating that solid surfacing countertops, including installation, comply with requirements of grades specified.
 - 3. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.
- D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Build mockup of typical solid surfacing countertop and backsplash in location as directed by Architect.
 - 2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.5 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions of construction to receive countertops by field measurements before fabrication and indicate measurements on Shop Drawings.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace solid-surface-material countertops that fail within specified warranty period.
 - 1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Quartz Agglomerate (**QTZ-001, 002**): Solid sheets consisting of quartz aggregates bound together with a matrix of filled plastic resin and complying with the "Physical Characteristics of Materials" Article of ANSI SS1.
 - 1. Basis of Design Product: Subject to compliance with requirements, provide **Caesarstone** or comparable product by one of the following:
 - a. Cambria.
 - b. Cosentino USA.
 - c. E. I. du Pont de Nemours and Company; Zodiaq.
 - 2. Composition: 93% crushed quartz aggregate combined with resins and pigments, fabricated into slabs using a vacuum vibro-compaction process.

3. Physical properties:
 - a. Minimum Compressive Strength (dry) per ASTM C 170: 24,750 psi.
 - b. Abrasion Resistance: Minimum value of 139, based on testing according to ASTM C 501.
 - c. Fungal and Bacterial Resistance per ASTM G 21 and G 22: No growth.
 - d. Surface Burning Characteristics per ASTM E 84: Flame spread of less than 15.
 - e. Stain and Acid Resistance per ANSI Z124.6: Not affected.
4. Finish: Polished.
5. Color: As indicated by manufacturer's designations on the Finish Legend.

2.2 QUARTZ AGGLOMERATE COUNTERTOPS

- A. Configuration: Provide countertops with the following front and backsplash style:
 1. Front: As indicated.
 2. Backsplash: Straight, slightly eased at corner.
 3. Endsplash: Matching backsplash.
- B. Countertops: Thickness indicated, quartz agglomerate with front edge built up with same material.
- C. Backsplashes: 1/2-inch- thick, quartz agglomerate.
- D. Fabrication: Fabricate tops in one piece with shop-applied edges. Comply with quartz agglomerate manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.
 1. Fabricate with loose backsplashes for field assembly.

2.3 ADHESIVES, SEALANTS, AND ACCESSORIES

- A. General: Use only adhesives formulated for simulated stone and recommended by their manufacturer for the application indicated.
- B. Water-Cleanable Epoxy Adhesive: ANSI A118.3.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Bonsal, W. R. Company.
 - b. Laticrete International, Inc.
 - c. MAPEI Corp.
- C. Joint Sealant: Silicone sealant to comply with Division 07 Section "Joint Sealants."
- D. Cleaner: Cleaner specifically formulated for simulated stone types, finishes, and applications indicated, as recommended by manufacturer. Do not use cleaning compounds containing acids, caustics, harsh fillers, or abrasives.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates indicated to receive countertops and conditions under which stone countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
 - 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of countertops.
 - 2. Proceed with installation only after unsatisfactory conditions have been corrected. Commencement of work acknowledges acceptance of substrates.

3.2 PREPARATION

- A. Clean dirty or stained surfaces by removing soil, stains, and foreign materials before setting. Use only mild cleaning compounds that contain no caustic or harsh materials or abrasives. Allow stone to dry before installing.

3.3 CONSTRUCTION TOLERANCES

- A. Variation from Level: Do not exceed 1/16 inch in 120 inches.
- B. Variation in Joint Width: Do not vary joint thickness more than 1/4 of nominal joint width.
- C. Variation in Plane at Joints (Lipping): Do not exceed 1/64-inch difference between planes of adjacent units.
- D. Variation in Line of Edge at Joints (Lipping): Do not exceed 1/64-inch difference between edges of adjacent units, where edge line continues across joint.

3.4 INSTALLATION OF COUNTERTOPS

- A. General: Install countertops by adhering to supports with water-cleanable epoxy adhesive.
- B. Set countertops to comply with requirements indicated on Drawings and Shop Drawings. Shim and adjust countertops to locations indicated, with uniform joints of widths indicated and with edges and faces aligned according to established relationships and indicated tolerances. Install anchors and other attachments indicated or necessary to secure stone countertops in place.
- C. Bond joints with adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.
- D. Install backsplash and end splash by adhering to wall with water-cleanable epoxy adhesive. Leave 1/16-inch gap between countertop and splash for filling with sealant. Use temporary shims to ensure uniform spacing.
 - 1. Apply silicone sealant to gap between wall and backsplash.
- E. Apply sealant to joints; comply with Division 07 Section "Joint Sealants." Remove temporary shims before applying sealant.

3.5 ADJUSTING AND CLEANING

- A. In-Progress Cleaning: Clean countertops as work progresses. Remove adhesive and sealant smears immediately.
- B. Remove and replace simulated stone countertops of the following description:
 - 1. Broken, chipped, stained, or otherwise damaged simulated stone. Simulated stone may be repaired if methods and results are approved by Architect.
 - 2. Defective countertops.
 - 3. Defective joints, including misaligned joints.
 - 4. Interior simulated stone countertops and joints not matching approved Samples and mockups.
 - 5. Interior simulated stone countertops not complying with other requirements indicated.
- C. Replace in a manner that results in countertops matching approved Samples and mockups, complying with other requirements, and showing no evidence of replacement.
- D. Clean countertops not less than six days after completion of installation, using clean water and soft rags. Do not use wire brushes, acid-type cleaning agents, cleaning compounds with caustic or harsh fillers, or other materials or methods that could damage simulated stone.

END OF SECTION 123631

SECTION 210100 - FIRE PROTECTION GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. All of the Contract Documents as listed on the Table of Contents and including General and Supplementary Conditions and Division 1 - General Requirements shall be included in and made part of this Section.

1.2 DESCRIPTION OF WORK

- A. The General Conditions and Supplementary General Conditions are a part of this Division and are to be considered a part of this Contract.
- B. Where items of the General Conditions and Supplementary General Conditions are repeated in other Sections of the Specifications, it is merely intended to qualify or to call particular attention to them. It is not intended that any other parts of the General Conditions and Supplementary General Conditions shall be assumed to be omitted if not repeated therein. This Section applies equally and specifically to all Contractors supplying labor and/or equipment and/or materials as required under each Section of this Division. Where conflicts exist between the drawings and the specifications or between this section of the specifications and other sections, the more stringent or higher cost option shall apply.
- C. The work under this Contract shall include all labor, materials, tools, equipment, transportation, insurance, temporary protection, supervision and incidental items essential for proper installation and operation, even though not specifically mentioned or indicated on the drawings, but which are usually provided or are essential for proper installation and operation, of all systems as indicated on the drawings and specified herein.
- D. The specifications and drawings describe the minimum requirements that must be met by the Fire Protection Subcontractor for the installation of all work as shown on the drawings and as specified herein under.
- E. Coordinate work with that of all other Trades affecting or affected by the work of this Section. Cooperate with such Trades to assure the steady progress of all work under the Contract.

1.3 INTENT

- A. It is the intent of the Contract Documents to require finished work, tested and ready for operation.
- B. It is not intended that Contract Documents show every pipe, fitting and appurtenance; however, such parts as may be necessary to complete the systems in accordance with best trade practice and Code requirements and to Architect's satisfaction shall be deemed to be included.
- C. Drawings are diagrammatic and indicate the general arrangement of systems and work included in the Contract. DO NOT SCALE THE DRAWINGS.

1.4 DEFINITIONS

- A. Words in the singular shall also mean and include the plural, wherever the context so indicates, and words in the plural shall mean the singular, wherever the context so indicates.
- B. "Acceptable": Acceptable, as determined in the opinion of the Architect.

- C. The term "Acceptable equivalent" or "Equal": Of weight, size, design, capacity and efficiency to meet requirements specified and shown, and of acceptable manufacturer, as determined in the opinion of the Architect.
- D. "Accessible": Indicates ease of access with or without the use of ladders and without requiring extensive removal of other equipment, such as ductwork, piping, etc. to gain access. "Accessible ceiling" indicates acoustic tile type hung ceilings. Concealed spline or sheetrock ceilings with access panels shall not be considered accessible ceilings.
- E. "Approved", or "Approval": Shall mean the written approval of the Architect.
- F. "Architect": Shall refer to the Architect: "Phase Zero Design" and/or the Engineer "Innovative Engineering Services, LLC."
- G. "Concealed": Hidden from site, embedded in masonry or other construction; or installed in furred spaces, trenches or crawl spaces; or installed within double partitions or hung ceilings; or in enclosures.
- H. The term "Contract Documents": Shall mean the entire set of Drawings and Specifications as listed in the Table of Contents of the General Conditions including all bound and unbound material and all items officially issued to date such as addenda, bulletins, job modifications, etc.
- I. "Contractor": General Contractor.
- J. The term "Directed", "Required", "Permitted", "Ordered", "Designated", "Prescribed", and similar words: Shall mean the direction, requirement, permission, order, designation or prescription of the Architect; the terms "Approved", "Acceptable", "Satisfactory", and similar words shall mean approved by, acceptable or satisfactory to the Architect; and, the terms "Necessary", "Reasonable", "Proper", "Correct", and similar words shall mean necessary, reasonable, proper or correct in the judgment of the Architect.
- K. "Exposed": Visible to building occupants, excluding mechanical room and utility tunnel locations.
- L. The term "Furnish" or "Supply": Shall mean purchase, deliver to, and off-load at the job site, ready to be installed including where appropriate all necessary interim storage and protection.
- M. The term "Finished": Refers to all rooms and areas to be specified to receive architectural treatment as indicated on the drawings. All rooms and areas not covered, including underground tunnels and areas above ceilings shall be considered not finished, unless otherwise noted.
- N. The term "Indicated": Refers to graphic representations, notes, or schedules on the Drawings, other paragraphs or schedules in the Specifications, and similar requirements in the Contract Documents. Where terms such as "shown," "noted," "scheduled," and "specified" are used, it is to help the reader locate the reference; no limitation on location is intended.
- O. "Installed": Shall mean set in place complete with all mounting facilities and connections as necessary ready for normal use or service.
- P. "Material": Is used in the specifications it will mean any "Product", "Equipment", "Device", "Assembly", or "Item" required under the Contract, as indicated by trade or brand name, manufacturer's name, standard specification reference or other description.
- Q. "Named" Product: Manufacturer's name for product, as recorded in published documents of latest issue as of date of Contract Documents. Obtain Architect's permission before using products of later or earlier model.

- R. "Owner": Shall refer to the Owner: "Purchase College State University of New York" or designated representative.
- S. "Other Work Contractor" (O.W.C.): Refers to the Contractor(s), or Subcontractor(s) performing work under other Sections of the Contract Documents.
- T. "Fire Protection Subcontractor": Refers to the Subcontractor responsible for furnishing and installation of all work indicated on the Fire Protection drawings and in the Fire Protection specifications.
- U. "Product": Shall mean any item of equipment, material, fixture, apparatus, appliance or accessory installed under this Division.
- V. "Provide": Is used in the specifications it will mean "Furnish" and "Install", "Connect", "Apply", "Erect", "Construct", or similar terms, unless otherwise indicated in the specifications.
- W. The term "Regulations" includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work
- X. The term "Remove" means to disconnect from its present position, remove from the premises and to dispose of in a legal manner.
- Y. The term "Shown on Drawings": Is used in the specifications, they shall mean "Noted", "Indicated", "Scheduled", "Detailed", or any other diagrammatic or written reference made on the drawings
- Z. The term "Special Warranties" Are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Owner.
- AA. "Specification": Shall mean all information contained in the bound or unbound volume, including all "Contract Documents" defined therein, except for the drawings.
- BB. The term "Standard Product Warranties" Are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.
- CC. "Substitution": Requests for changes in products, materials, equipment, and methods of construction proposed by the Contractor are considered requests for "Substitutions".
- DD. "Wiring": Shall mean cable assembly, raceway, conductors, fittings and any other necessary accessories to make a complete wiring system.
- EE. "Work": Labor, materials, equipment, apparatus, controls and accessories required for proper and complete installation.

1.5 RELATED WORK

- A. For work to be included as part of this Section, to be furnished and installed by the Fire Protection Subcontractor, refer to the following Sections:
 - 1. Section 210513 Common Motor Requirements for Fire Suppression Equipment.
 - 2. Section 210517 Sleeves and Sleeve Seals for Fire Suppression Piping.
 - 3. Section 210518 Escutcheons for Fire-Suppression Piping.
 - 4. Section 210523 General Duty Valves, Pipe, Fittings and Hangers for Fire Suppression Systems.
 - 5. Section 210548 Vibration and Seismic Controls for Fire Suppression Piping and Equipment.

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| 6. | Section 210553 | Identification for Fire Suppression Piping and Equipment. |
| 7. | Section 211100 | Facility Fire Suppression Water-Service Piping |
| 8. | Section 211313 | Wet Pipe Sprinkler Systems. |
| 9. | Section 211316 | Dry Pipe Sprinkler Systems. |

- B. For work related to, and to be coordinated with the Fire Protection work, but not included in this Section and required to be performed under other designated Sections, see the following:
1. Division 1 Section "General Commissioning Requirements" for Fire Protection construction.
 2. Division 4 Section "Masonry Work" for Fire Protection construction.
 3. Division 7 Section "Firestopping".
 4. Division 7 Section "Caulking, Flashing, Waterproofing, Roofing and setting of Roof Drains".
 5. Division 8 Section "Access Panels".
 6. Division 9 Section "Painting".

1.6 DRAWINGS

- A. The Contract Drawings are diagrammatic only intending to show general runs and locations of the piping, equipment, systems equipment, etc. and not necessarily showing all required offsets, details and accessories and equipment to be connected. All work shall be accurately laid out with other Trades to avoid conflicts and to obtain a neat and workman like installation which will afford maximum accessibility for operation, maintenance and headroom.
- B. Where discrepancies in scope of work as to what Trade provides items, such conflicts shall be reported to the Architect during bidding and prior to signing of the Contract. If such action is not taken, the Fire Protection Subcontractor shall furnish such items as part of his work as necessary, for complete and operable systems and equipment, as determined by the Architect.
- C. The Fire Protection Subcontractor shall coordinate the installation of all equipment.
- D. Where drawing details, plans, specification requirements and/or scheduled equipment capacities are in conflict or equipment are shown to be different between plans and/or between plans and riser diagrams, details or specifications, the most stringent requirement will be included in the Contract. Fire Protection systems and equipment called for in the specification and/or shown on the drawings shall be provided under this Contract as if it were required by both the drawings and specifications. However, prior to ordering or installation of any portion of work which appears to be in conflict, such work shall be brought to Architect's attention for direction as to what is to be provided.

1.7 CODES AND STANDARDS

- A. All materials and workmanship shall comply with all applicable Codes, Specifications, Local and State Ordinances, Industry Standards and Utility Company Regulations, latest editions.
- B. In case of difference between Building Codes, State Laws, Local Ordinances, Industry Standards and Utility Company Regulations and the Contract Documents, the Fire Protection Subcontractor shall promptly notify the Architect in writing of any such difference.
- C. In case of conflict between the Contract Documents and the requirements of any Code or Authorities having jurisdiction, the most stringent requirements of the aforementioned shall govern.
- D. Should the Fire Protection Subcontractor perform any work that does not comply with the requirements of the applicable Building Codes, State Laws, Local Ordinances, Industry Standards and Utility Company Regulations, he shall bear all costs arising in correcting the deficiencies, as approved by the Architect/Owner.

- E. Applicable Codes and Standards shall include all State Laws, Local Ordinances, Utility Company Regulations, and the applicable requirements of the latest adopted edition of the following Codes and Standards, without limiting the number, as follows:
1. International Building Code Latest Adopted Edition and Amendments of The State of New York.
 2. International Existing Building Code Latest Adopted Edition and Amendments of The State of New York.
 3. International fire Code Latest Adopted Edition and Amendments of The State of New York.
 4. The State of New York 2017 Uniform Code Supplement.
 5. NFPA 13: Standards for the Installation of Sprinkler Latest Adopted Edition and Amendments of The State of New York.
 6. NFPA 70: National Electrical Code Latest Adopted Edition and Amendments of The State of New York.
 7. NFPA 72: National Fire Alarm Code Latest Adopted Edition and Amendments of The State of New York.
 8. NFPA 101: Life Safety Code Latest Adopted Edition and Amendments of The State of New York.
 9. Occupational Safety and Health Administration, (OSHA)
 10. Department of Environmental Protection, (DEP)
 11. Local Building Code.
- F. In these specifications, references made to the following Industry Standards and Code Bodies are intended to indicate the latest volume or publication of the Standard. All equipment, materials and details of installation shall comply with the requirements and latest revisions of the following Bodies, as applicable:
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| ANSI: | American National Standards Institute |
| ASTM: | American Society of Testing Materials |
| FM: | Factory Mutual |
| NEMA: | National Electrical Manufacturers Association |
| UL: | Underwriters' Laboratories |
| IRI: | Industrial Risk Insurers |
| ISO: | Insurance Services Office |
| NBS: | National Bureau of Standards |
| NSC: | National Safety Council |

1.8 PERMITS AND FEES

- A. Fire Protection Subcontractor for the work in his scope of work shall give all necessary notices, obtain all permits, pay all governmental taxes, fees and other costs in connection with his work; file for necessary approvals with the jurisdiction under which the work is to be performed. Fire Protection Subcontractor shall obtain all required Certificates of Inspection for his respective work and deliver same to the Architect before request for acceptance of his portion of work is made and before final payment.

1.9 QUALITY ASSURANCE

- A. The manufacturers listed within these specifications have been preselected for use on this project. No submittal will be accepted from a manufacturer other than specified.

- B. Fire Protection Subcontractor shall furnish and install all equipment, accessories, connections and incidental items necessary to fully complete the work under his Contract for use, occupancy and operation by the Owner.
- C. Where equipment of a substitute manufacturer differs from that specified and require different arrangement or connections from those shown, it shall be the responsibility of the Subcontractor responsible for the substitution to modify the installation of the equipment/system to operate properly and in harmony with the original intent of the drawings and specifications. When directed by the Architect, the Fire Protection Subcontractor shall submit drawings showing the proposed, substitute installation. If the proposed installation is accepted, the Fire Protection Subcontractor shall make all necessary changes in all affected related work provided under his and other Sections including location of roughing-in connections by other Trades, supports, etc. All changes shall be made at no increase in the Contract amount or additional cost to the Owner. The General Contractor shall be responsible to assure that the Subcontractor responsible for the substitution bears the cost arising to all other Trades as a result of the substitution.
- D. Unless specifically indicated otherwise, all equipment and materials required for installation under these specifications shall be new, unused and without blemish or defect. Equipment and materials shall be products which will meet with the acceptance of the Authorities having jurisdiction over the work and as specified hereinbefore. Where such acceptance is contingent upon having the products listed and/or labeled by FM or UL or another testing laboratory, the products shall be so listed and/or labeled. Where no specific indication as to the type or quality of material or equipment is indicated, a first class standard article shall be provided.

1.10 SUBSTITUTIONS

- A. Contractor shall pay Architect/Engineer for time spent reviewing substitution requests. Charges shall be \$150/hour. Submittal of substitution request will be construed as evidence of Contractor's agreement to pay such charges, with no added cost to Owner.
- B. Contractor's request for substitution may be submitted only after award of Contract. Requests shall be in writing on Contractor's letterhead and shall include:
 - 1. Contractor's detailed comparison of significant qualities between specified item and proposed substitution.
 - 2. Statement of effect on construction time, coordination with other affected work, and cost information or proposal.
 - 3. Contractor's statement to the effect that proposed substitution will result in overall work equal to, or better than, work originally intended.
- C. Substitution requests will be considered: If extensive revisions to Contract Documents are not required; if changes are in keeping with general intent of Contract Documents; if submitted in timely and proper manner, fully documented; and if one or more of following conditions is satisfied; all as judged by Architect:
 - 1. Where request is directly related to "acceptable equivalent" clause, "or equal" clause or words of similar effect in Contract Documents.
 - 2. Where specified product, material or method cannot be provided within Contract Time; but not as a result of Contractor's failure to pursue the work promptly or to coordinate various activities properly.
 - 3. Where specified product, material or method cannot be provided in manner which is compatible with other materials of the work and where Contractor certifies that proposed substitution is compatible.
 - 4. Where specified product, material or method cannot be properly coordinated with other materials of the work and where Contractor certifies that proposed substitution can be properly coordinated.
 - 5. Where specified product, material or method cannot be warranted as required and where Contractor certifies that proposed substitution can be so warranted.

6. Where specified product, material or method cannot be used without adversely affecting Owner's insurance coverage on completed work and where Contractor certifies that proposed substitution can be so used.
 7. Where specified product, material or method will encounter other substantial non-compliance, which are not possible to otherwise overcome except by using proposed substitution.
 8. Where specified product, material or method cannot receive required approval by governing authority and proposed substitution can be so approved.
 9. Where substantial advantage is offered to the Owner; in terms of cost, time, energy conservation or other valuable considerations; after deducting offsetting responsibilities that Owner may be required to bear, including additional compensation to Architect for redesign and evaluation services, increased cost of other work by Owner or separate contractors, and similar considerations.
- D. The burden is upon the Contractor, supplier and manufacturer to satisfy Architect that:
1. Proposed substitute is equal to, or superior to, the item specified.
 2. Intent of the Contract Documents, including required performance, capacity, efficiency, quality, durability, safety, function, appearance, space clearances and delivery date, will be equaled or bettered.
- E. Submission of shop drawings of unspecified manufacturer or shop drawings at variance with the Contract Documents is not a proper request for substitution.
- F. Changes in work of other trades, such as structural supports, which are required as a result of substitution and the associated costs for such changes, shall be the complete responsibility of Contractor proposing substitution. Except as noted in subparagraph 1.11.C.9 above, there shall be no additional expense to the Owner.

1.11 SUBMITTALS

- A. Prepare and submit shop drawings in accordance with the requirements hereinbefore specified, and with Division 1 Section "Submittal Procedures" in the manner described therein, modified as noted hereinafter.
- B. The selection and intention to use a product specified by name shall not excuse the need for timely submission of shop drawings for that product.
- C. Prior to submitting shop drawings, submit for review preliminary list of intended or proposed manufacturers for all items for which shop drawings are required.
- D. Submission of shop drawings of an unnamed manufacture or shop drawings at variance with the Contract Documents is not a proper request for substitution.
- E. Samples that are submitted in lieu of shop drawings shall be clearly identified and shall be submitted in duplicate. Only one sample will be returned and that accepted sample shall be kept available at appropriate job site office. Accepted sample retained by Architect will be kept available at Architect's home office.
- F. Upon completion of shop drawing review, shop drawings will be returned, marked with one of following notations: No Exception Taken, Revise as Noted, Revise and Resubmit, or Rejected. Only products whose shop drawings are marked "No Exception Taken" or "Revise as Noted" shall be used on the project.
- G. Submittals shall include the following information:
1. Descriptive and product data necessary to verify compliance with Contract Documents.

2. Manufacturer's specifications including materials of construction, metal gauge, thickness and finish.
3. Certified dimensional drawings including clearances required for maintenance or access.
4. Performance data, ratings, operating characteristics, and operating limits.
5. Electrical ratings and characteristics.
6. Wiring and control diagrams, where applicable.
7. Certifications requested, including UL label or listing.
8. List of accessories, which are required but are not being provided by the product manufacturer or are not being furnished under this Section. Identify the Section(s) under which the accessories are being furnished.

H. In addition, submittals shall be clearly marked for the following:

1. Specification Section and Paragraph, or Drawing Schedule/Note/Detail/etc., where equipment is specified.
2. Equipment or fixture identification corresponding to that used in Contract Documents.
3. Accessories and special or non-standard features and materials which are being furnished.

1.12 PRODUCT SELECTION

A. Contractor's options for selecting products are limited by Contract Document requirements and governing regulations and are not controlled by industry traditions or procedures experienced by Contractor on previous construction projects. Required procedures include, but are not necessarily limited to, following various methods of specifying:

1. Single Product Manufacturer Named: Provide product indicated. Advise Architect, and obtain instructions before proceeding, when named product is known to be unacceptable or not feasible.
2. Two or More Manufacturers' Products Named: Provide one of the named products, at Contractor's option, but excluding products which do not comply with requirements. Do not provide, nor offer to provide, an unnamed product unless named products do not comply with requirements or are not feasible.
3. "Acceptable Equivalent" or "Or Equal": Where named products are accompanied by this term or words of similar effect, provide named products or propose substitute product according to paragraph 1.10, SUBSTITUTIONS.
4. Standards, Codes and Regulations: Where specification requires only compliance with a standard, code or regulation, Contractor may select any product which complies with requirements of that standard, code or regulation.
5. Performance Requirements: Provide products which comply with specific performances indicated and which are recommended by manufacturer (in published product literature or by individual certification) for application intended. Overall performance of product is implied where product is specified with only certain specific performance requirements.
6. Prescriptive Requirements: Provide products which have been produced in accordance with prescriptive requirements using specified materials and components, and complying with specified requirements for fabricating, finishing, testing and other manufacturing processes.
7. Visual Matching: Where matching with an established material is required, Architect's judgment of whether proposed product matches established material shall be final. Where product specified does NOT match established material, propose substitute product according to paragraph 1.10, SUBSTITUTIONS. Follow requirements for CHANGE ORDERS, also, if matching product within cost category of specified product is not available.
8. "Color as Selected by Architect": Unless otherwise noted, where specified product requirements include "Color as Selected by Architect" or words of similar effect, the selection of manufacturer and basic product complying with Contract Documents is Contractor's option and subsequent selection of color is Architect's option.

- B. Inclusion by name, of more than one manufacturer or fabricator, does not necessarily imply acceptability of standard products of those named. All manufacturers, named or proposed, shall conform, with modification as necessary, to criteria established by contract documents for performance, efficiency, materials and special accessories.

1.13 COORDINATION DRAWINGS

- A. Before materials are purchased, fabricated or work is begun, each Subcontractor shall prepare and obtain approval of coordination drawings, and sections for all floors/areas, including buried system/services, resulting in one (1) set of all-Trade-composite at 3/8" scale drawings, showing the size and location of all equipment, in the manner described herein under General Requirements. Architects review and approval of coordination drawings must be obtained prior to any fabrication or installation of any equipment or systems.
- B. The coordination drawings shall be generated from a computer CAD program compatible with AutoCAD Release 2013, in DWG or DXF format. The Fire Protection Subcontractor shall take the lead, supervise, and coordinate production of coordinated layout drawings, to show and coordinate all equipment. These drawings shall then be circulated to the Plumbing and HVAC Subcontractor so that he can indicate all his work as directed by the General Contractor and Architect and as required, to result in a fully coordinated installation.
- C. All costs associated with all aspects of coordination drawings, regardless as to how long they take to produce and how many times they have to be redrawn, shall be borne by the Fire Protection Subcontractor.
- D. The Fire Protection Subcontractor may purchase the Fire Protection AutoCAD computer drawing files from the Fire Protection Contract set on disk or via modem from the Engineer at the nominal cost of \$500.00, if he so chooses.

1.14 COORDINATION OF WORK WITH OTHER TRADES

- A. The Fire Protection Subcontractor shall compare his drawings and specifications with those of other Trades as well as the Architectural drawings and specifications, and report any discrepancies between them to the Architect and obtain from the Architect written instructions for changes necessary in the Fire Protection work.
- B. Coordinate work with that of all other Trades affecting or affected by the work of this Section. Cooperate with such Trades to assure the steady progress of all work under the Contract.
- C. All work shall be installed in cooperation with other Trades installing interrelated work. Before installation, Fire Protection Subcontractor shall make proper provisions to avoid interferences in a manner approved by the Architect. All changes required in the work of the Fire Protection Subcontractor or that of any other trade caused by the Fire Protection Subcontractor's neglect, shall be made by him at his own expense, to the Architect's satisfaction.
- D. The Fire Protection Subcontractor must include in his bid sufficient dollar amounts to coordinate the work of this Contract. This project is complex and will require additional time to coordinate all Trades and allow implementation of the Owners Standards and maintenance serviceability requirements. This requirement shall include, but not be limited to, producing the coordination drawings, as many times and as many drawings as required, to ensure serviceability of equipment, as approved by the Architect.
- E. Locations of ductwork and piping distribution, equipment, systems, etc. shall be adjusted to accommodate the work with interferences anticipated and encountered. The Fire Protection Subcontractor shall determine the exact routing and location of his systems prior to fabrication or installation of any system

component. Accurate measurements and coordination drawings shall be completed to verify dimensions and characteristics of the various systems installations.

- F. Lines which pitch shall have the right-of-way over those which do not pitch. For example, steam piping shall normally have the right-of-way. Lines whose elevations cannot be changed shall have the right-of-way over lines whose elevations can be changed.
- G. Offsets, transitions and changes of direction in all systems shall be made as required to maintain proper headroom and pitch of sloping lines whether or not indicated on the drawings. The Fire Protection Subcontractor shall provide elbows, fittings, offsets in piping, etc. as required for his work to affect these offsets, transitions and changes in direction.
- H. All work shall be installed in a way to permit removal (without damage to other parts) all other system components provided under this Contract requiring periodic replacement or maintenance. All work shall be done to allow easy access for maintaining equipment. The Owner and Engineer will require proof via the preparation of large scale sections and part plans that pull and junction boxes, etc. are accessible after the work is completed. Any items in the field discovered to be in non-compliance shall be removed and relocated, as required, and as directed by the Architect.
- I. Any equipment shown on the Fire Protection and/or Architectural drawings to be provided with services shall be included under this Contract as applicable to make equipment complete and operable. Additional equipment, etc., shall be provided to accomplish the above requirement, as required, all as part of this Contract, at no extra cost to the Owner. This requirement necessitates that the Fire Protection Subcontractor review the Architectural drawings and the drawings of other Trades during bidding to ascertain the extent of all requirements, and interface between the Trades and scope of work.
- J. The Fire Protection Subcontractor shall coordinate his work with other Trades' work so that all equipment and systems can be easily, safely and properly serviced and maintained. It is imperative that service personnel can safely access all equipment. Provide safety rails, steps, ladders, valve chains, handle extensions, etc. as required, in addition to the ones shown on the drawings, to ensure safe and easy access to all equipment is provided in a manner approved by the Architect.

1.15 WARRANTY

- A. Attention is directed to provisions of the General Requirements and Supplementary General Requirements regarding warranties for work under this Contract.
- B. All warranties shall begin on the Date of Substantial Completion of the entire project or the Owner's acceptance of the workmanship and/or material covered by the warranty, whichever is later. The warranty coverage shall continue for the specified period. Refer to individual specification sections for warranty period. If no specific warranty period is specified, the warranty shall extend for a minimum of 365 days.
- C. Manufacturers shall provide their standard warranties for work under the Fire Protection Trades. However, such warranties shall be in addition to, and not in lieu of, all other liabilities which the manufacturer and Fire Protection Subcontractor may have by law or by other provisions of the Contract Documents.
- D. All materials, items of equipment and workmanship furnished under the Fire Protection Section shall carry the standard warranty against all defects in material and workmanship. Any fault due to defective or improper material, equipment, workmanship or design which may develop shall be made good, forthwith, by and at the expense of the Fire Protection Subcontractor for the work under his Contract, including all other damage done to areas, materials and other systems resulting from this failure.

- E. The Fire Protection Subcontractor shall warranty that all elements of the systems which are to be provided under his Contract, are of sufficient capacity to meet the specified performance requirements as set forth herein or as indicated.
- F. Upon receipt of notice from the Owner or Architect of failure of any part of the systems or equipment during the warranty period, the affected part or parts shall be replaced by the Fire Protection Subcontractor for his work or any other work affected by the failure(s).
- G. Fire Protection Subcontractor shall furnish, before the final payment is made, a written warranty covering the above requirements in accordance with the General Requirements.

1.16 THE SUBCONTRACTOR

- A. The Fire Protection Subcontractor shall visit the site of the proposed new facility and base his bids from his own site examinations and estimates. The Fire Protection Subcontractor shall not hold the Architect, Engineer, Owner or their agents or employees responsible for, or bound by, any schedule, estimate or of any plan thereof. The Fire Protection Subcontractor shall study the Contract Documents included under this Contract to determine exactly the extent of work provided under this Contract, as well as to ascertain the difficulty to be encountered in performing the work, in installing new equipment and systems and coordinating the work with the other Trades and existing building conditions.
- B. The Fire Protection Subcontractor shall faithfully execute his work according to the terms and conditions of the Contract and specifications, and shall take all responsibility for and bear all losses resulting to him in the execution of his work.
- C. The Fire Protection Subcontractor shall be responsible for the location and performance of work provided under his Contract as indicated on the Contract Documents. All parties employed directly or indirectly by the Fire Protection Subcontractor shall perform their work according to all the conditions as set forth in these specifications.
- D. The Fire Protection Subcontractor shall furnish all materials and do all work in accordance with these specifications, and any supplementary documents provided by the Architect. The work shall include everything shown on the drawings and/or required by the specifications as interpreted by the Architect, regardless of where such information is indicated in the Contract Documents (Architectural, Electrical, Plumbing, HVAC, etc.). Unless specifically indicated otherwise, all work and materials furnished and installed shall be new, unused and of the best quality and workmanship. The Fire Protection Subcontractor shall cooperate with the Architect so that no error or discrepancy in the Contract Documents shall cause defective materials to be used or poor workmanship to be performed.

1.17 COORDINATION OF WORK

- A. The Fire Protection Subcontractor shall compare his drawings and specifications with those of other Trades as well as the Architectural drawings and specifications, and report any discrepancies between them to the Architect and obtain from the Architect written instructions for changes necessary in the Fire Protection work.
- B. Coordinate work with that of all other Trades affecting or affected by the work of this Section. Cooperate with such Trades to assure the steady progress of all work under the Contract.
- C. All work shall be installed in cooperation with other Trades installing interrelated work. Before installation, Fire Protection Subcontractor shall make proper provisions to avoid interferences in a manner approved by the Architect. All changes required in the work of the Fire Protection Subcontractor or that of any other trade caused by the Fire Protection Subcontractor's neglect, shall be made by him at his own expense, to the Architect's satisfaction.

- D. The Fire Protection Subcontractor must include in his bid sufficient dollar amounts to coordinate the work of this Contract. This project is complex and will require additional time to coordinate all Trades and allow implementation of the Owners Standards and maintenance serviceability requirements. This requirement shall include, but not be limited to, producing the coordination drawings, as many times and as many drawings as required, to ensure serviceability of equipment, as approved by the Architect.
- E. Locations of ductwork and piping distribution, equipment, systems, etc. shall be adjusted to accommodate the work with interferences anticipated and encountered. The Fire Protection Subcontractor shall determine the exact routing and location of his systems prior to fabrication or installation of any system component. Accurate measurements and coordination drawings shall be completed to verify dimensions and characteristics of the various systems installations.
- F. Lines which pitch shall have the right-of-way over those which do not pitch. For example, steam piping shall normally have the right-of-way. Lines whose elevations cannot be changed shall have the right-of-way over lines whose elevations can be changed.
- G. Offsets, transitions and changes of direction in all systems shall be made as required to maintain proper headroom and pitch of sloping lines whether or not indicated on the drawings. The Fire Protection Subcontractor shall provide elbows, fittings, offsets in piping, etc. as required for his work to affect these offsets, transitions and changes in direction.
- H. All work shall be installed in a way to permit removal (without damage to other parts) all other system components provided under this Contract requiring periodic replacement or maintenance. All work shall be done to allow easy access for maintaining equipment. The Owner and Engineer will require proof via the preparation of large scale sections and part plans that pull and junction boxes, etc. are accessible after the work is completed. Any items in the field discovered to be in non-compliance shall be removed and relocated, as required, and as directed by the Architect.
- I. The Contract Drawings are diagrammatic only intending to show general runs and locations of the ductwork, piping, equipment, systems equipment, etc. and not necessarily showing all required offsets, details and accessories and equipment to be connected. All work shall be accurately laid out with other Trades to avoid conflicts and to obtain a neat and work-man-like installation which will afford maximum accessibility for operation, maintenance and headroom.
- J. Where discrepancies in scope of work as to what Trade provides items, such conflicts shall be reported to the Architect during bidding and prior to signing of the Contract. If such action is not taken, the Fire Protection Subcontractor shall furnish such items as part of his work as necessary, for complete and operable systems and equipment, as determined by the Architect.
- K. The Fire Protection Subcontractor shall coordinate the installation of all equipment.
- L. Where drawing details, plans, specification requirements and/or scheduled equipment capacities are in conflict or equipment are shown to be different between plans and/or between plans and riser diagrams, details or specifications, the most stringent requirement will be included in the Contract. Fire Protection systems and equipment called for in the specification and/or shown on the drawings shall be provided under this Contract as if it were required by both the drawings and specifications. However, prior to ordering or installation of any portion of work which appears to be in conflict, such work shall be brought to Architect's attention for direction as to what is to be provided.
- M. Any equipment shown on the Fire Protection and/or Architectural drawings to be provided with services shall be included under this Contract as applicable to make equipment complete and operable. Additional equipment, etc., shall be provided to accomplish the above requirement, as required, all as part of this Contract, at no extra cost to the Owner. This requirement necessitates that the Fire Protection Subcontractor review the Architectural drawings and the drawings of other Trades during bidding to ascertain the extent of all requirements, and interface between the Trades and scope of work.

- N. The Fire Protection Subcontractor shall coordinate his work with other Trades' work so that all equipment and systems can be easily, safely and properly serviced and maintained. It is imperative that service personnel can safely access all equipment. Provide safety rails, steps, ladders, valve chains, handle extensions, etc. as required, in addition to the ones shown on the drawings, to ensure safe and easy access to all equipment is provided in a manner approved by the Architect.

1.18 GIVING INFORMATION

- A. Fire Protection Subcontractor shall keep himself fully informed as to the shape, size and position of all openings required for his apparatus and shall give information to the General Contractor and other Subcontractors sufficiently in advance of the work so that all openings may be built in advance.

1.19 EQUIPMENT AND MATERIALS

- A. Equipment and materials shall be delivered to the site and stored in original sealed containers, suitably sheltered from the elements, but readily accessible for inspection by the Architect until installed. All items subject to moisture damage such as controls shall be stored in dry, heated spaces.
- B. Equipment shall be tightly covered and protected against dirt, water, and chemical or mechanical injury and theft. At the completion of the work, equipment and materials shall be cleaned and polished thoroughly and turned over to the Owner in a condition satisfactory to the Architect. Damage or defects that develop before acceptance of the work shall be made good at the Fire Protection Subcontractor's expense.
- C. The Fire Protection Subcontractor shall make necessary field measurements to ascertain space requirements, for equipment and connections to be provided under his respective trade and shall furnish and install such sizes and shapes of equipment to allow for the final installation to conform to the drawings and specifications.
- D. Manufacturer's directions shall be followed completely in the delivery, storage, protection and installation. Promptly notify the Architect in writing of any conflict between any requirements of the Contract Documents and the manufacturer's directions. Obtain the Architect's written instructions before proceeding with the work. Should Fire Protection Subcontractor perform any work that does not comply with the manufacturer's directions or written instructions from the Architect, he shall bear all costs arising in correcting any deficiencies that should arise.
- E. All equipment of one type shall be the products of one manufacturer.
- F. Equipment pre-purchased by the General Contractor on behalf of the Owner or by the Owner himself, if assigned to the Fire Protection Subcontractor, shall be received, installed, tested, etc., as if the equipment was purchased by the Fire Protection Subcontractor. All guarantees, service contracts, etc., shall be the same as for all other equipment provided under this Contract.

1.20 USE OF PREMISES

- A. The Fire Protection Subcontractor shall confine all apparatus, storage of materials and construction to the limits as directed by the Architect and he shall not encumber the premises with his materials. The Fire Protection Subcontractor shall be held responsible for repairs, patching, or cleaning arising from any unauthorized use of premises.
- B. Notwithstanding any approvals or instructions which must be obtained by the Fire Protection Subcontractor from the Architect in connection with the use of the premises, the responsibility for the safe working conditions at the site shall remain that of the Fire Protection Subcontractor. The Architect, Engineer or Owner shall not be deemed to have any responsibility or liability in connection with safe working conditions at the site.

1.21 PROTECTION

- A. Materials, equipment, etc., shall be properly protected during construction and all conduit openings shall be temporarily closed so as to prevent obstruction and damage. Post notice prohibiting the use of all systems provided under the Fire Protection Contract, prior to completion of work and acceptance of all systems by the Owner except as otherwise, instructed by Architect. Take precautions to protect all materials furnished from damage and theft.
- B. The Fire Protection Subcontractor shall furnish, place and maintain proper safety guards for the prevention of accidents that might be caused by the workmanship, materials, equipment or Fire Protection systems provided under his Contract.

1.22 DAMAGE TO OTHER WORK

- A. The Fire Protection Subcontractor shall be held responsible and shall pay for all damages caused by his work to the building structures, equipment, systems, etc., and all work and finishes installed under this Contract. Repair of such damage shall be done by the General Contractor at the expense of the Fire Protection Subcontractor, to the Architect's satisfaction.

1.23 CORRECTION OF WORK

- A. The Fire Protection Subcontractor shall promptly correct all work provided under his Contract and rejected by the Architect as defective or as failing to conform to the Contract Documents, whether observed before or after completion of work, and whether or not fabricated, installed or completed.

1.24 EXTRA WORK

- A. No claim for extra work will be allowed unless it is authorized by the Architect before commencement of the extra said work.

1.25 TOUCH-UP PAINTING

- A. All equipment and systems shall be thoroughly cleaned of rust, splatters and other foreign matter of discoloration leaving every part of all systems in an acceptable prime condition. The Fire Protection Subcontractor for the work under his Contract shall refinish and restore to the original condition all equipment which has sustained damage to the manufacturer's prime and finish coats of paint and/or enamel during the course of construction, regardless of the source of damage.

1.26 PARTS LIST AND INSTRUCTIONS FOR OPERATION AND MAINTENANCE

- A. The Fire Protection Subcontractor shall thoroughly instruct the Owner, to the complete satisfaction of the Architect, in the proper operation of all systems and equipment provided by him. The Fire Protection Subcontractor shall make arrangements, via the Architect, as to whom the instructions are to be given in the operation of the basic and auxiliary systems and the period of time in which they are to be given. The Architect shall be completely satisfied that the Owner has been thoroughly and completely instructed in the proper operation of all systems and equipment before final payment is made. If the Architect determines that complete and thorough instructions have not been given by the Fire Protection Subcontractor to the Owner's representative, then the Fire Protection Subcontractor shall be directed by the Architect to provide whatever instructions are necessary until the intent of this specification has been complied with.
- B. Fire Protection Subcontractor shall submit to the Architect for approval, the required typed sets (see General Conditions and Division 1) bound neatly in loose-leaf binders, of all instructions for the installation, operation, emergency operation, start-up, care and maintenance of all equipment and systems (including instructions for the ordering and stocking of spare parts for all equipment installed under this

Contract). The lists shall include part numbers and suggested supplier. Each set shall also include an itemized list of component parts that should be kept on hand and where such parts can be purchased.

- C. Information shall indicate possible problems with equipment and suggested corrective action. The manuals shall be indexed for each type of equipment. Each section shall be clearly divided from the other sections. A sub-index for each section shall also be provided. The methodology of setting-up the manuals shall be submitted to the Architect and Owner for review prior to final submission of manuals.

1.27 MANUFACTURER'S REPRESENTATIVE

- A. The Fire Protection Subcontractor shall provide, at the appropriate time or as directed by Architect, the on-site services of a competent factory trained Engineer of the manufacturer of specific equipment, to inspect, test, adjust and place in proper operating condition any and all items of the same manufacturer. No additional compensation will be allowed for such services. A written report shall be issued by the particular manufacturer with his findings for the Architect's record.

1.28 RECORD DRAWINGS/AS-BUILT DRAWINGS

- A. The Fire Protection Subcontractor shall maintain current at the site a set of his drawings on which he shall accurately show the actual installation of all work provided under his Contract indicating hereon any variation from the Contract Drawings, in accordance with the General Conditions and Division 1. Changes, whether resulting from formal change orders or other instructions issued by the Architect, shall be recorded. Include changes in sizes, location, and dimensions of equipment, etc.
- B. The Fire Protection Subcontractor shall indicate progress by coloring-in equipment and associated appurtenances exactly as they are erected. This process shall incorporate both the changes noted above and all other deviations from the original drawings whether resulting from job conditions encountered or from any other causes.
- C. The marked-up and colored-up prints will be used as a guide for determining the progress of the work installed. They shall be inspected periodically by the Architect and Owner and they shall be corrected immediately if found either inaccurate or incomplete. This procedure is mandatory.
- D. At the completion of the job, these prints shall be submitted to the General Contractor and then to the Architect for final review and comment. The prints will be returned with appropriate comments and recommendations. These corrected prints, together with corrected prints indicating all the revisions, additions and deletions of work, shall form the basis for preparing a set of As-built Record Drawings.
- E. The Fire Protection Subcontractor shall be responsible for generating as-built Record Drawings utilizing CAD based documents in AutoCAD Release 2000 DWG or DXF format. A bound set of plans, as well as the computer files, on disk, shall be turned over to the Architect for review. After acceptance of the as-built documents by the Architect, the Fire Protection Subcontractor shall make any corrections necessary to the as-built documents and prepare one reproducible set of drawings as well as bound blueprint set(s) (quantity as determined by the Architect) for distribution to the Owner via the Architect.
- F. The Fire Protection Subcontractor may use the computer drawing files used for coordination drawings or purchase the Engineers most recently updated computer drawing files at a nominal charge of \$500.00 per drawing file. The updated drawings may not include all changes made during the course of construction and it shall be the Fire Protection Subcontractors responsibility to update the as-built documents to include all changes brought forth to the project resulting from bulletins, request for information (RFI's), change orders, etc. The Fire Protection Subcontractor may review the Engineers latest computer files for completeness prior to purchase, however the Engineer will not be responsible for updating the computer files.

- G. Included with the above shall be a complete drawing list and a standard layering system, which shall be required to be maintained within the as-built Record CAD documents.
- H. The Fire Protection Subcontractor shall be issued bulletins in the same manner as the original Design Documents described above.
- I. The as-built CAD documents required shall be in addition to other requirements stated elsewhere.

1.29 SAMPLES

- A. Submit samples as requested by Architect.

1.30 GENERAL PRODUCT REQUIREMENTS

- A. Products shall be undamaged and unused at time of installation and shall be complete with accessories, trim, finish, safety guards and other devices and details needed for complete installation and for intended use.
- B. Where available, products shall be standard products of types which have been produced and used previously and successfully on other projects and in similar applications.
- C. Where products by their nature and their use are likely to need replacement parts on future date, for maintenance and repair or replacement work, products shall be standard domestically produced products likely to have such parts available to Owner in future.
- D. Labels and stamps which are required for observation after installation shall be located on accessible surfaces which, in occupied spaces, are not conspicuous. Other labels and stamps shall be located on concealed surfaces.

1.31 COOPERATION AND WORK PROGRESS

- A. The Fire Protection work shall be carried on under the usual construction conditions, in conjunction with all other work at the site. The Fire Protection Subcontractor shall cooperate with the Architect, General Contractor, all other Subcontractors and equipment suppliers working at the site. The Fire Protection Subcontractor shall coordinate the work and proceed in a manner so as not to delay the progress of the project.
- B. The Fire Protection Subcontractor shall coordinate his work with the progress of the building and other Trades so that he will complete his work as soon as conditions permit and such that interruptions of the building functions will be at a minimum. Any overtime hours worked or additional costs incurred due to lack of or improper coordination with other Trades or the Owner by the Fire Protection Subcontractor, shall be assumed by him without any additional cost to the Owner.
- C. The Fire Protection Subcontractor shall furnish information on all equipment that is furnished under this Section but installed under another Section to the installing Subcontractor as specified herein.
- D. The Fire Protection Subcontractor shall provide all materials, equipment and workmanship to provide for adequate protection of all Fire Protection equipment during the course of construction of the project. This shall also include protection from moisture and all foreign matter. The Fire Protection Subcontractor shall also be responsible for damage which he causes to the work of other Trades, and he shall remedy such injury at his own expense.
- E. Waste materials shall be removed promptly from the premises. All material and equipment stored on the premises shall be kept in a neat and orderly fashion. Material or equipment shall not be stored where exposed to the weather. The Fire Protection Subcontractor shall be responsible for the security,

safekeeping and damages, including acts of vandalism, of all material and equipment stored at the job site.

- F. The Fire Protection Subcontractor shall be responsible for unloading all Fire Protection equipment and materials delivered to the site. This shall also include all large and heavy items or equipment which require hoisting. Consult with the General Contractor for hoisting/crane requirements. During construction of the building, the Fire Protection Subcontractor shall provide additional protection against moisture, dust accumulation and physical damage of the main service and distribution equipment. This shall include furnishing and installing temporary heaters within these units, as approved, to evaporate excessive moisture and ventilate it from the room, as may be required.
- G. It shall be the responsibility of the Fire Protection Subcontractor to coordinate the delivery of the Fire Protection equipment to the project prior to the time installation of equipment will be required; but he shall also make sure such equipment is not delivered too far in advance of such required installation, to ensure that possible damage and deterioration of such equipment will not occur. Such equipment stored for an excessively long period of time (as determined in the opinion of the Architect) on the project site prior to installation may be subject to rejection by the Architect.
- H. The Fire Protection Subcontractor shall erect and maintain, at all times, necessary safeguards for the protection of life and property of the Owner, Workmen, Staff and the Public.
- I. Prior to installation, the Fire Protection Subcontractor has the responsibility to coordinate the exact mounting arrangement and location of Fire Protection equipment to allow proper space requirements as indicated in the NEC. Particular attention shall be given in the field to group installations. If it is questionable that sufficient space, conflict with the work of other Subcontractors, architectural or structural obstructions will result in an arrangement which will prevent proper access, operation or maintenance of the indicated equipment, the Fire Protection Subcontractor shall immediately notify the Contractor and not proceed with this part of the Contract work until definite instructions have been given to him by the Architect.
- J. The Fire Protection Subcontractor shall obtain from the Plumbing, HVAC and Electrical Subcontractors copies of all shop drawing prints showing the ductwork and piping installation as they will be put in place on the project. These drawings shall be thoroughly checked by the Fire Protection Subcontractor be coordinated with the work of other trades so as to prevent any installation conflict.

1.32 INSTALLATION

- A. General:
 - 1. Unless specifically noted or indicated otherwise, all equipment and material specified in Division 21 of this specification or indicated on the drawings shall be installed under this Contract whether or not specifically itemized herein. This Section covers particular installation methods and requirements peculiar to certain items and classes of material and equipment.
 - 2. The Fire Protection Subcontractor shall obtain detailed information from manufacturers of equipment as to proper methods of installation.
 - 3. The Fire Protection Subcontractor shall obtain final roughing dimensions and other information as needed for complete installation of items furnished under other Sections or furnished by the Owner.
 - 4. The Fire Protection Subcontractor shall keep fully informed of size, shape and position of openings required for material and equipment provided under this and other Sections. Ensure that openings required for work of this Section are coordinated with work of other Sections. Provide cutting, coring and patching as necessary.
 - 5. All miscellaneous hardware and support accessories, including support rods, nuts, bolts, screws and other such items, shall be of a galvanized or cadmium plated finish or of another approved rust-inhibiting coating.

6. Throughout this Section where reference is made to steel channel supports, it shall be understood to mean that the minimum size shall be 1 5/8" mild strip steel with minimum wall thickness of 0.105", similar to Unistrut P1000 or equal products manufactured by Kindorf or Husky Products Co.

1.33 MATERIALS AND WORKMANSHIP

- A. All materials and equipment shall be new and unused and shall meet requirements of the latest Standards of NEMA, UL, IPCEA, ANSI and IEEE. Equipment shall have components required or recommended by OSHA, applicable NFPA documents and shall be UL listed and labeled.
- B. Despite references in the specifications or on the drawings to materials or pieces of equipment by name, make or catalog number, such references shall be interpreted as establishing standards of quality for materials and performance.
- C. Finish of materials, components and equipment shall not be less than Industry good practice. When material or equipment is visible or subject to corrosive or atmospheric conditions, the finish shall be as approved by the Architect.
- D. Provide proper access to material or equipment that requires inspection, replacement, repair or service. If proper access cannot be provided, confer with the Architect as to the best method of approach to minimize effects of reduced access.
- E. All work shall be installed in a neat and workmanlike manner and shall be done in accordance with all Local and State Codes.
- F. The Owner will not be responsible for material, equipment or the installation of same before testing and acceptance.

1.34 CLEANING

- A. This Section of the specifications shall include the cleaning of all equipment on a day-to-day basis and final cleaning of all Fire Protection equipment prior to turning building over to the Owner. All necessary cleaning referred to herein shall be cleaned to the satisfaction of the Architect.

1.35 FINAL INSPECTION

- A. When all Fire Protection work on the project has been completed and is ready for final inspection, such an inspection shall be made. At this time, and in addition to all other requirements in the Contract Documents, the Fire Protection Subcontractor, for the work under this Contract, shall demonstrate that the requirements of these specifications have been met to the Architect's satisfaction.

END OF SECTION 210100

SECTION 210513 - COMMON MOTOR REQUIREMENTS FOR FIRE SUPPRESSION EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.
- B. Related Sections:
 - 1. Section 210100 - Fire Protection General Requirements.
 - 2. Section 211316 – Dry-Pipe Sprinkler Systems.

1.3 COORDINATION

- A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:
 - 1. Motor controllers.
 - 2. Torque, speed, and horsepower requirements of the load.
 - 3. Ratings and characteristics of supply circuit and required control sequence.
 - 4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

- A. Comply with NEMA MG 1 unless otherwise indicated.
- B. Comply with IEEE 841 for severe-duty motors.

2.2 MOTOR CHARACTERISTICS

- A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet above sea level.
- B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 SINGLE-PHASE MOTORS

- A. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.
- B. Motors 1/20 HP and Smaller: Shaded-pole type.
- C. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 210513

SECTION 210517 - SLEEVES AND SLEEVE SEALS FOR FIRE-SUPPRESSION PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Sleeves.
 - 2. Stack-sleeve fittings.
 - 3. Sleeve-seal systems.
 - 4. Sleeve-seal fittings.
 - 5. Grout.
- B. Related Sections:
 - 1. Section 099000 - Painting and Coating: Execution requirements for piping painting specified by this section.
 - 2. Section 210100 - Fire Protection General Requirements.
 - 3. Section 210518 – Escutcheons for Fire Suppression Piping.
 - 4. Section 210523 – General Duty Valves, Pipe, Fittings and Hangers for Fire Suppression Systems.
 - 5. Section 210548 – Vibration and Seismic Controls for Fire-Suppression Piping and Equipment.
 - 6. Section 210553 - Identification for Fire Suppression Piping and Equipment.
 - 7. Section 211313 – Wet-Pipe Sprinkler System.
 - 8. Section 211316 – Dry-Pipe Sprinkler Systems.

1.3 SUBMITTALS

- A. Section 013300 - Submittal Procedures: Submittal procedures.
- B. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 SLEEVES

- A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.
- B. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.

- C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.
- D. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

2.2 STACK-SLEEVE FITTINGS

- A. Description: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring, bolts, and nuts for membrane flashing.
 - 1. Underdeck Clamp: Clamping ring with setscrews.

2.3 SLEEVE-SEAL SYSTEMS

- A. Manufacturers: provide products by one of the following:
 - 1. Advance Products & Systems, Inc.
 - 2. CALPICO, Inc.
 - 3. Metraflex Company (The).
 - 4. Pipeline Seal and Insulator, Inc.
 - 5. Proco Products, Inc.
- B. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.
 - 1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
 - 2. Pressure Plates: Carbon steel.
 - 3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, Stainless steel of length required to secure pressure plates to sealing elements.

2.4 SLEEVE-SEAL FITTINGS

- A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for imbedding in concrete slab or wall. Unit has plastic or rubber waterstop collar with center opening to match piping OD.

2.5 GROUT

- A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- B. Characteristics: Nonshrink; recommended for interior and exterior applications.
- C. Design Mix: 5000-psi, 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

- A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.
- B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.
 - 1. Sleeves are not required for core-drilled holes.
- C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.
 - 1. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.
 - 2. Cut sleeves to length for mounting flush with both surfaces.
 - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2-inches above finished floor level.
 - 3. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.
- D. Install sleeves for pipes passing through interior partitions.
 - 1. Cut sleeves to length for mounting flush with both surfaces.
 - 2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
 - 3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Section 079200 "Joint Sealants."
- E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 078413 "Penetration Firestopping."

3.2 STACK-SLEEVE-FITTING INSTALLATION

- A. Install stack-sleeve fittings in new slabs as slabs are constructed.
 - 1. Install fittings that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
 - 2. Secure flashing between clamping flanges for pipes penetrating floors with membrane waterproofing. Comply with requirements for flashing specified in Section 076200 "Sheet Metal Flashing and Trim."
 - 3. Install section of cast-iron soil pipe to extend sleeve to 2-inches above finished floor level.
 - 4. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
 - 5. Using grout, seal the space around outside of stack-sleeve fittings.
- B. Fire-Barrier Penetrations: Maintain indicated fire rating of floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 078413 "Penetration Firestopping."

3.3 SLEEVE-SEAL-SYSTEM INSTALLATION

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.
- B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.4 SLEEVE-SEAL-FITTING INSTALLATION

- A. Install sleeve-seal fittings in new walls and slabs as they are constructed.
- B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.
- C. Secure nailing flanges to concrete forms.
- D. Using grout, seal the space around outside of sleeve-seal fittings.

3.5 SLEEVE AND SLEEVE-SEAL SCHEDULE

- A. Use sleeves and sleeve seals for the following piping-penetration applications:
 - 1. Exterior Concrete Walls above Grade:
 - a. Piping Smaller Than 6-inches: Galvanized-steel wall sleeves Galvanized-steel-pipe sleeves.
 - b. Piping 6-inches and Larger: Galvanized-steel wall sleeves Galvanized-steel-pipe sleeves.
 - 2. Exterior Concrete Walls below Grade:
 - a. Piping Smaller Than 6-inches: Cast-iron wall sleeves with sleeve-seal system Galvanized-steel-pipe sleeves with sleeve-seal system.
 - 1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
 - b. Piping 6-inches and Larger: Cast-iron wall sleeves with sleeve-seal system Galvanized-steel-pipe sleeves with sleeve-seal system.
 - 1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
 - 3. Concrete Slabs-on-Grade:
 - a. Piping Smaller Than 6-inches: Cast-iron wall sleeves with sleeve-seal system Galvanized-steel wall sleeves with sleeve-seal system or Galvanized-steel-pipe sleeves with sleeve-seal system.
 - 1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

- b. Piping 6-inches and Larger: Cast-iron wall sleeves with sleeve-seal system Galvanized-steel wall sleeves with sleeve-seal system or Galvanized-steel-pipe sleeves with sleeve-seal system.
 - 1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
- 4. Interior Partitions:
 - a. Piping Smaller Than 6-inch: Galvanized-steel-pipe sleeves.
 - b. Piping 6-inches and Larger: Galvanized-steel-pipe sleeves.

END OF SECTION 210517

SECTION 210518 - ESCUTCHEONS FOR FIRE-SUPPRESSION PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Escutcheons.
 - 2. Floor plates.
- B. Related Sections:
 - 1. Section 099000 - Painting and Coating: Execution requirements for piping painting specified by this section.
 - 2. Section 210100 - Fire Protection General Requirements.
 - 3. Section 210517 – Sleeves and Sleeve Seals for Fire Suppression Piping.
 - 4. Section 210523 – General Duty Valves, Pipe, Fittings and Hangers for Fire Suppression Systems.
 - 5. Section 210548 – Vibration and Seismic Controls for Fire-Suppression Piping and Equipment.
 - 6. Section 210553 - Identification for Fire Suppression Piping and Equipment.
 - 7. Section 211313 – Wet-Pipe Sprinkler System.
 - 8. Section 211316 – Dry-Pipe Sprinkler Systems.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Section 013300 - Submittal Procedures: Submittal procedures.

PART 2 - PRODUCTS

2.1 ESCUTCHEONS

- A. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.
- B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.
- C. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.
- D. Split-Casting Brass Type: With polished, chrome-plated finish and with concealed hinge and setscrew.

- E. Split-Plate, Stamped-Steel Type: With chrome-plated finish, concealed and exposed-rivet hinge, and spring-clip fasteners.

2.2 FLOOR PLATES

- A. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.
- B. Split-Casting Floor Plates: Cast brass with concealed hinge.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.
- B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.
 - 1. Escutcheons for New Piping:
 - a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
 - b. Chrome-Plated Piping: One-piece, cast-brass type with polished, chrome-plated finish.
 - c. Insulated Piping: One-piece, stamped-steel type.
 - d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
 - e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.
 - f. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
 - g. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, stamped-steel type.
 - h. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
 - i. Bare Piping in Unfinished Service Spaces: One-piece, stamped-steel type.
 - j. Bare Piping in Equipment Rooms: One-piece, cast-brass type with polished, chrome-plated finish.
 - k. Bare Piping in Equipment Rooms: One-piece, stamped-steel type.
- C. Install floor plates for piping penetrations of equipment-room floors.
- D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.
 - 1. New Piping: One-piece, floor-plate type.

3.2 FIELD QUALITY CONTROL

- A. Replace broken and damaged escutcheons and floor plates using new materials.

END OF SECTION 210518

SECTION 210523 - GENERAL-DUTY VALVES PIPES, FITTINGS AND HANGERS FOR FIRE-SUPPRESSION SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections:
 - 1. Section 099000 - Painting and Coating: Execution requirements for piping painting specified by this section.
 - 2. Section 210100 - Fire Protection General Requirements.
 - 3. Section 210517 – Sleeves and Sleeve Seals for Fire Suppression Piping.
 - 4. Section 210518 – Escutcheons for Fire Suppression Piping.
 - 5. Section 210548 – Vibration and Seismic Controls for Fire-Suppression Piping and Equipment.
 - 6. Section 210553 - Identification for Fire Suppression Piping and Equipment.
 - 7. Section 211313 – Wet-Pipe Sprinkler System.
 - 8. Section 211316 – Dry-Pipe Sprinkler Systems.

1.2 SUMMARY

- A. Section Includes:
 - 1. Ball valves with indicators.
 - 2. Butterfly valves with indicators.
 - 3. Check valves.
 - 4. OS&Y gate valves.
 - 5. Non-rising stem gate valves.
 - 6. Backflow preventer assemblies
 - 7. Trim and drain valves.
 - 8. Pipe and fittings.
 - 9. Hangers.
 - 10. Fire department connections.

1.3 REFERENCES

- A. American Society of Mechanical Engineers:
 - 1. ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250 and 800.
 - 2. ASME B16.3 – Malleable Iron Threaded Fittings, Class 150 and 300.
 - 3. ASME B16.4 - Cast Iron Threaded Fittings, Class 125 and 250.
 - 4. ASME B16.5 - Pipe Flanges and Flanged Fittings
 - 5. ASME B16.9 – Factory-made Wrought Steel Butt Welding Fittings.
 - 6. ASME B16.11 - Forged Steel Fittings - Socket-Welding and Threaded.
 - 7. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.
 - 8. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
 - 9. ASME B16.25 – Butt Welding Ends.
 - 10. ASME B36.10M - Welded and Seamless Wrought Steel Pipe.
 - 11. ASME Sec 9 - Welding and Brazing Qualifications.
- B. American Society of Sanitary Engineers:

1. ASSE 1013 – Standard for Reduced Pressure Principal Backflow Preventer
 2. ASSE 1015 – Standard for Double Check Backflow Preventer Assembly
 3. ASSE 1047 – Standard for Reduced Pressure Detector Backflow Preventer
 4. ASSE 1048 – Standard for Double Check Detector Assembly Backflow Preventer.
- C. ASTM International:
1. ASTM A47 – Malleable Iron Castings.
 2. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 3. ASTM A135 - Standard Specification for Electric-Resistance-Welded Steel Pipe.
 4. ASTM A126 – Standard for Gray Iron Castings for Valves, Flanges and Pipe Fittings.
 5. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.
 6. ASTM A536 – Standard for Ductile Iron Casting.
 7. ASTM A795/A795M - Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use.
 8. ASTM B32 - Standard Specification for Solder Metal.
 9. ASTM B75 - Standard Specification for Seamless Copper Tube.
 10. ASTM B88 - Standard Specification for Seamless Copper Water Tube.
 11. ASTM B251 - Standard Specification for General Requirements for Wrought Seamless Copper and Copper-Alloy Tube.
- D. American Welding Society:
1. AWS A5.8 - Specification for Filler Metals for Brazing and Braze Welding.
 2. AWS D1.1 - Structural Welding Code - Steel.
 3. AWS D10.9 - Specifications for Qualification of Welding Procedures and Welders for Piping and Tubing.
- E. American Water Works Association:
1. AWWA C110 - American National Standard for Ductile-Iron and Grey-Iron Fittings, 3 in. through 48 in. (75 mm through 1200 mm), for Water and Other Liquids.
 2. AWWA C111 - American National Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
 3. AWWA C151 - American National Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water.
 4. AWWA C510 – Standard for Double Check Valve Backflow Prevention Assembly.
 5. AWWA C511 – Standard for Reduced Pressure Principal Backflow Prevention Assembly.
 6. AWWA C606 – Standard for Grooved and Shouldered Joints.
- F. National Fire Protection Association:
1. NFPA 13 - Installation of Sprinkler Systems.
 2. NFPA 14 - Standard for the Installation of Standpipe and Hose Systems.
 3. NFPA 24 - Installation of Private Fire Service Mains and Their Appurtenances.
- G. Underwriter Laboratories, Inc.:
1. UL 1887 - Fire Tests of Plastic Sprinkler Pipe for Visible Flame and Smoke Characteristics.
 2. UL - Fire Resistance Directory.
- H. Factory Mutual:
1. FM - Factory Mutual Approval Guide.
- 1.4 SUBMITTALS
- A. Section 013300 - Submittal Procedures: Submittal procedures.

- B. Shop Drawings: Indicate pipe materials used, jointing methods, supports, floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections.
- C. Product Data: Submit manufacturer's catalogue information. Provide data on each valve, and fittings, including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.
- D. Grooved joint couplings and fittings shall be shown on shop drawings and product submittals and shall be specifically identified with the applicable Victaulic style or series designation.
- E. Manufacturer's Certificate: Certify that system has been tested and meets or exceeds specified requirements and all code requirements

1.5 CLOSE OUT SUBMITTALS

- A. Section 017700 - Execution and Closeout Requirements: Closeout procedures.
- B. Project Record Documents: Record actual locations of components and tag numbering.
- C. Operation and Maintenance Data: Submit spare parts lists.

1.6 QUALITY ASSURANCE

- A. Workmanship and Qualifications: All materials and equipment shall be installed in accordance with NFPA and all applicable local codes and ordinances. The Sprinkler Contractor shall be state licensed to install sprinkler systems. The Sprinkler Contractor shall make sure that all work and materials conform to the requirements set forth by this Specification. Fire protection equipment shall be installed to conform to NFPA as applicable, and devices used shall be listed and approved by Underwriters laboratories (UL) and/or Factory Mutual (FM).
- B. Codes and Standards: All work shall be equal or superior to that required by codes, regulations, ordinances, and laws imposed by the jurisdictional authorities, including those of the State of Connecticut, State Fire Marshall, local ordinances and OSHA. Nothing in the Specifications permit violations of such directives, and where conflict occurs, the directive shall govern, except where superior work is specified or indicated.
- C. In addition to complying with the above codes and regulations, comply with the requirements of the following:
 - 1. NFPA Standard 13.
 - 2. NFPA Standard 24.
 - 3. State Building and Fire Codes.
 - 4. Local Jurisdictional Authorities.
- D. All grooved joint couplings, fittings, valves, and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components.
- E. Valves: Bear UL and/or FM label or marking. Provide manufacturer's name and pressure rating marked on valve body.
- F. All items of similar class shall be the products of the same manufacturer. All valves, accessory items, etc., shall be from the same source.

- G. Provide fire sprinkler piping located in plenums with peak optical density not greater than 0.5, average optical density not greater than 0.15, and flame spread not greater than 5 feet (1.5 m) when tested in accordance with UL 1887.
- H. Maintain one copy of each document on site.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
 - 1. Furnish cast iron and steel valves with temporary protective coating
 - 2. Protect internal parts against rust and corrosion.
 - 3. Protect threads, flange faces, and weld ends.
 - 4. Set valves open to minimize exposure of functional surfaces.
- B. Use the following precautions during storage:
 - 1. Deliver and store valves in shipping containers, with labeling in place.
 - 2. Maintain valve end protection, furnish cast iron and steel valves with temporary protective coating.
 - 3. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.
 - 4. Furnish temporary end caps and closures on piping and fittings. Maintain in place until installation.
 - 5. All equipment, valves, gages etc., shall be covered and protected during the execution of the work. All equipment and piping shall be protected from freezing. Labeling to remain in place.
- C. Protect flanges and specialties from moisture and dirt.
- D. All unloading, hauling, and handling of materials shall be the responsibility of the Sprinkler Contractor.
- E. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use operating handles or stems as lifting or rigging points.
- F. The Sprinkler Contractor can obtain information on available storage space on site from the Owner when making examination of the site.

1.8 WARRANTY

- A. Section 017700 - Execution and Closeout Requirements: Product warranties and product bonds.
- B. Furnish five year manufacturer warranty for basic fire suppression materials and methods.

1.9 EXTRA MATERIALS

- A. Section 017700 - Execution and Closeout Requirements: Spare parts and maintenance products.
- B. Furnish two sets of valve stem packing for each size and type of valve installed.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

- A. UL Listed: Valves shall be listed in UL's "Online Certifications Directory" and shall bear UL mark.
- B. FM Global Approved: Valves shall be listed in its "Approval Guide," for Automatic Sprinkler Systems.
- C. Source Limitations for Valves: Obtain valves for each valve type from single manufacturer.
- D. ASME Compliance:
 - 1. ASME B16.1 for flanges on iron valves.
 - 2. ASME B1.20.1 for threads for threaded-end valves.
 - 3. ASME B31.9 for building services piping valves.
- E. AWWA Compliance: Comply with AWWA C606 for grooved-end connections.
- F. NFPA Compliance: Comply with NFPA 13 for valves.
- G. Valve Pressure Ratings: Not less than the minimum pressure rating indicated or higher as required by system pressures.
- H. Valve Sizes: Same as upstream piping unless otherwise indicated.
- I. Valve Actuator Types:
 - 1. Worm-gear actuator with hand wheel for quarter-turn valves, except for trim and drain valves.
 - 2. Hand wheel: For other than quarter-turn trim and drain valves.
 - 3. Hand lever: For quarter-turn trim and drain valves 2-inch and smaller.

2.2 VALVE MANUFACTURES

- A. Description:
 - 1. Kennedy Valve Mfg. Co.
 - 2. Victaulic.
 - 3. Stockham.
 - 4. Nibco.
 - 5. Watts.
 - 6. Wilkins
 - 7. Hammond.
 - 8. Milwaukee.
 - 9. Substitutions: Section 016000 - Product Requirements.

2.3 TWO-PIECE BALL VALVES WITH INDICATORS

- A. Description:
 - 1. UL 1091, except with ball instead of disc and FM Global standard for indicating valves (butterfly or ball type), Class Number 1112.
 - 2. Minimum Pressure Rating: 175 psig.

3. Body Design: Two piece.
4. Body Material: Forged brass or bronze.
5. Port Size: Full or standard.
6. Seats: PTFE.
7. Stem: Bronze or stainless steel.
8. Ball: Stainless Steel.
9. Actuator: Worm gear or traveling nut.
10. Supervisory Switch: Internal or external.
11. End Connections for Valves 1-inch through 2-inch: Threaded ends.
12. End Connections for Valves 2-1/2-inch: Grooved ends.

2.4 BRONZE BUTTERFLY VALVES WITH INDICATORS

A. Description:

1. Standard: UL 1091 and FM Global standard for indicating valves, (butterfly or ball type), Class Number 1112.
2. Minimum: Pressure rating: 175 psig.
3. Body Material: Bronze.
4. Seat Material: EPDM.
5. Stem Material: Bronze or stainless steel.
6. Disc: Ductile iron disc with EPDM coating.
7. Actuator: Worm gear or traveling nut.
8. Supervisory Switch: Internal or external.
9. Ends Connections for Valves 1-inch through 2-inch: Threaded ends.
10. Ends Connections for Valves 2-1/2-inch: Grooved ends.

2.5 IRON BUTTERFLY VALVES WITH INDICATORS

A. Description:

1. Standard: UL 1091 and FM Global standard for indicating valves, (butterfly or ball type), Class Number 112.
2. Minimum Pressure Rating: 175 psig.
3. Body Material: Cast or ductile iron.
4. Seat Material: EPDM.
5. Stem: Stainless steel.
6. Disc: Ductile iron, with EPDM coating.
7. Actuator: Worm gear or traveling nut.
8. Supervisory Switch: Internal or external.
9. Body Design: Lug or grooved-end connections.

2.6 CHECK VALVES

A. Description, up to 2-inch:

1. Standard: UL 312 and FM Global standard for swing check valves, Class Number 1210.
2. Minimum Pressure Rating: 175 psig.
3. Type: Single swing check.
4. Body Material: bronze.
5. Clapper: Bronze, with elastomeric seal.

6. Clapper Seat: Brass, bronze, or stainless steel.
7. Hinge Shaft: Bronze or stainless steel.
8. Hinge Spring: Stainless steel.
9. End Connections: threaded.

B. Description, over 2-inch:

1. Standard: UL 312 and FM Global standard for swing check valves, Class Number 1210.
2. Minimum Pressure Rating: 175 psig.
3. Type: Single swing check.
4. Body Material: ductile iron.
5. Clapper: stainless steel with elastomeric seal.
6. Clapper Seat: stainless steel.
7. Hinge Shaft: stainless steel.
8. Hinge Spring: Stainless steel.
9. End Connections: Flanged or grooved.

2.7 BRONZE OS&Y GATE VALVES

A. Description:

1. Standard: UL 262 and FM Global standard for fire-service water control valves (OS&Y- and NRS-type gate valves).
2. Minimum Pressure Rating: 175 psig.
3. Body and Bonnet Material: Bronze or brass.
4. Wedge: One-piece bronze or brass.
5. Wedge Seat: Bronze.
6. Stem: Bronze or brass.
7. Packing: Non-asbestos PTFE.
8. Supervisory Switch: External.
9. End Connections: Threaded.

2.8 IRON OS&Y GATE VALVES

A. Description:

1. Standard: UL 262 and FM Global standard for fire-service water control valves (OS&Y- and NRS-type gate valves).
2. Minimum Pressure Rating: 175 psig.
3. Body and Bonnet Material: Cast or ductile iron.
4. Wedge: Cast or ductile iron, or bronze with elastomeric coating.
5. Wedge Seat: Cast or ductile iron, or bronze with elastomeric coating.
6. Stem: Brass or bronze.
7. Packing: Non-asbestos PTFE.
8. Supervisory Switch: External.
9. End Connections: Flanged or Grooved.

2.9 NRS GATE VALVES

A. Description:

1. Standard: UL 262 and FM Global standard for fire-service water control valves (OS&Y- and NRS-type gate valves).
2. Minimum Pressure Rating: 175 psig.
3. Body and Bonnet Material: Cast or ductile iron.
4. Wedge: Cast or ductile iron with elastomeric coating.
5. Wedge Seat: Cast or ductile iron, or bronze with elastomeric coating.
6. Stem: Brass or bronze.
7. Packing: Non-asbestos PTFE.
8. Supervisory Switch: External.
9. End Connections: Flanged or Grooved.

2.10 BACKFLOW PREVENTERS

A. Detector-Check, Fire-Protection Backflow-Preventer Assemblies:

1. Standard: ASSE 1047 and is FM Global approved or UL listed.
2. Operation: Continuous-pressure applications.
3. Pressure Loss: 12 psig maximum, through middle third of flow range.
4. Size: Refer to Fire Protection Drawings.
5. Design Flow Rate: 500 gpm.
6. Pressure Loss at Design Flow Rate: 12 psig maximum.
7. Body: Cast iron with interior lining that complies with AWWA C550 or that is FDA approved.
8. End Connections: Flanged or Grooved.
9. Configuration: Designed for horizontal, straight-through configuration flow.
10. Accessories:
 - a. Valves: Outside-screw and yoke-gate type with flanged or Grooved ends on inlet and outlet.
 - b. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.
 - c. Bypass: With displacement-type water meter, shutoff valves, and reduced-pressure backflow preventer.

B. Double-Check, Detector-Check Assembly Backflow Preventer Assemblies:

1. Standard: ASSE 1048 and is FM Global approved or UL listed.
2. Operation: Continuous-pressure applications.
3. Pressure Loss: psig maximum, through middle third of flow range.
4. Size: Refer to Fire Protection Drawings.
5. Design Flow Rate: 500 gpm.
6. Pressure Loss at Design Flow Rate: 6 psig maximum.
7. Body: Cast iron with interior lining that complies with AWWA C550 or that is FDA approved.
8. End Connections: Flanged or Grooved.
9. Configuration: Designed for horizontal, straight-through configuration flow.
10. Accessories:
 - a. Valves: Outside-screw and yoke-gate type with flanged or Grooved ends on inlet and outlet.
 - b. Bypass: With displacement-type water meter, shutoff valves, and double check valve.

2.11 TRIM AND DRAIN VALVES

A. Ball Valves:

1. Description:
 - a. Pressure Rating: 175 psig.

- b. Body Design: Two piece.
- c. Body Material: Forged brass or bronze.
- d. Port size: Full or standard.
- e. Seats: PTFE.
- f. Stem: Bronze or stainless steel.
- g. Ball: stainless steel.
- h. Actuator: Handlever.
- i. End Connections for Valves 1-inch through 2-inch: Threaded ends.
- j. End Connections for Valves 2-1/2-inch and over: Grooved ends.

B. Angle Valves:

1. Description:

- a. Pressure Rating: 175 psig.
- b. Body Material: Brass or bronze.
- c. Ends: Threaded.
- d. Stem: Bronze.
- e. Disc: Bronze.
- f. Packing: Asbestos free.
- g. Hand wheel: Malleable iron, bronze, or aluminum.

C. Globe Valves:

1. Description:

- a. Pressure Rating: 175 psig.
- b. Body Material: Bronze with integral seat and screw-in bonnet.
- c. Ends: Threaded.
- d. Stem: Bronze.
- e. Disc Holder and Nut: Bronze.
- f. Disc Seat: Nitrile.
- g. Packing: Asbestos free.
- h. Hand wheel: Malleable iron, bronze, or aluminum.

2.12 STEEL PIPE AND FITTINGS (WET PIPE)

A. Buried Piping:

- 1. Ductile Iron Pipe: ANSI/AWWA C151, cement lined.
 - a. Fittings: ANSI/AWWA C110, standard thickness.
 - b. Cast Iron Fittings: ASME B16.1, flanges and flanged fittings.
 - c. Joints: ANSI/AWWA C111, rubber gasket.

B. Above Ground Piping:

- 1. Black-Steel Pipe: ASTM A 53/A 53M, schedule 40 seamless carbon steel. Pipe ends may be factory or field formed to match joining method.
- 2. Black-Steel Pipe: ASTM A 135/A 135M, or ASTM A 795/A 795M, Schedule 10 for pipe sizes 2-inch and larger; and NFPA 13-specified wall thickness in 6-inch to 10-inch, plain end.
- 3. Cast Iron Fittings: ANSI/ASME B16.1, flanges and flanged fittings; ANSI/ASME B16.4, screwed fittings.
- 4. Malleable Iron Fittings: ANSI/ASME B16.3, screwed Class 300 type. Threads shall conform to ANSI/ASTM A47.
- 5. Grooved Mechanical Fittings: ANSI A21.10/AWWA C-110 ductile iron; ASTM A536 Grade 65-45-12 ductile iron; ASTM A234 Grade WPB; or factory fabricated from carbon steel pipe conforming to ASTM A53; with grooves or shoulders designed to accept grooved end couplings. Fittings shall be of the same manufacturer as the adjoining couplings. Grooved Mechanical

Couplings: ASTM A536 Grade 65-45-12, ductile iron housing, elastomer gasket with nuts and bolts to secure roll grooved pipe and fittings.

- a. Rigid Type Couplings: Housings cast with offsetting, angle-pattern bolt pads to provide rigidity and system support and hanging in accordance with NFPA-13.
 - 1) 1-1/4" through 4": Factory assembled for direct stab installation without field disassembly. Victaulic Style 009 EZ.
 - 2) 5" through 8": Victaulic FireLock™ Style 005.
 - 3) 10" and larger: Victaulic Zero-Flex® Style 07.
 - b. Flexible Type Couplings: Use in locations where vibration attenuation and stress relief are required, and for seismic considerations in accordance with the manufacturer's instructions. Victaulic Style 75.
6. All pipe installed on a dry pipe system shall be galvanized.
- C. Branch Outlet Fittings:
1. Standard: UL 213.
 2. Pressure Rating: 175-psig minimum.
 3. Body Material: Ductile-iron housing with EPDM seals and bolts and nuts.
 4. Type: Mechanical-tee and -cross fittings.
 5. Configurations: Snap-on and strapless, ductile-iron housing with branch outlets.
 6. Size: Of dimension to fit onto sprinkler main and with outlet connections as required to match connected branch piping.
 7. Branch Outlets: Grooved, plain-end pipe, or threaded.

2.13 STEEL PIPE AND FITTINGS (DRY PIPE)

- A. Standard-Weight, Galvanized-Steel Pipe: ASTM A 53/A 53M, Type E, Grade B. Pipe ends may be factory or field formed to match joining method.
- B. Schedule 40, Galvanized-Steel Pipe: ASTM A 135/A 135M; ASTM A 795/A 795M, Type E; or ASME B36.10M wrought steel, with wall thickness not less than Schedule 40. Pipe ends may be factory or field formed to match joining method.
- C. Thin wall Galvanized-Steel Pipe: ASTM A 135/A 135M or ASTM A 795/A 795M, threadable, with wall thickness less than Schedule 30 and equal to or greater than Schedule 10. Pipe ends may be factory or field formed to match joining method.
- D. Galvanized-Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M, standard-weight, seamless steel pipe with threaded ends.
- E. Galvanized-Steel Couplings: ASTM A 865/A 865M, threaded.
- F. Galvanized, Gray-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern.
- G. Malleable- or Ductile-Iron Unions: UL 860.
- H. Cast-Iron Flanges: ASME B16.1, Class 125.
- I. Grooved-Joint, Steel-Pipe Appurtenances:
 1. Pressure Rating: 175-psig minimum.
 2. Galvanized, Grooved-End Fittings for Steel Piping: ASTM A 47/A 47M, malleable-iron casting or ASTM A 536, ductile-iron casting, with dimensions matching steel pipe.

3. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213 rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.

2.14 UNIONS AND DIELECTRIC CONNECTIONS

- A. Unions for Pipe 2 Inches (50 mm) and Under:
 1. Ferrous Piping: 150 psig (1034 kPa) malleable iron, threaded.
 2. Copper Pipe: Bronze, soldered joints.
- B. Dielectric Connections: Union, waterway fitting, or flange with water impervious isolation barrier; Victaulic Style 47 or Watts 3000 Series or approved equal.

2.15 PIPE HANGERS AND SUPPORTS

- A. Conform to NFPA 13 and NFPA 14.
- B. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron, adjustable swivel, split ring.
- C. Hangers for Pipe Sizes 2 inch and Over: Carbon steel, adjustable, clevis.
- D. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
- E. Wall Support for Pipe Sizes to 3 inches: Cast iron hook.
- F. Wall Support for Pipe Sizes 4 inches and Over: Welded steel bracket and wrought steel clamp.
- G. Vertical Support: Steel riser clamp.
- H. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

2.16 FIRE DEPARTMENT CONNECTION.

- A. Fire department connection shall be chrome 5-inch Storz type connection. Provide with polished chrome identification plate.
- B. The fire department connection shall be constructed of cast brass with brass clapper, brass swivel couplings and a brass hinge pin. The words "AUTO SPKR" and "F.D. Conn" shall be cast in raised letters on the body.
- C. Fire department connection threads shall match the local fire departments standard.
- D. Drain: 3/4-inch automatic drip, install at low point after check valve, pipe to building exterior.
- E. Provide a 90-degree elbow with drain connection at each fire department connection to allow for drainage in areas exposed to the building exterior to prevent freezing. Elbow shall be Victaulic #10-DR.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Coordinate work of this Section with other affected work.
- B. Ream pipe and tube ends. Remove burrs.
- C. Remove scale and foreign material, from inside and outside, before assembly.
- D. Prepare piping connections to equipment with flanges or unions.

3.2 EXAMINATION

- A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- C. Examine threads on valve and mating pipe for form and cleanliness.
- D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.
- E. Do not attempt to repair defective valves; replace with new valves.

3.3 INSTALLATION – GENERAL

- A. Install in accordance with manufacturer's instructions.
- B. The Contractor shall maintain a clean and orderly site during the installation of the sprinkler system. Materials shall not be stored in the halls or other public areas.
- C. Cutting, welding and other hot work shall not be permitted without permission from the building owner. Contractor shall provide a fire watch for one hour after all welding.
- D. The required tests shall be witnessed by the Fire Marshall, authority having jurisdiction, Owner's insurance underwriter and Architect/Engineer.
- E. Pipe Hangers and Supports:
 - 1. Install in accordance with NFPA 13.
 - 2. Install hangers to with minimum 1/2-inch space between finished covering and adjacent work.
 - 3. Place hangers within 12 inches of each horizontal elbow.
 - 4. Use hangers with 1-1/2-inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
 - 5. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
 - 6. Where installing several pipes in parallel and at same elevation, provide multiple or trapeze hangers.

7. Prime coat exposed steel hangers and supports. Refer to Section 099000. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

3.4 PIPING INSTALLATION

- A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated on approved working plans.
 1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.
 2. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including light fixtures, HVAC equipment, and partition assemblies.
- B. Pipe/insulation: All wet sprinkler piping must be plumbed on the heated side of the building insulation to prevent freezing. The fire protection contractor must install the wet sprinkler piping such that space is provided around all wet piping for insulation to be installed. The space required for insulation is dictated by the insulation R-value for the specific area as specified by the Architect.
- C. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Use Victaulic Style 77 or 75 couplings in accordance with Victaulic instructions for expansion and contraction of pipe.
- D. Piping Standard: Comply with NFPA 13 requirements for installation of sprinkler piping.
- E. Install seismic restraints on piping. Comply with NFPA 13 requirements for seismic-restraint device materials and installation.
- F. Use listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.
- G. Install unions adjacent to each valve in pipes 2-inch and smaller.
- H. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having 2-1/2-inch and larger end connections.
- I. Install "Inspector's Test Connections" in sprinkler system piping, complete with shutoff valve, and sized and located according to NFPA 13.
- J. Pitch piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.
- K. Install sprinkler piping with drains for complete system drainage.
- L. Install sprinkler control valves, test assemblies, and drain risers adjacent to standpipes when sprinkler piping is connected to standpipes.
- M. Place piping in concealed spaces above finished ceilings unless noted otherwise.
- N. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.
- O. Install piping to conserve building space, to not interfere with use of space and other work.
- P. Group piping whenever practical at common elevations.

- Q. Prepare pipe, fittings, supports, and accessories for finish painting. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding. Refer to Section 099000.
- R. Install automatic (ball drip) drain valve at each check valve for fire-department connection, to drain piping between fire-department connection and check valve. Install drain piping to and spill over floor drain or to outside building.
- S. Do not penetrate building structural members unless indicated.
- T. Install alarm devices in piping systems.
- U. Provide surge restrainers on all end of branches and arm overs in excess of 12-inches.
- V. Fill sprinkler system piping with water.
- W. Install hangers and supports for sprinkler system piping according to NFPA 13. Comply with requirements for hanger materials in NFPA 13. In seismic-rated areas, refer to Section 210548 "Seismic Controls for Fire-Suppression Piping and Equipment."
- X. Pressurize and check drypipe sprinkler system piping, air-pressure maintenance devices and air compressors.
- Y. Install pressure gages on riser or feed main, at each sprinkler test connection, Include pressure gages with connection not less than 1/4-inch and with soft-metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and install where they are not subject to freezing.
- Z. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 210517 "Sleeves and Sleeve Seals for Fire-Suppression Piping."
- AA. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 210517 "Sleeves and Sleeve Seals for Fire-Suppression Piping."
- BB. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 210518 "Escutcheons for Fire-Suppression Piping."
- CC. Install electric heating cables and pipe insulation on sprinkler piping in areas subject to freezing. Comply with requirements for heating cables in Section 26000 "Heat Tracing for Fire-Suppression Piping" by Electrical Contractor and for piping insulation in Section 210700 by Fire Protection Contractor.

3.5 JOINT CONSTRUCTION

- A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.
- B. Install unions adjacent to each valve in pipes 2-inch and smaller.
- C. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having 2-1/2-inch and larger end connections.
- D. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

- E. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- F. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.
- G. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- H. Steel-Piping, Pressure-Sealed Joints: Join light wall steel pipe and steel pressure-seal fittings with tools recommended by fitting manufacturer.
- I. Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators according to "Quality Assurance" Article.
 - 1. Shop weld pipe joints where welded piping is indicated. Do not use welded joints for galvanized-steel pipe.
- J. Grooved joint couplings and fittings shall be installed in accordance with the manufacturer's written installation instructions. Grooved ends shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove. Gaskets shall be verified as suitable for the intended service prior to installation. Gaskets shall be molded and produced by the coupling manufacturer. The grooved coupling manufacturer's factory trained representative shall provide on-site training for contractor's field personnel in the use of grooving tools, application of groove, and installation of grooved joint products. The manufacturer's representative shall periodically visit the jobsite and review installation. Contractor shall remove and replace any joints deemed improperly installed.
- K. Steel-Piping, Cut-Grooved Joints: Cut square-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe joints.
- L. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.
- M. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.6 GENERAL REQUIREMENTS FOR VALVE INSTALLATION

- A. Install listed fire-protection shutoff valves supervised-open, located to control sources of water supply except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.
- B. Install valves having threaded connections with unions at each piece of equipment arranged to allow easy access, service, maintenance, and equipment removal without system shutdown. Provide separate support where necessary.
- C. Install valves in horizontal piping with stem at or above the pipe center.

- D. Install valves in position to allow full stem movement.
- E. Install valve tags. Comply with requirements in Section 210553 "Identification for Fire-Suppression Piping and Equipment" for valve tags and schedules and signs on surfaces concealing valves; and the NFPA standard applying to the piping system in which valves are installed. Install permanent identification signs indicating the portion of system controlled by each valve.
- F. Install drain valves at main shut-off valves, low points of piping and apparatus.
- G. All valves shall be accessible for operation and servicing. Provide access panels where required.
- H. Install valves with stems upright or horizontal, not inverted. Remove protective coatings after installation.
- I. Install gate valves for shut-off or isolating service.
- J. Provide double check valve backflow preventer assembly at sprinkler system water source connection. Install a drain line from the air gap fitting and terminate at the nearest floor drain. The double check valve assembly shall not be installed at more than 5'0" above finished floor for maintenance.

3.7 SLEEVE INSTALLATION

- A. Install sleeves in accordance with Specification Section 210517 – "Sleeves and Sleeve Seals for Fire Suppression Piping".

3.8 ESCUTCHEON INSTALLATION

- A. Install escutcheons in accordance with Specification Section 210518 – "Escutcheons for Fire Suppression Piping".

3.9 FIRE DEPARTMENT CONNECTION

- A. Locate fire department connection with sufficient clearance from walls, obstructions, etc., to allow full swing of fire department wrench handle. Coordinate the exact location of the fire department connection with the local fire officials. Installation shall conform to the local fire official's requirements.

3.10 PIPING SCHEDULE

- A. Piping between Fire Department Connections and Check Valves: Galvanized, standard-weight steel pipe with threaded ends and cast-iron threaded fittings or grooved ends with grooved-end fittings and grooved-end-pipe couplings joints.
- B. Sprinkler specialty fittings may be used, downstream of control valves, instead of specified fittings.
- C. Wet Pipe Sprinkler System:
 - 1. Standard-pressure, wet-pipe sprinkler system, 1 1/2-inch and smaller, shall be one of the following:
 - a. Schedule 40, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
 - b. Type L, hard copper tube with plain ends; wrought-copper, solder-joint fittings; and brazed joints.

2. Standard-pressure, wet-pipe sprinkler system, 2-inch to 4-inch, shall be one of the following:
 - a. Schedule 40, black-steel pipe with cut-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
 - b. Schedule 40, black-steel pipe with steel welding fittings; and welded joints.
 - c. Schedule 10 black-steel pipe with roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
 - d. Schedule 10 black-steel pipe with welding fittings; and welded joints.
 3. Standard-pressure, wet-pipe sprinkler system, 5-inch and larger shall be one of the following:
 - a. Schedule 40, black-steel pipe with cut-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
 - b. Schedule 40, black-steel pipe with steel welding fittings; and welded joints.
 - c. Schedule 10 black-steel pipe with roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
 4. Standard-pressure, dry-pipe sprinkler system, 1 1/2-inch and smaller, shall be one of the following:
 - a. Schedule 40, galvanized-steel pipe with threaded ends; galvanized, gray-iron threaded fittings; and threaded joints.
 5. Standard-pressure, dry-pipe sprinkler system, 2-inch to 4-inch, shall be one of the following:
 - a. Schedule 40, galvanized-steel pipe with threaded ends; galvanized, gray-iron threaded fittings; and threaded joints.
 - b. Schedule 40, galvanized-steel pipe with cut-grooved ends; galvanized, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
 - c. Schedule 10, galvanized-steel pipe with roll-grooved ends; galvanized, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
- D. Provide new fire service complete with double check valve backflow preventer assembly, and isolation valves with tamper switches.
1. Provide sleeve in wall for service main and support at wall with reinforced concrete bridge. Caulk enlarged sleeve and make watertight with pliable material. Anchor service main inside to concrete wall.
 2. Provide Link Seal Modular Seal assembly Model C for temperature rating of -40°F to 250°F. Install per manufacturers written instructions.

3.11 TESTING

- A. Piping: The complete system shall be subject to a pressure test, and to such other tests as the authorities having jurisdiction may require. The pressure test shall be a hydrostatic pressure of 200 pounds per square inch for a period of two hours. The above ground piping and attached appurtenances shall show no pressure loss or leaks, refer to NFPA Standard 13 Hydrostatic tests. For buried piping refer to NFPA Standard 24 Testing Underground Systems. Before applying specified test pressure, all air must be expelled from the system. All defects of whatever type shall be repaired or replaced to the satisfaction of the Owner and authorities having jurisdiction and at no additional cost to the Owner. Packing rings, special joint bolts, gaskets, and other material required for the proper installation of the pipe and fittings shall be provided. Testing shall be completed prior to permanent sealing of walls and partitions.
- B. Leaks in mechanical joints shall be repaired by dismantling the joint, reassembling it, and tightening the bolts in the correct order. Leaks in screw or grooved joint shall be repaired by dismantling the joint and reassembling it. Attempting to repair leaks in joints by over tightening the bolts or fittings shall not be permitted
- C. Upon satisfactory completion of all tests, the Contractor shall submit three copies of the Standard Contractors Material and Test Certificate to the Owner.

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END OF SECTION 210523

SECTION 210548 - VIBRATION AND SEISMIC CONTROLS FOR FIRE-SUPPRESSION PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections:
 - 1. Section 210500 - Fire Protection General Requirements.
 - 2. Section 210523 – General Duty Valves, Pipe, Fittings and Hangers for Fire Suppression Systems.
 - 3. Section 211200 - Fire Suppression Standpipes.
 - 4. Section 211313 – Wet-Pipe Sprinkler System.
 - 5. Section 211316 – Dry-Pipe Sprinkler Systems.

1.2 SUMMARY

- A. Section Includes:
 - 1. Elastomeric isolation pads.
 - 2. Elastomeric isolation mounts.
 - 3. Restrained elastomeric isolation mounts.
 - 4. Pipe-riser resilient supports.
 - 5. Resilient pipe guides.
 - 6. Elastomeric hangers.
 - 7. Snubbers.
 - 8. Restraint channel bracings.
 - 9. Seismic-restraint accessories.
 - 10. Mechanical anchor bolts.
 - 11. Adhesive anchor bolts.

1.3 DEFINITIONS

- A. IBC: International Building Code.
- B. ICC-ES: ICC-Evaluation Service.
- C. OSHPD: Office of Statewide Health Planning & Development (for the State of California).

1.4 SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.
 - 2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of vibration isolation device and seismic-restraint component required.

- a. Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear as evaluated by an agency acceptable to authorities having jurisdiction an evaluation service member of ICC-ES.
 - b. Annotate to indicate application of each product submitted and compliance with requirements.
 3. Interlocking Snubbers: Include ratings for horizontal, vertical, and combined loads.
 - B. Delegated-Design Submittal: For each vibration isolation and seismic-restraint device.
 1. Include design calculations and details for selecting vibration isolators and seismic restraints complying with performance requirements, design criteria, and analysis data signed and sealed by a qualified professional engineer.
 2. Design Calculations: Calculate static and dynamic loading due to equipment weight and operation, due to seismic forces required to select vibration isolators, and due to seismic restraints.
 3. Riser Supports: Include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on building structure, spring deflection changes, and seismic loads. Include certification that riser system was examined for excessive stress and that none exists.
 4. Seismic-Restraint Details:
 - a. Design Analysis: To support selection and arrangement of seismic restraints. Include calculations of combined tensile and shear loads.
 - b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to the restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events. Indicate association with vibration isolation devices.
 - c. Coordinate seismic-restraint and vibration isolation details with wind-restraint details required for equipment mounted outdoors. Comply with requirements in other Sections for equipment mounted outdoors.
 - C. Information Submittals.
 1. Coordination Drawings: Show coordination of vibration isolation device installation and seismic bracing for fire-suppression piping and equipment with other systems and equipment in the vicinity, including other supports and restraints, if any.
 2. Qualification Data: For professional engineer.
 3. Welding certificates.
 4. Field quality-control reports.
- 1.5 QUALITY ASSURANCE
- A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7 and that is acceptable to authorities having jurisdiction.
 - B. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.
 - C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

- D. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval OPA number from OSHPD, preapproval by ICC-ES, or preapproval by another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are unavailable, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic-Restraint Loading:

1. Site Class as Defined in the IBC: [A] [B] [C] [D] [E] [F].
2. Assigned Seismic Use Group or Building Category as Defined in the IBC: [I] [II] [III].
 - a. Component Importance Factor: 1.0.
 - b. Component Response Modification Factor: 2.5.
 - c. Component Amplification Factor: 1.0.
3. Design Spectral Response Acceleration at Short Periods (0.2 Second): 1.5.
4. Design Spectral Response Acceleration at 1.0-Second Period: .6.
5. Rated strengths, features, and applications shall be as defined in reports by an agency acceptable to authorities having jurisdiction an evaluation service member of ICC-ES.
 - a. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they are subjected.

2.2 ELASTOMERIC ISOLATION PADS

A. Elastomeric Isolation Pads:

1. Fabrication: Single or multiple layers of sufficient durometer stiffness for uniform loading over pad area.
2. Size: Factory or field cut to match requirements of supported equipment.
3. Pad Material: Oil and water resistant with elastomeric properties.
4. Surface Pattern: Smooth Ribbed pattern.
5. Infused nonwoven cotton or synthetic fibers.
6. Load-bearing metal plates adhered to pads.
7. Sandwich-Core Material: Resilient and elastomeric.
 - a. Surface Pattern: Smooth Ribbed pattern.
 - b. Infused nonwoven cotton or synthetic fibers.

2.3 ELASTOMERIC ISOLATION MOUNTS

A. Double-Deflection, Elastomeric Isolation Mounts:

1. Mounting Plates:

- a. Top Plate: Encapsulated steel load transfer top plates, factory drilled and threaded with threaded studs or bolts.
 - b. Baseplate: Encapsulated steel bottom plates with holes provided for anchoring to support structure.
2. Elastomeric Material: Molded, oil-resistant rubber, neoprene, or other elastomeric material.

2.4 RESTRAINED ELASTOMERIC ISOLATION MOUNTS

- A. Restrained Elastomeric Isolation Mounts:
 1. Description: All-directional isolator with seismic restraints containing two separate and opposing elastomeric elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.
 - a. Housing: Cast-ductile iron or welded steel.
 - b. Elastomeric Material: Molded, oil-resistant rubber, neoprene or other elastomeric material.

2.5 PIPE-RISER RESILIENT SUPPORT

- A. Description: All-directional, acoustical pipe anchor consisting of two steel tubes separated by a minimum 1/2-inch-thick neoprene.
 1. Vertical-Limit Stops: Steel and neoprene vertical-limit stops arranged to prevent vertical travel in both directions.
 2. Maximum Load Per Support: 500 psig on isolation material providing equal isolation in all directions.

2.6 RESILIENT PIPE GUIDES

- A. Description: Telescopic arrangement of two steel tubes or post-and-sleeve arrangement separated by a minimum 1/2-inch-thick neoprene.
 1. Factory-Set Height Guide with Shear Pin: Shear pin shall be removable and reinsertable to allow for selection of pipe movement. Guides shall be capable of motion to meet location requirements.

2.7 ELASTOMERIC HANGERS

- A. Elastomeric Mount in a Steel Frame with Upper and Lower Steel Hanger Rods:
 1. Frame: Steel, fabricated with a connection for an upper threaded hanger rod and an opening on the underside to allow for a maximum of 30 degrees of angular lower hanger-rod misalignment without binding or reducing isolation efficiency.
 2. Dampening Element: Molded, oil-resistant rubber, neoprene, or other elastomeric material with a projecting bushing for the underside opening preventing steel to steel contact.

2.8 SNUBBERS

- A. Description: Factory fabricated using welded structural-steel shapes and plates, anchor bolts, and replaceable resilient isolation washers and bushings.

1. Anchor bolts for attaching to concrete shall be seismic-rated, drill-in, and stud-wedge or female-wedge type.
2. Resilient Isolation Washers and Bushings: Oil- and water-resistant neoprene.
3. Maximum 1/4-inch air gap, and minimum 1/4-inch-thick resilient cushion.

2.9 RESTRAINT CHANNEL BRACINGS

- A. Description: MFMA-4, shop- or field-fabricated bracing assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; rated in tension, compression, and torsion forces.

2.10 SEISMIC-RESTRAINT ACCESSORIES

- A. Hanger-Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections or Reinforcing steel angle clamped to hanger rod.
- B. Hinged and Swivel Brace Attachments: Multifunctional steel connectors for attaching hangers to rigid channel bracings.
- C. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchor bolts and studs.
- D. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings, and matched to type and size of attachment devices used.
- E. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

2.11 MECHANICAL ANCHOR BOLTS

- A. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

2.12 ADHESIVE ANCHOR BOLTS

- A. Adhesive Anchor Bolts: Drilled-in and capsule anchor system containing PVC or urethane methacrylate-based resin and accelerator, or injected polymer or hybrid mortar adhesive. Provide anchor bolts and hardware with zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and equipment to receive vibration isolation and seismic-control devices for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

- A. Multiple Pipe Supports: Secure pipes to trapeze member with clamps approved for application by an agency acceptable to authorities having jurisdiction an evaluation service member of ICC-ES.
- B. Hanger-Rod Stiffeners: Install hanger-rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods due to seismic forces.
- C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength is adequate to carry present and future static and seismic loads within specified loading limits.

3.3 VIBRATION CONTROL AND SEISMIC-RESTRAINT DEVICE INSTALLATION

- A. Coordinate the location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in Section 033000 "Cast-in-Place Concrete." and Section 033053 "Miscellaneous Cast-in-Place Concrete."
- B. Installation of vibration isolators must not cause any change of position of equipment, piping, or ductwork resulting in stresses or misalignment.
- C. Equipment Restraints:
 - 1. Install seismic snubbers on fire-suppression equipment mounted on vibration isolators. Locate snubbers as close as possible to vibration isolators and bolt to equipment base and supporting structure.
 - 2. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.
 - 3. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction an evaluation service member of ICC-ES that provides required submittals for component.
- D. Piping Restraints:
 - 1. Comply with requirements in MSS SP-127.
 - 2. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c.
 - 3. Brace a change of direction longer than 12 feet.

- E. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction an evaluation service member of ICC-ES that provides required submittals for component.
- F. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.
- G. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.
- H. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.
- I. Drilled-in Anchors:
 - 1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
 - 2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
 - 3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
 - 4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
 - 5. Set anchors to manufacturer's recommended torque, using a torque wrench.
 - 6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.4 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

- A. Install flexible connections in piping where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where the connections terminate with connection to equipment that is anchored to a different structural element from the one supporting the connections as they approach equipment. Comply with requirements in Section 211200 "Fire-Suppression Standpipes," Section 211313 "Wet-Pipe Sprinkler Systems," and Section 211316 "Dry-Pipe Sprinkler Systems" for piping flexible connections.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Perform tests and inspections.
- C. Tests and Inspections:
 - 1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
 - 2. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless postconnection testing has been approved), and with at least seven days' advance notice.

3. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
 4. Test at least four of each type and size of installed anchors and fasteners selected by Architect.
 5. Test to 90 percent of rated proof load of device.
 6. Measure isolator restraint clearance.
 7. Measure isolator deflection.
 8. Verify snubber minimum clearances.
- D. Remove and replace malfunctioning units and retest as specified above.
- E. Prepare test and inspection reports.

END OF SECTION 210548

SECTION 210553 - IDENTIFICATION FOR FIRE-SUPPRESSION PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections:
 - 1. Section 210100 - Fire Protection General Requirements.
 - 2. Section 210513 – Common Motor Requirements for Fire Suppression Equipment.
 - 3. Section 210523 – General Duty Valves, Pipes, Fittings and Hangers for Fire Suppression Systems.
 - 4. Section 211313 – Wet-Pipe Sprinkler System.
 - 5. Section 211316 – Dry-Pipe Sprinkler Systems.

1.2 SUMMARY

- A. Section Includes:
 - 1. Equipment labels.
 - 2. Warning signs and labels.
 - 3. Pipe labels.
 - 4. Stencils.
 - 5. Valve tags.
 - 6. Warning tags.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For color, letter style, and graphic representation required for each identification material and device.
- C. Equipment-Label Schedule: Include a listing of all equipment to be labeled and the proposed content for each label.
- D. Valve Schedules: Valve numbering scheme.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

- A. Metal Labels for Equipment:
 - 1. Material and Thickness: Brass, 0.032-inch-thick, with predrilled holes for attachment hardware.
 - 2. Letter Color: White.

3. Background Color: Black.
 4. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
 5. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
 6. Fasteners: Stainless-steel rivets or self-tapping screws.
 7. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- B. Plastic Labels for Equipment:
1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, with predrilled holes for attachment hardware.
 2. Letter Color: White.
 3. Background Color: Black.
 4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
 5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
 6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
 7. Fasteners: Stainless-steel rivets or self-tapping screws.
 8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- C. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), and the Specification Section number and title where equipment is specified.
- D. Equipment-Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules) and the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

- A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8-inch-thick, with predrilled holes for attachment hardware.
- B. Letter Color: White.
- C. Background Color: Black.
- D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
- E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
- F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
- G. Fasteners: Stainless-steel rivets or self-tapping screws.
- H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

- I. Label Content: Include caution and warning information, plus emergency notification instructions.

2.3 PIPE LABELS

- A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service and showing flow direction according to ASME A13.1.
- B. Pre-tensioned Pipe Labels: Pre-coiled, semi-rigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.
- C. Self-adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.
- D. Pipe-Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.
 1. Flow-Direction Arrows: Integral with piping-system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
 2. Lettering Size: Size letters according to ASME A13.1 for piping. Lettering shall be minimum of 1/2 inch.
- E. Pipe-Label Colors:
 1. Background Color: Safety Red.
 2. Letter Color: White.

2.4 VALVE TAGS

- A. Description: Stamped or engraved with 1/4-inch letters for piping-system abbreviation and 1/2-inch numbers.
 1. Tag Material: Brass, 0.032-inch-thick, with predrilled holes for attachment hardware.
 2. Fasteners: Brass beaded chain or S-hook.
 3. Valve-Tag Color: Safety Red.
 4. Letter Color: White.
- B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.
 1. Valve-tag schedule shall be included in operation and maintenance data.

2.5 WARNING TAGS

- A. Description: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with matte finish suitable for writing.
 1. Size: 3 by 5-1/4 inches minimum.
 2. Fasteners: Reinforced grommet and wire or string.
 3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."

4. Color: Safety Yellow background with black lettering.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean piping and equipment surfaces of incompatible primers, paints, and encapsulants, as well as dirt, oil, grease, release agents, and other substances that could impair bond of identification devices.

3.2 GENERAL INSTALLATION REQUIREMENTS

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be installed.
- B. Coordinate installation of identifying devices with locations of access panels and doors.
- C. Install identifying devices before installing acoustical ceilings and similar concealment.

3.3 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.

3.4 PIPE LABEL INSTALLATION

- A. Piping: Painting of piping is specified in Division 9.
- B. Stenciled Pipe-Label Option: Stenciled labels may be provided instead of manufactured pipe labels, at Installer's option. Install stenciled pipe labels, complying with ASME A13.1, with painted, color-coded bands or rectangles on each piping system.
 1. Identification Paint: Use for contrasting background.
 2. Stencil Paint: Use for pipe marking.
- C. Pipe-Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
 1. Near each valve and control device.
 2. Near each branch connection excluding short takeoffs. Where flow pattern is not obvious, mark each pipe at branch.
 3. Near penetrations and on both sides of through walls, floors, ceilings, and inaccessible enclosures.
 4. At access doors, manholes, and similar access points that permit a view of concealed piping.
 5. Near major equipment items and other points of origination and termination.
 6. Spaced at maximum intervals of 25 feet along each run. Reduce intervals to 10 feet in areas of congested piping and equipment.
 7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

- D. Directional Flow Arrows: Arrows shall be used to indicate direction of flow in pipes including pipes where flow is allowed in both directions.

3.5 VALVE-TAG INSTALLATION

- A. Install tags on valves and control devices in fire-suppression piping systems. List tagged valves in a valve-tag schedule.
- B. Valve-Tag Application Schedule: Tag valves according to size, shape, and with captions similar to those indicated in "Valve-Tag Size and Shape" Subparagraph below:
 - 1. Valve-Tag Size and Shape:
 - a. Wet-Pipe Sprinkler System: 1-1/2 inches, round.
 - b. Dry-Pipe Sprinkler System: 1-1/2 inches, round.

3.6 WARNING-TAG INSTALLATION

- A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION 210553

SECTION 211100 - FACILITY FIRE-SUPPRESSION WATER-SERVICE PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections:
 - 1. Section 210100 - Fire Protection General Requirements.
 - 2. Section 210517 – Sleeves and Sleeve Seals for Fire Suppression Piping.
 - 3. Section 210518 – Escutcheons for Fire Suppression Piping.
 - 4. Section 210548 – Vibration and Seismic Controls for Fire-Suppression Piping and Equipment.
 - 5. Section 210553 - Identification for Fire Suppression Piping and Equipment.
 - 6. Section 211313 – Wet-Pipe Sprinkler System.
 - 7. Section 211316 – Dry-Pipe Sprinkler Systems.

1.2 SUMMARY

- A. Section includes fire-suppression water-service piping and related components outside the building and service entrance piping through floor or through the foundation wall into the building and the following:
 - 1. Pipes, fittings, and specialties.
 - 2. Fire-suppression specialty valves.
 - 3. Alarm devices.
- B. Utility-furnished products include water meters that are furnished to the site, ready for installation.
- C. Related Requirements:
 - 1. Section 211119 "Fire-Department Connections" for exposed-, flush-, and yard-type, fire-department connections.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings:
 - 1. Detail precast concrete vault assemblies and indicate dimensions, method of field assembly, and components.
 - 2. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: For piping and specialties including relation to other services in same area, drawn to scale. Show piping and specialty sizes and valves, meter and specialty locations, and elevations.
- B. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Comply with requirements of utility company supplying the water. Include tapping of water mains and backflow prevention.
 - 2. Comply with standards of authorities having jurisdiction for fire-suppression water-service piping, including materials, hose threads, installation, and testing.
- B. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. Comply with FM Global's "Approval Guide" or UL's "Fire Protection Equipment Directory" for fire-service-main products.
- E. NFPA Compliance: Comply with NFPA 24 for materials, installations, tests, flushing, and valve and hydrant supervision for fire-suppression water-service piping.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Preparation for Transport: Prepare valves, including fire hydrants, according to the following:
 - 1. Ensure that valves are dry and internally protected against rust and corrosion.
 - 2. Protect valves against damage to threaded ends and flange faces.
 - 3. Set valves in best position for handling. Set valves closed to prevent rattling.
- B. During Storage: Use precautions for valves, including fire hydrants, according to the following:
 - 1. Do not remove end protectors unless necessary for inspection; then reinstall for storage.
 - 2. Protect from weather. Store indoors and maintain temperature higher than ambient dew point temperature. Support off the ground or pavement in watertight enclosures when outdoor storage is necessary.
- C. Handling: Use sling to handle valves and fire hydrants if size requires handling by crane or lift. Rig valves to avoid damage to exposed parts. Do not use hand-wheels or stems as lifting or rigging points.
- D. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.
- E. Protect stored piping from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.
- F. Protect flanges, fittings, and specialties from moisture and dirt.

- G. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

1.7 PROJECT CONDITIONS

- A. Interruption of Existing Fire-Suppression Water-Service Piping: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water-distribution service according to requirements indicated:
 - 1. Notify the Owner no fewer than five days in advance of proposed interruption of service.
 - 2. Do not proceed with interruption of service without the Owner's written permission.

PART 2 - PRODUCTS

2.1 DUCTILE-IRON PIPE AND FITTINGS

- A. Grooved-Joint, Ductile-Iron Pipe: AWWA C151, with cut, rounded-grooved ends.
- B. Mechanical-Joint, Ductile-Iron Pipe: AWWA C151, with mechanical-joint bell and plain spigot end.
- C. Push-on-Joint, Ductile-Iron Pipe: AWWA C151, with push-on-joint bell and plain spigot end.
- D. Grooved-End, Ductile-Iron Pipe Appurtenances:
 - 1. Grooved-End, Ductile-Iron Fittings: ASTM A 47/A 47M, malleable-iron castings or ASTM A 536, ductile-iron castings with dimensions matching pipe.
 - 2. Grooved-End, Ductile-Iron-Piping Couplings: AWWA C606, for ductile-iron-pipe dimensions. Include ferrous housing sections, gasket suitable for water, and bolts and nuts.
- E. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
 - 1. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.
- F. Push-on-Joint, Ductile-Iron Fittings: AWWA C153, ductile-iron compact pattern.
 - 1. Gaskets: AWWA C111, rubber.
- G. Flanges: ASME B16.1, Class 125, cast iron.

2.2 SPECIAL PIPE FITTINGS

- A. Ductile-Iron Flexible Expansion Joints:
 - 1. Description: Compound, ductile-iron fitting with combination of flanged and mechanical-joint ends complying with AWWA C110 or AWWA C153. Include two gasketed ball-joint sections and one or more gasketed sleeve sections. Assemble components for offset and expansion indicated. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.
 - 2. Pressure Rating: 250 psig minimum.
- B. Ductile-Iron Deflection Fittings:

1. Description: Compound, ductile-iron coupling fitting with sleeve and one or two flexing sections for up to 15-degree deflection, gaskets, and restrained-joint ends complying with AWWA C110 or AWWA C153. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.
2. Pressure Rating: 250 psig minimum.

2.3 ENCASEMENT FOR PIPING

- A. Standard: ASTM A 674 or AWWA C105.
- B. Material: Linear low-density PE film of 0.008-inch minimum thickness or high-density, cross-laminated PE film of 0.004-inch minimum thickness.
- C. Form: Sheet or tube.
- D. Color: Black or natural.

2.4 JOINING MATERIALS

- A. Gaskets for Ferrous Piping: ASME B16.21, asbestos free.

2.5 PIPING SPECIALTIES

- A. Transition Fittings: Manufactured fitting or coupling same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.
- B. Tubular-Sleeve Pipe Couplings:
 1. Description: Metal, bolted, sleeve-type, reducing or transition coupling, with center sleeve, gaskets, end rings, and bolt fasteners, and with ends of same sizes as piping to be joined.
 2. Standard: AWWA C219.
 3. Center-Sleeve Material: Ductile iron or Malleable iron.
 4. Gasket Material: Natural or synthetic rubber.
 5. Pressure Rating: 200 psig minimum.
 6. Metal Component Finish: Corrosion-resistant coating or material.

2.6 CORPORATION VALVES

- A. Corporation Valves: Comply with AWWA C800. Include saddle and valve compatible with tapping machine and manifold.
 1. Service Saddle: Copper alloy with seal and AWWA C800, threaded outlet for corporation valve.
 2. Corporation Valve: Bronze body and ground-key plug, with AWWA C800, threaded inlet and outlet matching service piping material.
 3. Manifold: Copper fitting with two to four inlets as required, with ends matching corporation valves and outlet matching service piping material.
- B. Meter Valves: Comply with AWWA C800 for high-pressure, service-line valves. Include angle- or straight-through-pattern bronze body, ground-key plug or ball, and wide tee head, with inlet and outlet matching service piping material.

2.7 DETECTOR CHECK VALVES

- A. Description: Galvanized cast-iron body, bolted cover with air-bleed device for access to internal parts, and flanged ends. Include one-piece bronze disc with bronze bushings, pivot, and replaceable seat. Include threaded bypass taps in inlet and outlet for bypass meter connection. Set valve to allow minimal water flow through bypass meter when major water flow is required.
- B. Standards: UL 312 and FM Global's "Approval Guide."
- C. Pressure Rating: 175 psig.
- D. Water Meter: AWWA C700, disc type, at least one-fourth size of detector check valve. Include meter, bypass piping, gate valves, check valve, and connections to detector check valve.

2.8 DETECTOR-TYPE WATER METERS

- A. AWWA, Detector Check Water Meters:
 - 1. Description: Main line, turbine meter with second meter on bypass.
 - 2. Standard: AWWA C703.
 - 3. Registration: Flow in gallons cubic feet.
 - 4. Pressure Rating: 150 psig.
 - 5. Bypass Meter: AWWA C701, turbine AWWA C702, compound-type, bronze case.
 - a. Size: At least one-half nominal size of main-line meter.
- B. Fire-Protection, Detector Check Water Meters:
 - 1. Description: Main-line turbine meter with strainer and second meter on bypass.
 - 2. Standards: UL's "Fire Protection Equipment Directory" listing and FM Global's "Approval Guide."
 - 3. Registration: Flow in gallons cubic feet.
 - 4. Pressure Rating: 175 psig minimum.
 - 5. Bypass Meter: AWWA C701, turbine-type, bronze case.
 - a. Size: At least 2-inch.
- C. Remote Registration System:
 - 1. Description: Utility company's standard; direct-reading type. Include meter modified with signal-transmitting assembly, low-voltage connecting wiring, and remote register assembly.
 - 2. Standard: AWWA C706.
 - 3. Registration: Flow in gallons cubic feet.
- D. Remote Registration System:
 - 1. Description: Utility company's standard; encoder type. Include meter modified with signal-transmitting assembly, low-voltage connecting wiring, and remote register assembly.
 - 2. Standard: AWWA C707.
 - 3. Registration: Flow in gallons cubic feet.
 - 4. Data-Acquisition Units: Comply with utility company's requirements for type and quantity.
 - 5. Visible Display Units: Comply with utility company's requirements for type and quantity.

2.9 PRESSURE-REDUCING VALVES

- A. Water Regulators:
 - 1. Standard: ASSE 1003.
 - 2. Pressure Rating: Initial pressure of 150 psig.
 - 3. Size: 6-inch.
 - 4. Design Flow Rate: 500 gpm.
 - 5. Design Inlet Pressure: 50 psig.
 - 6. Design Outlet Pressure Setting: 100 psig.
 - 7. Body Material: Bronze for 2-inch and smaller; cast iron with interior lining complying with AWWA C550 or that is FDA approved for 2-1/2-inch and 3-inch.
 - 8. End Connections: Threaded for 2-inch and smaller; flanged for 2-1/2 and 3-inch.

2.10 BACKFLOW PREVENTERS

- A. Double-Check, Backflow-Prevention Assemblies:
 - 1. Standard: ASSE 1015.
 - 2. Operation: Continuous-pressure applications unless otherwise indicated.
 - 3. Pressure Loss: 5 psig maximum, through middle one-third of flow range.
 - 4. Size: 6-inch.
 - 5. Design Flow Rate: 500- gpm.
 - 6. Pressure Loss at Design Flow Rate: 10 psig for 2-inch and smaller; 14 psig for 2-1/2-inch and larger.
 - 7. Body Material: Bronze for 2-inch and smaller; steel with interior lining complying with AWWA C550 for 2-1/2-inch and larger.
 - 8. End Connections: Threaded for 2-inch and smaller; flanged for 2-1/2-inch and larger.
 - 9. Configuration: Designed for horizontal, straight through flow.
 - 10. Accessories: Ball valves with threaded ends on inlet and outlet of 2-inch and smaller; OS&Y gate valves with flanged ends on inlet and outlet of 2-1/2-inch and larger.
- B. Double-Check, Detector-Assembly Backflow Preventers:
 - 1. Standards: ASSE 1048 and UL's "Fire Protection Equipment Directory" listing or FM Global's "Approval Guide."
 - 2. Operation: Continuous-pressure applications.
 - 3. Pressure Loss: 5 psig maximum, through middle one-third of flow range.
 - 4. Size: 6-inch.
 - 5. Design Flow Rate: 500 gpm.
 - 6. Pressure Loss at Design Flow Rate: 14 psig.
 - 7. Body Material: Steel with interior lining complying with AWWA C550.
 - 8. End Connections: Flanged.
 - 9. Configuration: Designed for horizontal, straight through flow.
 - 10. Accessories:
 - a. Valves: UL 262 and FM Global's "Approval Guide" listing; OS&Y gate type with flanged ends on inlet and outlet.
 - b. Bypass: With displacement-type water meter, shutoff valves, and reduced-pressure backflow preventer.
- C. Backflow Preventer Test Kits:
 - 1. Description: Factory calibrated, with gages, fittings, hoses, and carrying case with test-procedure instructions.

2.11 ALARM DEVICES

- A. General: UL 753 and FM Global's "Approval Guide" listing, of types and sizes to mate and match piping and equipment.
- B. Water-Flow Indicators: Vane-type water-flow detector, rated for 250-psig working pressure; designed for horizontal or vertical installation; with two single-pole, double-throw circuit switches to provide isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal when cover is removed.
- C. Supervisory Switches: Single pole, double throw; designed to signal valve in other than fully open position.
- D. Pressure Switches: Single pole, double throw; designed to signal increase in pressure.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Comply with excavating, trenching, and backfilling requirements in Section 312000 "Earth Moving."

3.2 PIPING INSTALLATION

- A. Water-Main Connection: Arrange with water utility company for tap of size and in location indicated in water main.
- B. Water-Main Connection: Tap water main according to requirements of water utility company and of size and in location indicated.
- C. Make connections larger than 2-inch with tapping machine according to the following:
 - 1. Install tapping sleeve and tapping valve according to MSS SP-60.
 - 2. Install tapping sleeve on pipe to be tapped. Position flanged outlet for gate valve.
 - 3. Use tapping machine compatible with valve and tapping sleeve; cut hole in main. Remove tapping machine and connect water-service piping.
 - 4. Install gate valve onto tapping sleeve. Comply with MSS SP-60. Install valve with stem pointing up and with valve box.
- D. Make connections 2-inch and smaller with drilling machine according to the following:
 - 1. Install service-saddle assemblies and corporation valves in size, quantity, and arrangement required by utility company's standards.
 - 2. Install service-saddle assemblies on water-service pipe to be tapped. Position outlets for corporation valves.
 - 3. Use drilling machine compatible with service-saddle assemblies and corporation valves. Drill hole in main. Remove drilling machine and connect water-service piping.
 - 4. Install corporation valves into service-saddle assemblies.
 - 5. Install manifold for multiple taps in water main.
 - 6. Install curb valve in water-service piping with head pointing up and with service box.

- E. Comply with NFPA 24 for fire-service-main piping materials and installation.
 - F. Install ductile-iron, water-service piping according to AWWA C600 and AWWA M41.
 - 1. Install encasement for piping according to ASTM A 674 or AWWA C105.
 - G. Bury piping with depth of cover over top at least 60 inches, with top at least 12 inches below level of maximum frost penetration, and according to the following:
 - 1. Under Driveways: With at least 60 inches of cover over top.
 - 2. Under Railroad Tracks: With at least 72 inches of cover over top.
 - 3. In Loose Gravelly Soil and Rock: With at least 12 inches of additional cover.
 - H. Install piping by tunneling or jacking, or combination of both, under streets and other obstructions that cannot be disturbed.
 - I. Extend fire-suppression water-service piping and connect to water-supply source and building fire-suppression water-service piping systems at locations and pipe sizes indicated.
 - 1. Terminate fire-suppression water-service piping within the building at the floor slab or foundation wall until building-water-piping systems are installed. Terminate piping with caps, plugs, or flanges as required for piping material. Make connections to building's fire-suppression water-service piping systems when those systems are installed.
 - J. Install underground piping with restrained joints at horizontal and vertical changes in direction. Use restrained-joint piping, thrust blocks, anchors, tie-rods and clamps, and other supports.
 - K. Comply with requirements for fire-suppression water-service piping inside the building in the following Sections:
 - 1. Section 211313 "Wet-Pipe Sprinkler Systems"
 - 2. Section 211316 "Dry-Pipe Sprinkler Systems"
 - L. Comply with requirements in Section 221116 "Domestic Water Piping" for potable-water piping inside the building.
 - M. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 210517 "Sleeves and Sleeve Seals for Fire-Suppression Piping."
 - N. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 210517 "Sleeves and Sleeve Seals for Fire-Suppression Piping."
- 3.3 JOINT CONSTRUCTION
- A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure rating same as or higher than systems pressure rating for aboveground applications unless otherwise indicated.
 - B. Install unions adjacent to each valve in tubing 2-inch and smaller.
 - C. Install flanges, flange adaptors, or couplings for grooved-end piping on valves, apparatus, and equipment having 2-1/2-inch and larger end connections.

- D. Ream ends of tubes and remove burrs.
- E. Remove scale, slag, dirt, and debris from outside and inside of pipes, tubes, and fittings before assembly.
- F. Ductile-Iron Piping, Gasketed Joints for Fire-Service-Main Piping: UL 194.
- G. Ductile-Iron Piping, Grooved Joints: Cut-groove pipe. Assemble joints with grooved-end, ductile-iron-piping couplings, gaskets, lubricant, and bolts.
- H. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with bolts according to ASME B31.9.
- I. Dissimilar Materials Piping Joints: Use adapters compatible with both piping materials, with OD, and with system working pressure.
- J. Do not use flanges or unions for underground piping.

3.4 ANCHORAGE INSTALLATION

- A. Anchorage, General: Install water-distribution piping with restrained joints. Anchorages and restrained-joint types that may be used include the following:
 - 1. Concrete thrust blocks.
 - 2. Locking mechanical joints.
 - 3. Set-screw mechanical retainer glands.
 - 4. Bolted flanged joints.
 - 5. Heat-fused joints.
 - 6. Pipe clamps and tie rods.
- B. Install anchorages for tees, plugs and caps, bends, crosses, valves, and hydrant branches in fire-suppression water-service piping according to NFPA 24 and the following:
 - 1. Gasketed-Joint, Ductile-Iron, Water-Service Piping: According to AWWA C600.
- C. Apply full coat of asphalt or other acceptable corrosion-resistant material to surfaces of installed ferrous anchorage devices.

3.5 VALVE INSTALLATION

- A. AWWA Gate Valves: Comply with AWWA C600 and AWWA M44. Install each underground valve with stem pointing up and with valve box.
- B. AWWA Valves Other Than Gate Valves: Comply with AWWA C600 and AWWA M44.
- C. UL-Listed or FM Global-Approved Gate Valves: Comply with NFPA 24. Install each underground valve and valves in vaults with stem pointing up and with vertical cast-iron indicator post.
- D. UL-Listed or FM Global-Approved Valves Other Than Gate Valves: Comply with NFPA 24.
- E. MSS Valves: Install as component of connected piping system.
- F. Pressure-Reducing Valves: Install in vault or aboveground between shutoff valves.

- G. Support valves and piping, not direct buried, on concrete piers. Comply with requirements for concrete piers in Section 033000 "Cast-in-Place Concrete." Section 033053 "Miscellaneous Cast-in-Place Concrete."

3.6 DETECTOR CHECK VALVE INSTALLATION

- A. Install in vault or aboveground.
- B. Install for proper direction of flow. Install bypass with water meter, gate valves on each side of meter, and check valve downstream from meter.
- C. Support detector check valves and piping on concrete piers. Comply with requirements for concrete piers in Section 033000 "Cast-in-Place Concrete." Section 033053 "Miscellaneous Cast-in-Place Concrete."

3.7 BACKFLOW PREVENTER INSTALLATION

- A. Install backflow preventers of type, size, and capacity indicated. Include valves and test cocks. Install according to requirements of plumbing and health department and authorities having jurisdiction.
- B. Do not install backflow preventers that have relief drain in vault or in other spaces subject to flooding.
- C. Do not install bypass piping around backflow preventers.
- D. Support 2-1/2-inch and larger backflow preventers and piping on concrete piers. Comply with requirements for concrete piers in Section 033000 "Cast-in-Place Concrete." Section 033053 "Miscellaneous Cast-in-Place Concrete."

3.8 FIRE-DEPARTMENT CONNECTION INSTALLATION

- A. Install ball drip valves at each check valve for fire-department connection to mains.
- B. Install protective pipe bollards on two sides of each freestanding fire-department connection. Pipe bollards are specified in Section 055000 "Metal Fabrications."

3.9 ALARM DEVICE INSTALLATION

- A. General: Comply with NFPA 24 for devices and methods of valve supervision. Underground valves with valve box do not require supervision.
- B. Supervisory Switches: Supervise valves in open position.
 - 1. Valves: Grind away portion of exposed valve stem. Bolt switch, with plunger in stem depression, to OS&Y gate-valve yoke.
 - 2. Indicator Posts: Drill and thread hole in upper-barrel section at target plate. Install switch, with toggle against target plate, on barrel of indicator post.
- C. Locking and Sealing: Secure unsupervised valves as follows:
 - 1. Valves: Install chain and padlock on open OS&Y gate valve.
 - 2. Post Indicators: Install padlock on wrench on indicator post.

- D. Pressure Switches: Drill and thread hole in exposed barrel of fire hydrant. Install switch.
- E. Water-Flow Indicators: Install in water-service piping in vault. Select indicator with saddle and vane matching pipe size. Drill hole in pipe, insert vane, and bolt saddle to pipe.
- F. Connect alarm devices to building's fire-alarm system. Wiring and fire-alarm devices are specified in Section 284621.11 "Addressable Fire-Alarm Systems."

3.10 CONNECTIONS

- A. Connect fire-suppression water-service piping to utility water main existing water main. Use tapping sleeve and tapping valve.
- B. Connect fire-suppression water-service piping to interior fire-suppression piping.
- C. Connect waste piping from concrete vault drains to waste water system.

3.11 FIELD QUALITY CONTROL

- A. Use test procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described below.
- B. Piping Tests: Conduct piping tests before joints are covered and after concrete thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.
- C. Hydrostatic Tests: Test at not less than one-and-one-half times the working pressure for two hours.
 - 1. Increase pressure in 50-psig increments and inspect each joint between increments. Hold at test pressure for one hour; decrease to zero psig. Slowly increase again to test pressure and hold for one more hour. Maximum allowable leakage is 2 quarts per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within allowed limits.
- D. Prepare test and inspection reports.

3.12 IDENTIFICATION

- A. Install continuous underground detectable warning tape during backfilling of trench for underground fire-suppression water-service piping. Locate below finished grade, directly over piping. Underground warning tapes are specified in Section 312000 "Earth Moving."
- B. Permanently attach equipment nameplate or marker indicating plastic fire-suppression water-service piping or fire-suppression water-service piping with electrically insulated fittings, on main electrical meter panel. Comply with requirements for identifying devices in Section 210553 "Identification for Fire Suppression Piping and Equipment."

3.13 CLEANING

- A. Clean and disinfect fire-suppression water-service piping as follows:

1. Purge new piping systems and parts of existing systems that have been altered, extended, or repaired before use.
 2. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in NFPA 24 for flushing of piping. Flush piping system with clean, potable water until dirty water does not appear at points of outlet.
 3. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in AWWA C651 or do as follows:
 - a. Fill system or part of system with water/chlorine solution containing at least 50 ppm of chlorine; isolate and allow it to stand for 24 hours.
 - b. Drain system or part of system of previous solution and refill with water/chlorine solution containing at least 200 ppm of chlorine; isolate and allow it to stand for three hours.
 - c. After standing time, flush system with clean, potable water until no chlorine remains in water coming from system.
 - d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination shows evidence of contamination.
- B. Prepare reports of purging and disinfecting activities.

3.14 PIPING SCHEDULE

- A. Underground fire-suppression water-service piping up to 4-inches shall be one of the following:
1. Mechanical-joint, ductile-iron pipe; mechanical-joint, ductile- or gray-iron, standard-pattern fittings; glands, gaskets, and bolts; and gasketed joints.
 2. Push-on-joint, ductile-iron pipe; push-on-joint, ductile-iron compact-pattern fittings; and gasketed joints.
- B. Underground fire-suppression water-service piping 6-inches and over shall be one of the following:
1. Mechanical-joint, ductile-iron pipe; mechanical-joint, ductile- or gray-iron, standard-pattern fittings; glands, gaskets, and bolts; and gasketed joints.
 2. Push-on-joint, ductile-iron pipe; push-on-joint, ductile-iron compact-pattern fittings; and gasketed joints.
- C. Aboveground and vault fire-suppression water-service piping up to 4-inches shall be the following:
1. Grooved-end, ductile-iron pipe; grooved-end, ductile-iron pipe appurtenances; and grooved joints.
- D. Aboveground and vault fire-suppression water-service piping 6-inches and over shall be the following:
1. Grooved-end, ductile-iron pipe; grooved-end, ductile-iron pipe appurtenances; and grooved joints.
- E. Underslab fire-suppression water-service piping up to 4-inches shall be one of the following:
1. Mechanical-joint, ductile-iron pipe; mechanical-joint, ductile- or gray-iron, standard-pattern fittings; glands, gaskets, and bolts; and restrained, gasketed joints.
 2. Push-on-joint, ductile-iron pipe; push-on-joint, ductile-iron compact-pattern fittings; and restrained, gasketed joints.
- F. Underslab fire-suppression water-service piping 6-inches and over shall be one of the following:
1. Mechanical-joint, ductile-iron pipe; mechanical-joint, ductile- or gray-iron, standard-pattern fittings; glands, gaskets, and bolts; and restrained, gasketed joints.
 2. Push-on-joint, ductile-iron pipe; push-on-joint, ductile-iron compact-pattern fittings; and restrained, gasketed joints.

3.15 VALVE SCHEDULE

- A. Underground fire-suppression water-service shutoff valves shall be corporation valves or curb valves with ends compatible with piping.
- B. Meter box fire-suppression water-service shutoff valves shall be meter valves.
- C. Vault fire-suppression water-service shutoff valves shall be Class 125, MSS, bronze, nonrising stem or UL-listed or FM Global-approved, OS&Y, bronze, gate valves.
- D. Underground fire-suppression water-service shutoff valves shall be one of the following:
 - 1. 175-psig, UL-listed or FM Global-approved, iron, nonrising-stem gate valves.
- E. Standard-pressure, aboveground and vault fire-suppression water-service shutoff valves shall be one of the following:
 - 1. 175-psig, UL-listed or FM Global-approved, iron, OS&Y gate valves.
- F. Fire-suppression water-service check valves shall be one of the following:
 - 1. AWWA and UL-listed or FM Global-approved check valves.
 - 2. UL-listed or FM Global-approved detector check valves.

END OF SECTION 211100

SECTION 211313 - WET-PIPE SPRINKLER SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections:
 - 1. Section 210100 "Fire Protection General Requirements".
 - 2. Section 210517 "Sleeves and Sleeve Seals for Fire Suppression Piping".
 - 3. Section 210518 "Escutcheons for Fire Suppression Piping".
 - 4. Section 210523 "General-Duty Valves, Pipe and Fittings for Water-Based Fire-Suppression Piping" for ball, butterfly, check, gate, post-indicator, and trim and drain valves.
 - 5. Section 210548 "Vibration and Seismic Controls for Fire Suppression Piping and Equipment".
 - 6. Section 210553 Identification for Fire Suppression Piping and Equipment".

1.2 SUMMARY

- A. Section Includes:
 - 1. Specialty valves.
 - 2. Sprinklers.
 - 3. Alarm devices.
 - 4. Pressure gages.
 - 5. Specialties.

1.3 DEFINITIONS

- A. High-Pressure Sprinkler Piping: Wet-pipe sprinkler system piping designed to operate at working pressure higher than standard 175 psig, but not higher than 250 psig.
- B. Standard-Pressure Sprinkler Piping: Wet-pipe sprinkler system piping designed to operate at working pressure of 175-psig maximum.

1.4 REFERENCES

- A. National Fire Protection Association:
 - 1. NFPA 13 - Installation of Sprinkler Systems.
 - 2. NFPA 24 - Installation of Private Fire Service Mains and Their Appurtenances.
- B. Underwriter Laboratories, Inc.:
 - 1. UL - Fire Resistance Directory.
- C. Factory Mutual:
 - 1. FM - Factory Mutual Approval Guide.

1.5 SYSTEM DESCRIPTION

- A. Provide a wet pipe system hydraulically designed in accordance with NFPA 13 and all requirements of the local Authority Having Jurisdiction.
- B. System to provide coverage for the entire building areas indicated on the Fire Protection Drawings.
- C. Provide system to NFPA Standard occupancy requirements as noted on the drawings.
- D. Hydraulic data and water supply information shall be as noted on the drawings.
- E. Interface system with building fire alarm system.
- F. The sprinkler locations and piping arrangements indicated on the contract documents are diagrammatic. It is the responsibility of the contractor to fully coordinate sprinkler and piping locations with all other trades.
- G. Sprinkler locations indicated on the Contract Documents indicate sprinkler coverage utilizing standard coverage sprinklers maximum 225 square feet per sprinkler for light hazard and 130 square feet per sprinkler for ordinary hazard. Extended coverage sprinklers shall not be installed in any locations unless specifically indicated on the Contract Document drawings.
- H. All sprinklers installed in a light hazard classification occupancy shall be a listed quick response type.
- I. Provide fire department connections as indicated on Drawings.
- J. Sprinkler Cabinets: Finished, wall-mounted, steel cabinet with hinged cover, and with space for minimum of six spare sprinklers plus sprinkler wrench. Include number of sprinklers required by NFPA 13 and sprinkler wrench. Include separate cabinet with sprinklers and wrench for each type of sprinkler used on Project.

1.6 PERFORMANCE REQUIREMENTS

- A. Standard-Pressure Piping System Component: Listed for 175-psig minimum working pressure.
- B. Delegated Design: Design sprinkler system(s), including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
 - 1. Available fire-hydrant flow test records indicate the following conditions:
 - a. Refer to fire protection drawings.
- C. Sprinkler system design shall be approved by authorities having jurisdiction.
 - 1. Margin of Safety for Available Water Flow and Pressure: 10 percent @ 10 psi, including losses through water-service piping, valves, and backflow preventers.
 - 2. Sprinkler Occupancy Hazard Classifications:
 - a. Electrical Equipment Rooms: Ordinary Hazard, Group 1.
 - b. General Storage Areas: Ordinary Hazard, Group 1.
 - c. Laundries: Ordinary Hazard, Group 1.
 - d. Mechanical Equipment Rooms: Ordinary Hazard, Group 1.

- e. Office and Public Areas: Light Hazard.
 - f. Residential Living Areas: Light Hazard.
 - g. Restaurant Service Areas: Ordinary Hazard, Group 1.
3. Minimum Density for Automatic-Sprinkler Piping Design:
- a. Residential (Dwelling) Occupancy: 0.05 gpm over 400-sq. ft. area.
 - b. Light-Hazard Occupancy: 0.10 gpm over 1500-sq. ft. area.
 - c. Ordinary-Hazard, Group 1 Occupancy: 0.15 gpm over 1500-sq. ft. area.
 - d. Ordinary-Hazard, Group 2 Occupancy: 0.20 gpm over 1500-sq. ft. area.
 - e. Extra-Hazard, Group 1 Occupancy: 0.30 gpm over 2500-sq. ft. area.
 - f. Extra-Hazard, Group 2 Occupancy: 0.40 gpm over 2500-sq. ft. area.
 - g. Special Occupancy Hazard: As determined by authorities having jurisdiction.
- D. Seismic Performance: Sprinkler piping shall withstand the effects of earthquake motions determined according to NFPA 13 and ASCE/SEI 7.

1.7 SUBMITTALS

- A. Section 013300 - Submittal Procedures: Submittal procedures.
- B. Where the terms "authorities having jurisdiction" is used, within this Specification, it is intended to include the Insurance Underwriter and all regulatory agencies having vested interest in this project.
- C. Shop Drawings:
- 1. Provide fire protections shop drawings drawn to a minimum scale of $\frac{1}{4}" = 1'-0"$. Indicate pipe materials used, joining methods, supports, floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections.
 - 2. Provide hydraulic calculations, detailed pipe layout, hangers and supports, components and accessories. Indicate system controls.
 - 3. All sprinkler drawings and calculations shall bear the seal of a Professional Engineer licensed in the State of New York. Seal and signature shall not be copied and shall be provided as an original drawing and each calculation.
 - 4. Sprinklers shall be as shown on drawings and submittals and shall be specifically identified with the applicable style or series designation as published in the appropriate agency listing or approval. Trade names or other abbreviated designations are not permitted.
 - 5. Working plans, prepared according to NFPA 13.
 - 6. Sprinkler Contractor shall conduct a hydrant flow test. This flow data shall be used for the Sprinkler Contractor's hydraulic calculations. Coordinate flow test requirements with the water company. All fees associated with the flow test shall be paid for by the Sprinkler Contractor.
- D. Product Data: Provide data on sprinklers, valves, and specialties, including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.
- E. After successful review by the Engineer, submit sprinkler layout shop drawings, product data, hydraulic calculations to authority having jurisdiction, Fire Marshall, and Owner's insurance underwriter for approval. Submit proof of approval to Architect/Engineer.
- F. Grooved joint couplings and fittings shall be shown on shop drawings and product submittals and shall be specifically identified with the applicable Victaulic style or series designation.

- G. Manufacturer's Certificate: Certify that system has been tested and meets or exceeds specified requirements and all code requirements.
- H. Provide submittals for information purposes:
 - 1. Qualification Data: For qualified Installer and professional engineer.
 - 2. Welding certificates.
 - 3. Fire-hydrant flow test report.
 - 4. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13. Include "Contractor's Material and Test Certificate for Aboveground Piping."
 - 5. Field quality-control reports.

1.8 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Sprinkler systems, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Domestic water piping.
 - 2. HVAC hydronic piping.
 - 3. Items penetrating finished ceiling including the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
- B. Qualification Data: For qualified Installer and professional engineer.
- C. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, that have been approved by authorities having jurisdiction, including hydraulic calculations if applicable.
- D. Fire-hydrant flow test report.
- E. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13. Include "Contractor's Material and Test Certificate for Aboveground Piping."
- F. Field quality-control reports.

1.9 CLOSEOUT SUBMITTALS

- A. Section 017700 - Execution and Closeout Requirements: Closeout procedures.
- B. Project Record Documents: Record actual locations of sprinklers and deviations of piping from drawings. Indicate drain and test locations.
- C. Operation and Maintenance Data: For wet-pipe sprinkler systems and specialties to include in emergency, operation, and maintenance manuals. Submit components of system, servicing requirements, record drawings, inspection data, replacement part numbers and availability, and location and numbers of service depot.

1.10 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Sprinkler Cabinets: Finished, wall-mounted, steel cabinet with hinged cover, and with space for minimum of six spare sprinklers plus sprinkler wrench. Include number of sprinklers required by NFPA 13 and sprinkler wrench. Include separate cabinet with sprinklers and wrench for each type of sprinkler used on Project.

1.11 QUALITY ASSURANCE

- A. Workmanship and Qualifications: All materials and equipment shall be installed in accordance with NFPA and all applicable local codes and ordinances. The Sprinkler Contractor shall be state licensed to install sprinkler systems. The Sprinkler Contractor shall make sure that all work and materials conform to the requirements set forth by this Specification. Fire protection equipment shall be installed to conform to NFPA as applicable, and devices used shall be listed and approved by Underwriters laboratories (UL) and/or Factory Mutual (FM).
- B. Codes and Standards: All work shall be equal or superior to that required by codes, regulations, ordinances, and laws imposed by the jurisdictional authorities, including those of the State of Connecticut, State Fire Marshall, local ordinances and OSHA. Nothing in the Specifications permit violations of such directives, and where conflict occurs, the directive shall govern, except where superior work is specified or indicated.
- C. In addition to complying with the above codes and regulations, comply with the requirements of the following:
 1. NFPA Standard 13.
 2. NFPA Standard 24.
 3. State Building and Fire Codes.
 4. Local Jurisdictional Authorities.
- D. All grooved joint couplings, fittings, valves, and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components.
- E. Valves: Bear UL and/or FM label or marking. Provide manufacturer's name and pressure rating marked on valve body.
- F. All items of similar class shall be the products of the same manufacturer. All valves, accessory items, etc., shall be from the same source.
- G. Maintain one copy of each applicable NFPA standard on site.
- H. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
- I. Installer: Company specializing in performing work of this Section with minimum five years experience.
- J. Design sprinkler system under direct supervision of a Professional Engineer experienced in design of this Work and licensed in the State where the project is located.
- K. Welding Qualifications: Qualify procedures and operators according to 2010 ASME Boiler and Pressure Vessel Code.
- L. Provide sprinklers system hydraulic calculations with a 10% safety factor.
- M. Maximum pipe velocity for hydraulic calculations shall be 18 feet per second (FPS).

1.12 FIELD CONDITIONS

- A. Interruption of Existing Sprinkler Service: Do not interrupt sprinkler service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary sprinkler service according to requirements indicated:
 - 1. Notify Owner no fewer than two days in advance of proposed interruption of sprinkler service.
 - 2. Do not proceed with interruption of sprinkler service without Owner's written permission.

1.13 DELIVERY, STORAGE AND HANDLING

- A. Section 016000 - Product Requirements: Product storage and handling requirements.
- B. Deliver and store products in shipping containers, with labeling in place.
- C. All equipment, valves, gages and etc., shall be covered and protected during the execution of the work. All equipment and piping shall be protected from freezing. Labeling to remain in place.
- D. All unloading, hauling, and handling of materials shall be the responsibility of the Sprinkler Contractor.
- E. The Sprinkler Contractor can obtain information on available storage space on site from the Owner when making examination of the site.

1.14 WARRANTY

- A. Section 017700 - Execution and Closeout Requirements: Product warranties and product bonds.

1.15 EXTRA MATERIALS

- A. Section 017700 - Execution and Closeout Requirements: Spare parts and maintenance products.
- B. Furnish extra sprinklers under provisions of NFPA 13.
- C. Furnish suitable wrenches for each sprinkler type.
- D. Provide metal storage cabinet adjacent to the sprinkler riser.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Standard-Pressure Piping System Component: Listed for 175-psig minimum working pressure.
- B. Seismic Performance: Sprinkler piping shall withstand the effects of earthquake motions determined according to NFPA 13 and ASCE/SEI 7.

2.2 SPECIALTY VALVES

- A. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
- B. Pressure Rating:
 - 1. Standard-Pressure Piping Specialty Valves: 175-psig minimum.
- C. Body Material: Cast or ductile iron.
- D. Size: Same as connected piping.
- E. End Connections: Flanged or grooved.
- F. Manufactures:
 - 1. Viking.
 - 2. Tyco.
 - 3. Victaulic.
 - 4. Grinnell Corp.
 - 5. Reliable Sprinkler Corp.
- G. Alarm Valves:
 - 1. Check type valve with Nitrile seat o-ring aluminum bronze clapper with EPDM seal to automatically actuate electrically and hydraulically operated alarms, with pressure retard chamber and variable pressure trim. Valve internal components shall be replaceable without removing valve from the installed position. Valve shall be Series 751 as manufactured by Victaulic Co or engineer approved equal.
 - 2. Provide retard chamber as part of wet alarm valve trim to allow for pressure fluctuations. Retard chamber shall be Victaulic Series 752 or engineer approved equal by manufacturers listed above. Provide all other trim as recommended by the manufacturer
 - 3. Alarm check valve assembly shall allow discharge of one or more sprinklers to activate electric and hydraulic alarms
 - 4. Drip Cup Assembly: Pipe drain without valves and separate from main drain piping.
 - 5. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application

2.3 SPRINKLER PIPING SPECIALTIES

- A. Manufactures:
 - 1. Potter.
 - 2. Potter-Roemer.
 - 3. System Sensor.
 - 4. Victaulic.
 - 5. Viking.
- B. Flow Detection and Test Assemblies:
 - 1. Standard: UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
 - 2. Pressure Rating: 175-psig minimum.
 - 3. Body Material: Cast- or ductile-iron housing with orifice, sight glass, and integral test valve.
 - 4. Size: Same as connected piping.
 - 5. Inlet and Outlet: Threaded or grooved.
- C. Branch Line Testers:

1. Standard: UL 199.
 2. Pressure Rating: 175 psig.
 3. Body Material: Brass.
 4. Size: Same as connected piping.
 5. Inlet: Threaded.
 6. Drain Outlet: Threaded and capped.
 7. Branch Outlet: Threaded, for sprinkler.
- D. Sprinkler Inspector's Test Fittings:
1. Standard: UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
 2. Pressure Rating: 175-psig.
 3. Body Material: Cast- or ductile-iron housing with sight glass.
 4. Size: Same as connected piping.
 5. Inlet and Outlet: Threaded.
- E. Adjustable Drop Nipples:
1. Standard: UL 1474.
 2. Pressure Rating: 250-psig minimum.
 3. Body Material: Steel pipe with EPDM-rubber O-ring seals.
 4. Size: Same as connected piping.
 5. Length: Adjustable.
 6. Inlet and Outlet: Threaded.
- F. Flexible Sprinkler Hose Fittings:
1. Standard: UL 1474.
 2. Type: Flexible hose for connection to sprinkler, and with bracket for connection to ceiling grid.
 3. Pressure Rating: 175-psig minimum.
 4. Size: Same as connected piping, for sprinkler.

2.4 SPRINKLERS

- A. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
- B. Pressure Rating for Residential Sprinklers: 175-psig maximum.
- C. Pressure Rating for Automatic Sprinklers: 175-psig minimum.
- D. Manufacturers:
1. Viking.
 2. Tyco.
 3. Victaulic.
 4. Grinnell Corp.
 5. Reliable Sprinkler Corp.
- E. All sprinklers shall be adjustable, glass bulb, automatic sprinklers with ½ inch orifice and 5.6 K-factor unless noted otherwise. Type of sprinkler head shall be as indicated on the plans and in accordance with section 211313.
- F. Sprinkler bodies shall be die-cast brass, with hex shaped wrench boss integrally cast into the sprinkler body to reduce the risk of damage during installation.
- G. Unless noted otherwise, ordinary temperature rated sprinkler heads shall be used throughout the building.

- H. Where sprinklers will be installed in close proximity to heat sources and special locations, as identified in NFPA 13, temperature ratings shall be in accordance with the requirements of NFPA 13.
- I. Where plans call for extended coverage sprinkler heads coordinate coverage requirements with required pressure and K-factor.
- J. Spare Sprinklers: The Sprinkler Contractor shall furnish spare automatic sprinklers in accordance with the requirements of NFPA for stock of extra sprinklers. The sprinklers shall be packed in a suitable container and shall be representative of, and in proportion to, the number of each type and temperature rating of the sprinklers installed. The Sprinkler Contractor shall furnish no less than two special sprinkler wrenches, or at least one wrench for each container or sprinkler box, whichever is greater.
- K. In areas where sprinkler heads are subject to physical damage, provide sprinkler guard assembly over head, finish to match sprinkler finish. This shall include but not limited to the following locations.
1. Heads in elevator shafts.
 2. Heads under lower rakes of stairways.
 3. Heads in electrical rooms, boiler rooms and other mechanical rooms.
 4. Heads installed 7'-0" or less above finished floors.
 5. Heads in gymnasium/fitness center areas.
- L. Sprinklers shall be in accordance with the following table:

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Sprinkler Type	Sprinkler Finish	Manufacturer/Model Number
Pendent Type Sprinklers	Chrome plated finish with chrome plated surface escutcheon	Reliable Model F156
Upright Type Sprinklers	Brass finish.	Reliable Model F156.
Semi-recessed Pendent Type Sprinkler	Chrome plated finish with chrome plated adjustable semi-recessed escutcheon	Reliable Model F156
Concealed Type Sprinklers	Brass finish with factory painted white cover plate.	Reliable Model G4
Sidewall Type Sprinklers	Chrome plated finish with chrome plated, adjustable, semi-recessed escutcheon.	Reliable Model F156
Quick-response Pendent and Upright Type Sprinklers	Chrome plated finish with chrome plated adjustable semi-recessed escutcheon	Reliable Model F1FR
Quick-response Sidewall Type Sprinklers	Chrome plated finish with chrome plated adjustable semi-recessed escutcheon	Reliable Model F1FR
Quick-response Concealed Type Sprinklers	Brass finish with factory painted white cover plate.	Reliable Model G5-56
Dry Pendent Type Sprinklers	Chrome plated finish with chrome plated adjustable semi-recessed escutcheon	Reliable F3
Dry Horizontal Sidewall Type Sprinklers	Chrome plated finish with chrome plated, adjustable, semi-recessed escutcheon.	Reliable Model F3
Quick-response Dry Pendent Type Sprinkler	Chrome plated finish with chrome plated adjustable	Reliable Model F3QR

	semi-recessed escutcheon	
Quick-response Dry Horizontal Sidewall Type Sprinklers	Chrome plated finish with chrome plated, adjustable, semi-recessed escutcheon.	Reliable Model DH56 HSW FP

2.5 ALARM DEVICES

- A. Manufacturers:
 - 1. Potter.
 - 2. Potter-Roemer.
 - 3. System Sensor.
 - 4. Victaulic.
 - 5. Viking.
- B. Alarm-device types shall match piping and equipment connections.
- C. Water-Motor-Operated Alarm:
 - 1. Standard: UL 753.
 - 2. Type: Mechanically operated, with Pelton wheel.
 - 3. Alarm Gong: Cast aluminum with red-enamel factory finish.
 - 4. Size: 8-1/2-inches diameter.
 - 5. Components: Shaft length, bearings, and sleeve to suit wall construction.
 - 6. Inlet: NPS 3/4.
 - 7. Outlet: NPS 1 drain connection.
- D. Electrically Operated Alarm Bell:
 - 1. Standard: UL 464.
 - 2. Type: Vibrating, metal alarm bell.
 - 3. Size: 8-inch diameter.
 - 4. Finish: Red-enamel factory finish, suitable for outdoor use.
 - 5. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application
- E. Water-Flow Indicators:
 - 1. Standard: UL 346.
 - 2. Water-Flow Detector: Electrically supervised.
 - 3. Components: Two single-pole, double-throw circuit switches for isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal if removed.
 - 4. Type: Paddle operated.
 - 5. Pressure Rating: 250 psig.
 - 6. Design Installation: Horizontal or vertical.
- F. Pressure Switches:
 - 1. Standard: UL 346.
 - 2. Type: Electrically supervised water-flow switch with retard feature.
 - 3. Components: Single-pole, double-throw switch with normally closed contacts.
 - 4. Design Operation: Rising pressure signals water flow.
- G. Valve Supervisory Switches:
 - 1. Standard: UL 346.
 - 2. Type: Electrically supervised.
 - 3. Components: Single-pole, double-throw switch with normally closed contacts.

4. Design: Signals that controlled valve is in other than fully open position.
5. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application

2.6 PRESSURE GAGES

- A. Standard: UL 393.
- B. Dial Size: 3-1/2- to 4-1/2-inch diameter.
- C. Pressure Gage Range: 0- to 250-psig minimum.
- D. Label: Include "WATER" label on dial face.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Perform fire-hydrant flow test according to NFPA 13 and NFPA 291. Use results for system design calculations required in "Quality Assurance" Article.
- B. Report test results promptly and in writing.
- C. Coordinate work of this Section with other affected work.
- D. Prepare piping connections to equipment with grooved joint couplings, flanges, or unions.

3.2 SERVICE-ENTRANCE PIPING

- A. Connect sprinkler piping to water-service piping for service entrance to building. Comply with requirements of NFPA 24.
- B. Provide double check valve backflow preventer assembly at sprinkler system water source connection. Install a drain line from the air gap fitting and terminate at the nearest floor drain. The backflow preventer shall be installed at a minimum height to allow installation of the air gap fitting, but shall not be installed at more than 5'0" above finished floor for maintenance.
- C. Install shutoff valve, check valve, pressure gage, and drain at connection to water service.

3.3 VALVE AND SPECIALTIES INSTALLATION

- A. Install listed fire-protection valves, trim and drain valves, specialty valves and trim, controls, and specialties according to NFPA 13 and authorities having jurisdiction.
- B. Install listed fire-protection shutoff valves supervised open, located to control sources of water supply except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.

- C. Installation of Alarm Valves: Install a drain line from the drain connection to the nearest floor drain. Install a test line from the test connection to the exterior of the building. Provide a splash block. Provide gate valves at each line. Minimum alarm valve riser shall be 4-inch.
- D. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water-supply sources.
- E. Locate outside alarm gong on building wall as indicated.
- F. Coordinate flow switches, tamper switches, and all other sprinkler devices with the fire alarm system.

3.4 SPRINKLER INSTALLATION

- A. Install sprinklers in suspended ceilings in center of acoustical ceiling panels, provide pipe off-sets as required.
- B. Install dry-type sprinklers with water supply from heated space. Do not install pendent or sidewall, wet-type sprinklers in areas subject to freezing.
- C. Install sprinklers into flexible, sprinkler hose fittings, and install hose into bracket on ceiling grid.
- D. Sprinkler Bulb protector must remain in place until the sprinkler is completely installed. Remove the bulb protector by hand after installation and before the system is placed in service. (Do not use any tools to remove the bulb protector).
- E. Do not install sprinklers that have been dropped, damaged, or show a visible loss of fluid. Never install sprinklers with cracked bulbs.

3.5 IDENTIFICATION

- A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13.
- B. Install identification for fire protection systems in accordance with Section 210553 "Identification for Fire Suppression Piping and Equipment".
- C. Provide and apply signs to control, drain, test and alarm valves to identify their purpose and function. Provide and permanently attach hydraulic calculations data nameplate at the controlling valve for the sprinkler system. Provide lettering size and style from NFPA's suggested styles.

3.6 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - 3. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.
 - 4. Energize circuits to electrical equipment and devices.
 - 5. Coordinate with fire-alarm tests. Operate as required.
 - 6. Verify that equipment hose threads are same as local fire department equipment.

- B. Sprinkler piping system will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.
- D. Apply masking tape or paper cover to protect concealed sprinklers, cover plates, and sprinkler escutcheons not receiving field paint finish. Remove after painting. Replace painted sprinklers with new.

3.7 CLEANING

- A. Flush entire piping system of foreign matter.
- B. Clean dirt and debris from sprinklers.
- C. Only sprinklers with their original factory finish are acceptable. Remove and replace any sprinklers that are painted or have any other finish than their original factory finish.

3.8 TESTING

- A. The required tests shall be witnessed by the Fire Marshall, authority having jurisdiction, Owner's insurance underwriter and Architect/Engineer.
- B. Section 210523 - General Duty Valves Pipe and Fittings and hangers for Fire Suppression Systems.

3.9 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain specialty valves.

3.10 SPRINKLER SCHEDULE

- A. Use sprinkler types in subparagraphs below for the following applications:
 - 1. Rooms without Ceilings: Upright sprinklers.
 - 2. Rooms with Suspended Ceilings: Concealed sprinklers Recessed Pendent sprinklers.
 - 3. Wall Mounting: Sidewall sprinklers.
 - 4. Spaces Subject to Freezing: Upright sprinklers Pendent, dry sprinklers and Sidewall, dry sprinklers.
 - 5. Special Applications: Extended-coverage, flow-control, and quick-response sprinklers where indicated, Combustible concealed space sprinklers.

END OF SECTION 211313

SECTION 211316 - DRY-PIPE SPRINKLER SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections:
 - 1. Section 210100 "Fire Protection General Requirements".
 - 2. Section 210513 "Common Motor Requirements for Fire Suppression Equipment".
 - 3. Section 210517 "Sleeves and Sleeve Seals for Fire Suppression Piping".
 - 4. Section 210518 "Escutcheons for Fire Suppression Piping".
 - 5. Section 210523 "General-Duty Valves, Pipe and Fittings for Water-Based Fire-Suppression Piping" for ball, butterfly, check, gate, post-indicator, and trim and drain valves.
 - 6. Section 210548 "Vibration and Seismic Controls for Fire Suppression Piping and Equipment".
 - 7. Section 210553 Identification for Fire Suppression Piping and Equipment".

1.2 SUMMARY

- A. Section Includes:
 - 1. Specialty valves.
 - 2. Sprinkler specialty pipe fittings.
 - 3. Sprinklers.
 - 4. Alarm devices.

1.3 DEFINITIONS

- A. High-Pressure Sprinkler Piping: Dry-pipe sprinkler system piping designed to operate at working pressure higher than standard 175 psig, but not higher than 250 psig.
- B. Standard-Pressure Sprinkler Piping: Dry-pipe sprinkler system piping designed to operate at working pressure of 175-psig maximum.

1.4 REFERENCES

- A. National Fire Protection Association:
 - 1. NFPA 13 - Installation of Sprinkler Systems.
 - 2. NFPA 24 - Installation of Private Fire Service Mains and Their Appurtenances.
- B. Underwriter Laboratories, Inc.:
 - 1. UL - Fire Resistance Directory.
- C. Factory Mutual:
 - 1. FM - Factory Mutual Approval Guide.

1.5 SYSTEM DESCRIPTIONS

- A. Dry-Pipe Sprinkler System: Automatic sprinklers are attached to piping containing compressed air. Opening of sprinklers releases compressed air and permits water pressure to open dry-pipe valve. Water then flows into piping and discharges from opened sprinklers.
- B. System to provide coverage for the building areas indicated on the Fire Protection Drawings.
- C. Provide system to NFPA Standard occupancy requirements as noted on the drawings.
- D. Hydraulic data and water supply information shall be provided.
- E. Interface system with building fire alarm system.
- F. The sprinkler locations and piping arrangements indicated on the contract documents are diagrammatic. It is the responsibility of the contractor to fully coordinate sprinkler and piping locations with all other trades.
- G. Sprinkler locations indicated on the Contract Documents indicate sprinkler coverage utilizing standard coverage sprinklers maximum 225 square feet per sprinkler for light hazard and 130 square feet per sprinkler for ordinary hazard. Extended coverage sprinklers shall not be installed in any locations unless specifically indicated on the Contract Document drawings.
- H. All sprinklers installed in a light hazard classification occupancy shall be a listed quick response type.
- I. Provide fire department connections as indicated on Drawings.
- J. Sprinkler Cabinets: Finished, wall-mounted, steel cabinet with hinged cover, and with space for minimum of six spare sprinklers plus sprinkler wrench. Include number of sprinklers required by NFPA 13 and sprinkler wrench. Include separate cabinet with sprinklers and wrench for each type of sprinkler used on Project.

1.6 PERFORMANCE REQUIREMENTS

- A. Standard-Pressure Piping System Component: Listed for 175-psig minimum working pressure.
- B. Delegated Design: Design sprinkler system(s), including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
 - 1. Available fire-hydrant flow test records indicate the following conditions:
 - a. SUNY Purchase College physical plant Department.
- C. Sprinkler system design shall be approved by authorities having jurisdiction.
 - 1. Margin of Safety for Available Water Flow and Pressure: 10 percent, including losses through water-service piping, valves, and backflow preventers.
 - 2. Sprinkler Occupancy Hazard Classifications:
 - a. Automobile Parking Areas: Ordinary Hazard, Group 1.
 - b. Building Service Areas: Ordinary Hazard, Group 1.
 - c. Electrical Equipment Rooms: Ordinary Hazard, Group 1.
 - d. General Storage Areas: Ordinary Hazard, Group 1.

- e. Mechanical Equipment Rooms: Ordinary Hazard, Group 1.
 - f. Office and Public Areas: Light Hazard.
 - g. Restaurant Service Areas: Ordinary Hazard, Group 1.
- 3. Minimum Density for Automatic-Sprinkler Piping Design:
 - a. Residential (Dwelling) Occupancy: 0.05 gpm over 400-sq. ft. area.
 - b. Light-Hazard Occupancy: 0.10 gpm over 1500-sq. ft. area.
 - c. Ordinary-Hazard, Group 1 Occupancy: 0.15 gpm over 1500-sq. ft. area.
 - d. Ordinary-Hazard, Group 2 Occupancy: 0.20 gpm over 1500-sq. ft. area.
 - e. Extra-Hazard, Group 1 Occupancy: 0.30 gpm over 2500-sq. ft. area.
 - f. Extra-Hazard, Group 2 Occupancy: 0.40 gpm over 2500-sq. ft. area.
 - g. Special Occupancy Hazard: As determined by authorities having jurisdiction.
- 4. Maximum Protection Area per Sprinkler: Per UL listing.
- 5. Maximum Protection Area per Sprinkler:
 - a. Residential Areas: 225 sq. ft.
 - b. Office Spaces: 225 sq. ft.
 - c. Storage Areas: 130 sq. ft.
 - d. Mechanical Equipment Rooms: 130 sq. ft.
 - e. Electrical Equipment Rooms: 130 sq. ft.
 - f. Other Areas: According to NFPA 13 recommendations unless otherwise indicated.
- 6. Total Combined Hose-Stream Demand Requirement: According to NFPA 13 unless otherwise indicated:
 - a. Light-Hazard Occupancies: 100 gpm for 30 minutes.
 - b. Ordinary-Hazard Occupancies: 250 gpm for 60 to 90 minutes.
 - c. Extra-Hazard Occupancies: 500 gpm for 90 to 120 minutes.
- D. Seismic Performance: Sprinkler piping shall withstand the effects of earthquake motions determined according to NFPA 13 and ASCE/SEI 7.

1.7 SUBMITTALS

- A. Section 013300 - Submittal Procedures: Submittal procedures.
- B. Where the terms “authorities having jurisdiction” is used, within this Specification, it is intended to include the Insurance Underwriter and all regulatory agencies having vested interest in this project.
- C. Shop Drawings:
 - 1. Provide fire protections shop drawings drawn to a minimum scale of $\frac{1}{4}'' = 1'-0''$. Indicate pipe materials used, joining methods, supports, floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections.
 - 2. Provide hydraulic calculations, detailed pipe layout, hangers and supports, components and accessories. Indicate system controls.
 - 3. All sprinkler drawings and calculations shall bear the seal of a Professional Engineer licensed in the State of New York. Seal and signature shall not be copied and shall be provided as an original drawing and each calculation.
 - 4. Sprinklers shall be as shown on drawings and submittals and shall be specifically identified with the applicable style or series designation as published in the appropriate agency listing or approval. Trade names or other abbreviated designations are not permitted.

5. Working plans, prepared according to NFPA 13.
 6. Sprinkler Contractor shall conduct a hydrant flow test. This flow data shall be used for the Sprinkler Contractor's hydraulic calculations. Coordinate flow test requirements with the water company. All fees associated with the flow test shall be paid for by the Sprinkler Contractor.
- D. Product Data: Provide data on sprinklers, valves, and specialties, including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.
- E. After successful review by the Engineer, submit sprinkler layout shop drawings, product data, hydraulic calculations to authority having jurisdiction, Fire Marshall, and Owner's insurance underwriter for approval. Submit proof of approval to Architect/Engineer.
- F. Grooved joint couplings and fittings shall be shown on shop drawings and product submittals and shall be specifically identified with the applicable Victaulic style or series designation.
- G. Manufacturer's Certificate: Certify that system has been tested and meets or exceeds specified requirements and all code requirements.
- H. Provide submittals for information purposes:
1. Qualification Data: For qualified Installer and professional engineer.
 2. Welding certificates.
 3. Fire-hydrant flow test report.
 4. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13. Include "Contractor's Material and Test Certificate for Aboveground Piping."
 5. Field quality-control reports.

1.8 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Sprinkler systems, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
1. Domestic water piping.
 2. HVAC hydronic piping.
 3. Items penetrating finished ceiling including the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
- B. Qualification Data: For qualified Installer and professional engineer.
- C. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, that have been approved by authorities having jurisdiction, including hydraulic calculations if applicable.
- D. Fire-hydrant flow test report.
- E. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13. Include "Contractor's Material and Test Certificate for Aboveground Piping."
- F. Field quality-control reports.

1.9 CLOSEOUT SUBMITTALS

- A. Section 017700 - Execution and Closeout Requirements: Closeout procedures
- B. Project Record Documents: Record actual locations of sprinklers and deviations of piping from drawings. Indicate drain and test locations
- C. Operation and Maintenance Data: For dry-pipe sprinkler systems and specialties to include in emergency, operation, and maintenance manuals. Submit components of system, servicing requirements, record drawings, inspection data, replacement part numbers and availability, and location and numbers of service depot.

1.10 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Sprinkler Cabinets: Finished, wall-mounted, steel cabinet with hinged cover, and with space for minimum of six spare sprinklers plus sprinkler wrench. Include number of sprinklers required by NFPA 13 and sprinkler wrench. Include separate cabinet with sprinklers and wrench for each type of sprinkler used on Project.

1.11 QUALITY ASSURANCE

- A. Workmanship and Qualifications: All materials and equipment shall be installed in accordance with NFPA and all applicable local codes and ordinances. The Sprinkler Contractor shall be state licensed to install sprinkler systems. The Sprinkler Contractor shall make sure that all work and materials conform to the requirements set forth by this Specification. Fire protection equipment shall be installed to conform to NFPA as applicable, and devices used shall be listed and approved by Underwriters laboratories (UL) and/or Factory Mutual (FM).
- B. Codes and Standards: All work shall be equal or superior to that required by codes, regulations, ordinances, and laws imposed by the jurisdictional authorities, including those of the State of New York, State Fire Marshall, local ordinances and OSHA. Nothing in the Specifications permit violations of such directives, and where conflict occurs, the directive shall govern, except where superior work is specified or indicated.
- C. In addition to complying with the above codes and regulations, comply with the requirements of the following:
 - 1. NFPA Standard 13.
 - 2. NFPA Standard 24.
 - 3. State Building and Fire Codes.
 - 4. Local Jurisdictional Authorities.
- D. All grooved joint couplings, fittings, valves, and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components.
- E. Valves: Bear UL and/or FM label or marking. Provide manufacturer's name and pressure rating marked on valve body.
- F. All items of similar class shall be the products of the same manufacturer. All valves, accessory items, etc., shall be from the same source.

- G. Maintain one copy of each applicable NFPA standard on site.
- H. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
- I. Installer: Company specializing in performing work of this Section with minimum five years experience.
- J. Design sprinkler system under direct supervision of a Professional Engineer experienced in design of this Work and licensed in the State where the project is located.
- K. Welding Qualifications: Qualify procedures and operators according to 2010 ASME Boiler and Pressure Vessel Code.
- L. Provide sprinklers system hydraulic calculations with a 10% safety factor.
- M. Maximum pipe velocity for hydraulic calculations shall be 18 feet per second (FPS).

1.12 FIELD CONDITIONS

- A. Interruption of Existing Sprinkler Service: Do not interrupt sprinkler service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary sprinkler service according to requirements indicated:
 - 1. Notify Owner no fewer than two days in advance of proposed interruption of sprinkler service.
 - 2. Do not proceed with interruption of sprinkler service without Owner's written permission.

1.13 DELIVERY, STORAGE AND HANDLING

- A. Section 016000 - Product Requirements: Product storage and handling requirements.
- B. Deliver and store products in shipping containers, with labeling in place.
- C. All equipment, valves, gages etc., shall be covered and protected during the execution of the work. All equipment and piping shall be protected from freezing. Labeling to remain in place.
- D. All unloading, hauling, and handling of materials shall be the responsibility of the Sprinkler Contractor.
- E. The Sprinkler Contractor can obtain information on available storage space on site from the Owner when making examination of the site.

1.14 WARRANTY

- A. Section 017700 - Execution and Closeout Requirements: Product warranties and product bonds.

1.15 EXTRA MATERIALS

- A. Section 017700 - Execution and Closeout Requirements: Spare parts and maintenance products.
- B. Furnish extra sprinklers under provisions of NFPA 13.

- C. Furnish suitable wrenches for each sprinkler type.
- D. Provide metal storage cabinet adjacent to the sprinkler riser.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Standard-Pressure Piping System Component: Listed for 175-psig minimum working pressure.
- B. Seismic Performance: Sprinkler piping shall withstand the effects of earthquake motions determined according to NFPA 13 and ASCE/SEI 7.

2.2 SPECIALTY VALVES

- A. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
- B. Pressure Rating:
 - 1. Standard-Pressure Piping Specialty Valves: 175-psig minimum.
- C. Body Material: Cast or ductile iron.
- D. Size: Same as connected piping.
- E. End Connections: Flanged or grooved.
- F. Dry-Pipe Valves:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Globe Fire Sprinkler Corporation.
 - b. Reliable Automatic Sprinkler Co., Inc. (The).
 - c. Tyco Fire & Building Products LP.
 - d. Victaulic Company.
 - e. Viking Corporation.
 - 2. Standard: UL 260.
 - 3. Design: Differential-pressure type.
 - 4. Include UL 1486, quick-opening devices, trim sets for air supply, drain, priming level, alarm connections, ball drip valves, pressure gages, priming chamber attachment, and fill-line attachment.
 - 5. Air-Pressure Maintenance Device:
 - 6. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Globe Fire Sprinkler Corporation.
 - b. Reliable Automatic Sprinkler Co., Inc. (The).

- c. Tyco Fire & Building Products LP.
 - d. Victaulic Company.
 - e. Viking Corporation.
 - 7. Standard: UL 260.
 - 8. Type: Automatic device to maintain minimum air pressure in piping.
 - 9. Include shutoff valves to permit servicing without shutting down sprinkler piping, bypass valve for quick filling, pressure regulator or switch to maintain pressure, strainer, pressure ratings with 14- to 60-psig adjustable range, and 175-psig [**300-psig**] outlet pressure.
 - 10. Air Compressor:
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Gast Manufacturing Inc.
 - 2) General Air Products, Inc.
 - 3) Viking Corporation.
 - b. Standard: UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
 - c. Motor Horsepower: Fractional.
 - d. Power: 120-V ac, 60 Hz, single phase.
- G. Automatic (Ball Drip) Drain Valves:
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Reliable Automatic Sprinkler Co., Inc. (The).
 - b. Tyco Fire & Building Products LP.
 - 2. Standard: UL 1726.
 - 3. Pressure Rating: 175-psig minimum.
 - 4. Type: Automatic draining, ball check.
 - 5. Size: NPS 3/4.
 - 6. End Connections: Threaded.

2.3 SPRINKLER PIPING SPECIALTIES

- A. Manufacturers:
 - 1. Potter.
 - 2. Potter-Roemer.
 - 3. System Sensor.
 - 4. Victaulic.
 - 5. Viking.
 - 6. Tyco.
 - 7. Elkhart Brass.
 - 8. Croker Corp.
- B. Branch Outlet Fittings:
 - 1. Standard: UL 213.

2. Pressure Rating: 175-psig minimum.
3. Body Material: Ductile-iron housing with EPDM seals and bolts and nuts.
4. Type: Mechanical-tee and -cross fittings.
5. Configurations: Snap-on and strapless, ductile-iron housing with branch outlets.
6. Size: Of dimension to fit onto sprinkler main and with outlet connections as required to match connected branch piping.
7. Branch Outlets: Grooved, plain-end pipe, or threaded.

C. Flow Detection and Test Assemblies:

1. Standard: UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
2. Pressure Rating: 175-psig minimum.
3. Body Material: Cast- or ductile-iron housing with orifice, sight glass, and integral test valve.
4. Size: Same as connected piping.
5. Inlet and Outlet: Threaded.

D. Branch Line Testers:

1. Standard: UL 199.
2. Pressure Rating: 175-psig minimum.
3. Body Material: Brass.
4. Size: Same as connected piping.
5. Inlet: Threaded.
6. Drain Outlet: Threaded and capped.
7. Branch Outlet: Threaded, for sprinkler.

E. Sprinkler Inspector's Test Fittings:

1. Standard: UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
2. Pressure Rating: 175-psig minimum.
3. Body Material: Cast- or ductile-iron housing with sight glass.
4. Size: Same as connected piping.
5. Inlet and Outlet: Threaded.

F. Adjustable Drop Nipples:

1. Standard: UL 1474.
2. Pressure Rating: 250-psig minimum.
3. Body Material: Steel pipe with EPDM O-ring seals.
4. Size: Same as connected piping.
5. Length: Adjustable.
6. Inlet and Outlet: Threaded.

2.4 SPRINKLERS

- A. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
- B. Pressure Rating for Residential Sprinklers: 175-psig maximum.
- C. Pressure Rating for Automatic Sprinklers: 175-psig minimum.
- D. Manufacturers:
 1. Viking.

2. Tyco.
 3. Victaulic.
 4. Grinnell Corp.
 5. Reliable Sprinkler Corp.
- E. All sprinklers shall be adjustable, glass bulb, automatic sprinklers with ½ inch orifice and 5.6 K-factor unless noted otherwise. Type of sprinkler head shall be as indicated on the plans and in accordance with section 211313.
- F. Sprinkler bodies shall be die-cast brass, with hex shaped wrench boss integrally cast into the sprinkler body to reduce the risk of damage during installation.
- G. Unless noted otherwise, ordinary temperature rated sprinkler heads shall be used throughout the building.
- H. Where sprinklers will be installed in close proximity to heat sources and special locations, as identified in NFPA 13, temperature ratings shall be in accordance with the requirements of NFPA 13.
- I. Where plans call for extended coverage sprinkler heads coordinate coverage requirements with required pressure and K-factor.
- J. Spare Sprinklers: The Sprinkler Contractor shall furnish spare automatic sprinklers in accordance with the requirements of NFPA for stock of extra sprinklers. The sprinklers shall be packed in a suitable container and shall be representative of, and in proportion to, the number of each type and temperature rating of the sprinklers installed. The Sprinkler Contractor shall furnish no less than two special sprinkler wrenches, or at least one wrench for each container or sprinkler box, whichever is greater.
- K. In areas where sprinkler heads are subject to physical damage, provide sprinkler guard assembly over head, finish to match sprinkler finish. This shall include but not limited to the following locations.
1. Heads in elevator shafts.
 2. Heads under lower rakes of stairways.
 3. Heads in electrical rooms, boiler rooms and other mechanical rooms.
 4. Heads installed 7'-0" or less above finished floors.
 5. Heads in gymnasium/fitness center areas.
- L. Special Coatings: Wax, lead and corrosion-resistant paint.
- M. Sprinklers shall be in accordance with the following table:

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Sprinkler Type	Sprinkler Finish	Manufacturer/Model Number
Upright Type Sprinklers	Brass finish.	Reliable Model F156.
Quick-response Upright Type Sprinklers	Chrome plated finish with chrome plated adjustable semi-recessed escutcheon	Reliable Model F1FR
Dry Pendent Type Sprinklers	Chrome plated finish with chrome plated adjustable semi-recessed escutcheon	Reliable F3
Dry Horizontal Sidewall Type Sprinklers	Chrome plated finish with chrome plated, adjustable, semi-recessed escutcheon.	Reliable Model F3
Quick-response Dry Pendent Type Sprinkler	Chrome plated finish with chrome plated adjustable semi-recessed escutcheon	Reliable Model F3QR

Quick-response Dry Horizontal Sidewall Type Sprinklers	Chrome plated finish with chrome plated, adjustable, semi-recessed escutcheon.	Reliable Model DH56 HSW FP
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2.5 ALARM DEVICES

- A. Manufacturers:
1. Potter.
 2. Potter-Roemer.
 3. System Sensor.
 4. Victaulic.
 5. Viking.
- B. Alarm-device types shall match piping and equipment connections.
- C. Water-Motor-Operated Alarm:
1. Standard: UL 753.
 2. Type: Mechanically operated, with Pelton wheel.
 3. Alarm Gong: Cast aluminum with red-enamel factory finish.
 4. Size: 10-inch diameter.
 5. Components: Shaft length, bearings, and sleeve to suit wall construction.
 6. Inlet: NPS 3/4.
 7. Outlet: NPS 1 drain connection.
- D. Electrically Operated Alarm Bell:
1. Standard: UL 464.
 2. Type: Vibrating, metal alarm bell.
 3. Size: 8-inch minimum diameter.
 4. Finish: Red-enamel factory finish, suitable for outdoor use.
 5. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA70, by a qualified testing agency, and marked for intended location and application.
- E. Pressure Switches:
1. Standard: UL 346.
 2. Type: Electrically supervised water-flow switch with retard feature.
 3. Components: Single-pole, double-throw switch with normally closed contacts.
 4. Design Operation: Rising pressure signals water flow.
- F. Valve Supervisory Switches:
1. Standard: UL 346.
 2. Type: Electrically supervised.
 3. Components: Single-pole, double-throw switch with normally closed contacts.
 4. Design: Signals that controlled valve is in other than fully open position.
 5. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application

2.6 MANUAL CONTROL STATIONS

- A. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide" for hydraulic operation, with union, NPS 1/2 pipe nipple, and bronze ball valve.
- B. Include metal enclosure labeled "MANUAL CONTROL STATION" with operating instructions and cover held closed by breakable strut to prevent accidental opening.

2.7 PRESSURE GAGES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. AGF Manufacturing Inc.
 - 2. AMETEK, Inc.
 - 3. Ashcroft Inc.
 - 4. Brecco Corporation.
 - 5. WIKA Instrument Corporation.
- B. Standard: UL 393.
- C. Dial Size: 3-1/2- to 4-1/2-inch diameter.
- D. Pressure Gage Range: 0- to 250-psig minimum.
- E. Label: Include "WATER" or "AIR/WATER" label on dial face.
- F. Air System Piping Gage: Include retard feature and "AIR" or "AIR/WATER" label on dial face.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Perform fire-hydrant flow test according to NFPA 13 and NFPA 291. Use results for system design calculations required in "Quality Assurance" Article.
- B. Report test results promptly and in writing.
- C. Coordinate work of this Section with other affected work.
- D. Prepare piping connections to equipment with grooved joint couplings, flanges, or unions.

3.2 SERVICE-ENTRANCE PIPING

- A. Connect sprinkler piping to water-service piping for service entrance to building. Comply with requirements of NFPA 24.
- B. Provide double check valve backflow preventer assembly at sprinkler system water source connection. Install a drain line from the air gap fitting and terminate at the nearest floor drain. The backflow preventer shall be installed at a minimum height to allow installation of the air gap fitting, but shall not be installed at more than 5'0" above finished floor for maintenance.

- C. Install shutoff valve, check valve, pressure gage, and drain at connection to water service.

3.3 WATER-SUPPLY CONNECTIONS

- A. Connect sprinkler piping to building's interior water-distribution piping. Comply with requirements for interior piping in Section 221116 "Domestic Water Piping."
- B. Install shutoff valve, backflow preventer, pressure gage, drain, and other accessories indicated at connection to water-distribution piping. Comply with requirements in Section 221119 "Domestic Water Piping Specialties" for backflow preventers.
- C. Install shutoff valve, check valve, pressure gage, and drain at connection to water supply.

3.4 VALVE AND SPECIALTIES INSTALLATION

- A. Install listed fire-protection valves, trim and drain valves, specialty valves and trim, controls, and specialties according to NFPA 13 and authorities having jurisdiction.
- B. Install listed fire-protection shutoff valves supervised open, located to control sources of water supply except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.
- C. Installation of Dry Pipe Valves: Install a drain line from the drain connection to the nearest floor drain. Install a test line from the test connection to the exterior of the building. Provide a splash block. Provide gate valves at each line. Minimum alarm valve riser shall be 4-inch
- D. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water-supply sources.
- E. Locate outside alarm gong on building wall as indicated.
- F. Coordinate flow switches, tamper switches, and all other sprinkler devices with the fire alarm system.
- G. Specialty Valves:
 - 1. Install valves in vertical position for proper direction of flow, in main supply to system.
 - 2. Install dry-pipe valves with trim sets for air supply, drain, priming level, alarm connections, ball drip valves, pressure gages, priming chamber attachment, and fill-line attachment.
 - a. Install air compressor and compressed-air-supply piping.
 - b. Install air-pressure maintenance device with shutoff valves to permit servicing without shutting down sprinkler system; bypass valve for quick system filling; pressure regulator or switch to maintain system pressure; strainer; pressure ratings with 14- to 60-psig adjustable range; and 175-psig maximum inlet pressure.
 - c. Install compressed-air-supply piping from building's compressed-air piping system.

3.5 SPRINKLER INSTALLATION

- A. Install sprinklers in suspended ceilings in center of acoustical ceiling panels, provide pipe off-sets as required.

- B. Install dry-type sprinklers with water supply from heated space. Do not install pendent or sidewall, wet-type sprinklers in areas subject to freezing.
- C. Sprinkler Bulb protector must remain in place until the sprinkler is completely installed. Remove the bulb protector by hand after installation and before the system is placed in service. (Do not use any tools to remove the bulb protector).
- D. Do not install sprinklers that have been dropped, damaged, or show a visible loss of fluid. Never install sprinklers with cracked bulbs.

3.6 IDENTIFICATION

- A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13.
- B. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- C. Provide and apply signs to control, drain, test and alarm valves to identify their purpose and function. Provide and permanently attach hydraulic calculations data nameplate at the controlling valve for the sprinkler system. Provide lettering size and style from NFPA's suggested styles.

3.7 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
 - 1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - 3. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.
 - 4. Energize circuits to electrical equipment and devices.
 - 5. Start and run air compressors.
 - 6. Coordinate with fire-alarm tests. Operate as required.
 - 7. Verify that equipment hose threads are same as local fire department equipment.
- B. Sprinkler piping system will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.
- D. Apply masking tape or paper cover to protect concealed sprinklers, cover plates, and sprinkler escutcheons not receiving field paint finish. Remove after painting. Replace painted sprinklers with new.

3.8 CLEANING

- A. Flush entire piping system of foreign matter.
- B. Clean dirt and debris from sprinklers.
- C. Only sprinklers with their original factory finish are acceptable. Remove and replace any sprinklers that are painted or have any other finish than their original factory finish.

3.9 TESTING

- A. The required tests shall be witnessed by the Fire Marshall, authority having jurisdiction, Owner's insurance underwriter and Architect/Engineer.
- B. Section 210523 - General Duty Valves Pipe and Fittings and hangers for Fire Suppression Systems.

3.10 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain specialty valves.

3.11 SPRINKLER SCHEDULE

- A. Use sprinkler types in subparagraphs below for the following applications:
 - 1. Rooms without Ceilings: Upright sprinklers.
 - 2. Rooms with Suspended Ceilings: Dry pendent sprinklers, Dry recessed sprinklers, Dry flush sprinklers Dry concealed sprinklers, Dry pendent, recessed, flush, and concealed sprinklers as indicated.
 - 3. Wall Mounting: Dry sidewall sprinklers.
 - 4. Spaces Subject to Freezing: Upright sprinklers, Dry pendent sprinklers, Dry sidewall sprinklers.
 - 5. Special Applications: Extended-coverage and quick-response sprinklers where indicated.
- B. Provide sprinkler types in subparagraphs below with finishes indicated.
 - 1. Concealed Sprinklers: Rough brass, with factory-painted white cover plate.
 - 2. Flush Sprinklers: Bright chrome, with painted white escutcheon.
 - 3. Recessed Sprinklers: Bright chrome, with bright chrome escutcheon.
 - 4. Upright, Pendent and Sidewall Sprinklers: Chrome plated in finished spaces exposed to view; rough bronze in unfinished spaces not exposed to view; wax coated where exposed to acids, chemicals, or other corrosive fumes.

END OF SECTION 211316

SECTION 220100 - PLUMBING GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. All of the Contract Documents as listed on the Table of Contents and including General and Supplementary Conditions and Division 1 - General Requirements shall be included in and made part of this Section.

1.2 DESCRIPTION OF WORK

- A. The General Conditions and Supplementary General Conditions are a part of this Division and are to be considered a part of this Contract.
- B. Where items of the General Conditions and Supplementary General Conditions are repeated in other Sections of the Specifications, it is merely intended to qualify or to call particular attention to them. It is not intended that any other parts of the General Conditions and Supplementary General Conditions shall be assumed to be omitted if not repeated therein. This Section applies equally and specifically to all Contractors supplying labor and/or equipment and/or materials as required under each Section of this Division. Where conflicts exist between the drawings and the specifications or between this section of the specifications and other sections, the more stringent or higher cost option shall apply.
- C. The work under this Contract shall include all labor, materials, tools, equipment, transportation, insurance, temporary protection, supervision and incidental items essential for proper installation and operation, even though not specifically mentioned or indicated on the drawings, but which are usually provided or are essential for proper installation and operation, of all systems as indicated on the drawings and specified herein.
- D. The specifications and drawings describe the minimum requirements that must be met by the Plumbing Subcontractor for the installation of all work as shown on the drawings and as specified herein under.
- E. Coordinate work with that of all other Trades affecting or affected by the work of this Section. Cooperate with such Trades to assure the steady progress of all work under the Contract.

1.3 INTENT

- A. It is the intent of the Contract Documents to require finished work, tested and ready for operation.
- B. It is not intended that Contract Documents show every pipe, fitting and appurtenance; however, such parts as may be necessary to complete the systems in accordance with best trade practice and Code requirements and to Architect's satisfaction shall be deemed to be included.
- C. Drawings are diagrammatic and indicate the general arrangement of systems and work included in the Contract. DO NOT SCALE THE DRAWINGS.

1.4 DEFINITIONS

- A. Words in the singular shall also mean and include the plural, wherever the context so indicates, and words in the plural shall mean the singular, wherever the context so indicates.
- B. "Acceptable": Acceptable, as determined in the opinion of the Architect.
- C. The term "Acceptable equivalent" or "Equal": Of weight, size, design, capacity and efficiency to meet requirements specified and shown, and of acceptable manufacturer, as determined in the opinion of the Architect.
- D. "Accessible": Indicates ease of access with or without the use of ladders and without requiring extensive removal of other equipment, such as ductwork, piping, etc. to gain access. "Accessible ceiling" indicates acoustic tile type hung ceilings. Concealed spline or sheetrock ceilings with access panels shall not be considered accessible ceilings.
- E. "Approved", or "Approval": Shall mean the written approval of the Architect
- F. "Architect": Shall refer to the Architect: "Phase Zero Design" and/or the Engineer "Innovative Engineering Services, LLC."
- G. "Concealed": Hidden from site, embedded in masonry or other construction; or installed in furred spaces, trenches or crawl spaces; or installed within double partitions or hung ceilings; or in enclosures.
- H. The term "Contract Documents": Shall mean the entire set of Drawings and Specifications as listed in the Table of Contents of the General Conditions including all bound and unbound material and all items officially issued to date such as addenda, bulletins, job modifications, etc.
- I. "Contractor": General Contractor.
- J. The term "Directed", "Required", "Permitted", "Ordered", "Designated", "Prescribed", and similar words: Shall mean the direction, requirement, permission, order, designation or prescription of the Architect; the terms "Approved", "Acceptable", "Satisfactory", and similar words shall mean approved by, acceptable or satisfactory to the Architect; and, the terms "Necessary", "Reasonable", "Proper", "Correct", and similar words shall mean necessary, reasonable, proper or correct in the judgment of the Architect.
- K. "Exposed": Visible to building occupants, excluding mechanical room and utility tunnel locations.
- L. The term "Furnish" or "Supply": Shall mean purchase, deliver to, and off-load at the job site, ready to be installed including where appropriate all necessary interim storage and protection.

- M. The term "Finished": Refers to all rooms and areas to be specified to receive architectural treatment as indicated on the drawings. All rooms and areas not covered, including underground tunnels and areas above ceilings shall be considered not finished, unless otherwise noted.
- N. The term "Indicated": Refers to graphic representations, notes, or schedules on the Drawings, other paragraphs or schedules in the Specifications, and similar requirements in the Contract Documents. Where terms such as "shown," "noted," "scheduled," and "specified" are used, it is to help the reader locate the reference; no limitation on location is intended.
- O. "Installed": Shall mean set in place complete with all mounting facilities and connections as necessary ready for normal use or service.
- P. "Material": Is used in the specifications it will mean any "Product", "Equipment", "Device", "Assembly", or "Item" required under the Contract, as indicated by trade or brand name, manufacturer's name, standard specification reference or other description.
- Q. "Named" Product: Manufacturer's name for product, as recorded in published documents of latest issue as of date of Contract Documents. Obtain Architect's permission before using products of later or earlier model.
- R. "Owner": Shall refer to the Owner: "Purchase College State University of New York" or designated representative.
- S. "Other Work Contractor" (O.W.C.): Refers to the Contractor(s), or Subcontractor(s) performing work under other Sections of the Contract Documents.
- T. "Plumbing Subcontractor": Refers to the Subcontractor responsible for furnishing and installation of all work indicated on the Plumbing drawings and in the Plumbing specifications.
- U. "Product": Shall mean any item of equipment, material, fixture, apparatus, appliance or accessory installed under this Division.
- V. "Provide": Is used in the specifications it will mean "Furnish" and "Install", "Connect", "Apply", "Erect", "Construct", or similar terms, unless otherwise indicated in the specifications.
- W. The term "Regulations" includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work
- X. The term "Remove" means to disconnect from its present position, remove from the premises and to dispose of in a legal manner.

- Y. The term "Shown on Drawings": Is used in the specifications, they shall mean "Noted", "Indicated", "Scheduled", "Detailed", or any other diagrammatic or written reference made on the drawings
- Z. The term "Special Warranties" Are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Owner.
- AA. "Specification": Shall mean all information contained in the bound or unbound volume, including all "Contract Documents" defined therein, except for the drawings.
- BB. The term "Standard Product Warranties" Are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.
- CC. "Substitution": Requests for changes in products, materials, equipment, and methods of construction proposed by the Contractor are considered requests for "Substitutions".
- DD. "Wiring": Shall mean cable assembly, raceway, conductors, fittings and any other necessary accessories to make a complete wiring system.
- EE. "Work": Labor, materials, equipment, apparatus, controls and accessories required for proper and complete installation.

1.5 RELATED WORK

- A. For work to be included as part of this Section, to be furnished and installed by the Plumbing Subcontractor, refer to the following Sections:
- | | | |
|-----|----------------|--|
| 1. | Section 220516 | Expansion Fittings and Loops for Plumbing Piping |
| 2. | Section 220517 | Sleeves and Sleeve Seals for Plumbing Piping |
| 3. | Section 220518 | Escutcheons for Plumbing Piping |
| 4. | Section 220519 | Meters and Gauges for Plumbing Piping |
| 5. | Section 220523 | General Duty Valves for Plumbing Piping |
| 6. | Section 220529 | Hangers and Supports for Plumbing Piping and Equipment |
| 7. | Section 220548 | Vibration and Seismic Controls for Plumbing Piping and Equipment |
| 8. | Section 220553 | Identification for Plumbing Piping and Equipment |
| 9. | Section 220719 | Plumbing Piping Insulation |
| 10. | Section 221116 | Domestic Water Piping |
| 11. | Section 221119 | Domestic Water Piping Specialties |
| 12. | Section 221316 | Sanitary Waste and Vent Piping |
| 13. | Section 221319 | Sanitary Waste Pipe Specialties |
| 14. | Section 221433 | Soda Machine Piping Conduit |
| 15. | Section 224300 | Plumbing Fixtures |
| 16. | Section 224500 | Emergency Plumbing Fixtures |
- B. For work related to, and to be coordinated with the Plumbing work, but not included in this Section and required to be performed under other designated Sections, see the following:

1. Division 1 Section "General Commissioning Requirements" to Plumbing construction.
2. Division 4 Section "Masonry Work" for Plumbing construction.
3. Division 7 Section "Fire stopping".
4. Division 7 Section "Caulking, Flashing, Waterproofing, Roofing and setting of Roof Drains".
5. Division 8 Section "Access Panels".
6. Division 9 Section "Painting".

1.6 DRAWINGS

- A. The Contract Drawings are diagrammatic only intending to show general runs and locations of the ductwork, piping, equipment, systems equipment, etc. and not necessarily showing all required offsets, details and accessories and equipment to be connected. All work shall be accurately laid out with other Trades to avoid conflicts and to obtain a neat and workmanlike installation which will afford maximum accessibility for operation, maintenance and headroom.
- B. Where discrepancies in scope of work as to what Trade provides items, such conflicts shall be reported to the Architect during bidding and prior to signing of the Contract. If such action is not taken, the Plumbing Subcontractor shall furnish such items as part of his work as necessary, for complete and operable systems and equipment, as determined by the Architect.
- C. The Plumbing Subcontractor shall coordinate the installation of all equipment.
- D. Where drawing details, plans, specification requirements and/or scheduled equipment capacities are in conflict or equipment are shown to be different between plans and/or between plans and riser diagrams, details or specifications, the most stringent requirement will be included in the Contract. Plumbing systems and equipment called for in the specification and/or shown on the drawings shall be provided under this Contract as if it were required by both the drawings and specifications. However, prior to ordering or installation of any portion of work which appears to be in conflict, such work shall be brought to Architect's attention for direction as to what is to be provided.

1.7 CODES AND STANDARDS

- A. All materials and workmanship shall comply with all applicable Codes, Specifications, Local and State Ordinances, Industry Standards and Utility Company Regulations, latest editions.
- B. In case of difference between Building Codes, State Laws, Local Ordinances, Industry Standards and Utility Company Regulations and the Contract Documents, the Plumbing Subcontractor shall promptly notify the Architect in writing of any such difference.
- C. In case of conflict between the Contract Documents and the requirements of any Code or Authorities having jurisdiction, the most stringent requirements of the aforementioned shall govern.
- D. Should the Plumbing Subcontractor perform any work that does not comply with the requirements of the applicable Building Codes, State Laws, Local Ordinances, Industry Standards and Utility Company Regulations, he shall bear all costs arising in correcting the deficiencies, as approved by the Architect/Owner.

- E. Applicable Codes and Standards shall include all State Laws, Local Ordinances, Utility Company Regulations, and the applicable requirements of the latest adopted edition of the following Codes and Standards, without limiting the number, as follows:
1. International Building Code Latest Adopted Edition and Amendments of The State of New York.
 2. International Existing Building Code Latest Adopted Edition and Amendments of The State of New York.
 3. International Plumbing Code Latest Adopted Edition and Amendments of The State of New York.
 4. International Fuel Gas Code Latest Adopted Edition and Amendments of The State of New York.
 5. International Fire Code Latest Adopted Edition and Amendments of The State of New York.
 6. The State of New York 2017 Uniform Code Supplement.
 7. NFPA 70: National Electrical Code Latest Adopted Edition and Amendments of The State of New York.
 8. NFPA 101: Life Safety Code Latest Adopted Edition and Amendments of The State of New York.
 9. Occupational Safety and Health Administration, (OSHA).
 10. Department of Environmental Protection, (DEP)
 11. Local Building Code.
- F. In these specifications, references made to the following Industry Standards and Code Bodies are intended to indicate the latest volume or publication of the Standard. All equipment, materials and details of installation shall comply with the requirements and latest revisions of the following Bodies, as applicable:
- | | |
|------------|---|
| ANSI: | American National Standards Institute |
| ASTM/ASME: | American Society of Testing Materials |
| ASSE: | American Society of Sanitary Engineers |
| AWS: | American Welding Society |
| AWWA: | American Water Works Association |
| NEMA: | National Electrical Manufacturers Association |
| NFPA: | National Fire Protection Association |
| UL: | Underwriters' Laboratories |
| NBS: | National Bureau of Standards |
| NSC: | National Safety Council |
- G. Plumbing Subcontractor for the work in his scope of work shall give all necessary notices, obtain all permits, pay all governmental taxes, fees and other costs in connection with his work; file for necessary approvals with the jurisdiction under which the work is to be performed. Plumbing Subcontractor shall obtain all required Certificates of Inspection for his respective work and deliver same to the Architect before request for acceptance of his portion of work is made and before final payment.
- 1.8 PERMITS AND FEES
- A. Plumbing Subcontractor for the work in his scope of work shall give all necessary notices, obtain all permits, pay all governmental taxes, fees and other costs in connection with his work; file for necessary approvals with the jurisdiction under which the work is to be performed. Plumbing Subcontractor shall obtain all required Certificates of Inspection for his respective work and deliver same to the Architect before request for acceptance of his portion of work is made and before final payment.

1.9 QUALITY ASSURANCE

- A. The manufacturers listed within these specifications have been preselected for use on this project. No submittal will be accepted from a manufacturer other than specified.
- B. Plumbing Subcontractor shall furnish and install all equipment, accessories, connections and incidental items necessary to fully complete the work under his Contract for use, occupancy and operation by the Owner.
- C. Where equipment of a substitute manufacturer differ from that specified and require different arrangement or connections from those shown, it shall be the responsibility of the Subcontractor responsible for the substitution to modify the installation of the equipment/system to operate properly and in harmony with the original intent of the drawings and specifications. When directed by the Architect, the Plumbing Subcontractor shall submit drawings showing the proposed, substitute installation. If the proposed installation is accepted, the Plumbing Subcontractor shall make all necessary changes in all affected related work provided under his and other Sections including location of roughing-in connections by other Trades, supports, etc. All changes shall be made at no increase in the Contract amount or additional cost to the Owner. The General Contractor shall be responsible to assure that the Subcontractor responsible for the substitution bears the cost arising to all other Trades as a result of the substitution.
- D. Unless specifically indicated otherwise, all equipment and materials required for installation under these specifications shall be new, unused and without blemish or defect. Equipment and materials shall be products which will meet with the acceptance of the Authorities having jurisdiction over the work and as specified hereinbefore. Where such acceptance is contingent upon having the products listed and/or labeled by FM or UL or another testing laboratory, the products shall be so listed and/or labeled. Where no specific indication as to the type or quality of material or equipment is indicated, a first class standard article shall be provided.

1.10 SUBSTITUTIONS

- A. Contractor shall pay Architect/Engineer for time spent reviewing substitution requests. Charges shall be \$120/hour. Submittal of substitution request will be construed as evidence of Contractor's agreement to pay such charges, with no added cost to Owner.
- B. Contractor's request for substitution may be submitted only after award of Contract. Requests shall be in writing on Contractor's letterhead and shall include:
 - 1. Contractor's detailed comparison of significant qualities between specified item and proposed substitution.
 - 2. Statement of effect on construction time, coordination with other affected work, and cost information or proposal.
 - 3. Contractor's statement to the effect that proposed substitution will result in overall work equal to, or better than, work originally intended.
- C. Substitution requests will be considered: If extensive revisions to Contract Documents are not required; if changes are in keeping with general intent of Contract Documents; if submitted in timely and proper manner, fully documented; and if one or more of following conditions is satisfied; all as judged by Architect:

1. Where request is directly related to “acceptable equivalent” clause, “or equal” clause or words of similar effect in Contract Documents.
2. Where specified product, material or method cannot be provided within Contract Time; but not as a result of Contractor’s failure to pursue the work promptly or to coordinate various activities properly.
3. Where specified product, material or method cannot be provided in manner which is compatible with other materials of the work and where Contractor certifies that proposed substitution is compatible.
4. Where specified product, material or method cannot be properly coordinated with other materials of the work and where Contractor certifies that proposed substitution can be properly coordinated.
5. Where specified product, material or method cannot be warranted as required and where Contractor certifies that proposed substitution can be so warranted.
6. Where specified product, material or method cannot be used without adversely affecting Owner’s insurance coverage on completed work and where Contractor certifies that proposed substitution can be so used.
7. Where specified product, material or method will encounter other substantial non-compliance, which are not possible to otherwise overcome except by using proposed substitution.
8. Where specified product, material or method cannot receive required approval by governing authority and proposed substitution can be so approved.
9. Where substantial advantage is offered to the Owner; in terms of cost, time, energy conservation or other valuable considerations; after deducting offsetting responsibilities that Owner may be required to bear, including additional compensation to Architect for redesign and evaluation services, increased cost of other work by Owner or separate contractors, and similar considerations.

D. The burden is upon the Contractor, supplier and manufacturer to satisfy Architect that:

1. Proposed substitute is equal to, or superior to, the item specified.
2. Intent of the Contract Documents, including required performance, capacity, efficiency, quality, durability, safety, function, appearance, space clearances and delivery date, will be equaled or bettered.

E. Submission of shop drawings of unspecified manufacturer or shop drawings at variance with the Contract Documents is not a proper request for substitution.

F. Changes in work of other trades, such as structural supports, which are required as a result of substitution and the associated costs for such changes, shall be the complete responsibility of Contractor proposing substitution. Except as noted in subparagraph 1.10.C.9 above, there shall be no additional expense to the Owner.

1.11 SUBMITTALS

A. Prepare and submit shop drawings in accordance with the requirements hereinbefore specified, and with Division 1 Section “Submittal Procedures” in the manner described therein, modified as noted hereinafter.

B. The selection and intention to use a product specified by name shall not excuse the need for timely submission of shop drawings for that product.

- C. Prior to submitting shop drawings, submit for review preliminary list of intended or proposed manufacturers for all items for which shop drawings are required.
- D. Submission of shop drawings of an unnamed manufacture or shop drawings at variance with the Contract Documents is not a proper request for substitution.
- E. Samples that are submitted in lieu of shop drawings shall be clearly identified and shall be submitted in duplicate. Only one sample will be returned and that accepted sample shall be kept available at appropriate job site office. Accepted sample retained by Architect will be kept available at Architect's home office.
- F. Upon completion of shop drawing review, shop drawings will be returned, marked with one of following notations: No Exception Taken, Revise as Noted, Revise and Resubmit, or Rejected. Only products whose shop drawings are marked "No Exception Taken" or "Revise as Noted" shall be used on the project.
- G. Submittals shall include the following information:
 - 1. Descriptive and product data necessary to verify compliance with Contract Documents.
 - 2. Manufacturer's specifications including materials of construction, metal gauge, thickness and finish.
 - 3. Certified dimensional drawings including clearances required for maintenance or access.
 - 4. Performance data, ratings, operating characteristics, and operating limits.
 - 5. Electrical ratings and characteristics.
 - 6. Wiring and control diagrams, where applicable.
 - 7. Certifications requested, including UL label or listing.
 - 8. List of accessories, which are required but are not being provided by the product manufacturer or are not being furnished under this Section. Identify the Section(s) under which the accessories are being furnished.
- H. In addition, submittals shall be clearly marked for the following:
 - 1. Specification Section and Paragraph, or Drawing Schedule/Note/Detail/etc., where equipment is specified.
 - 2. Equipment or fixture identification corresponding to that used in Contract Documents.
 - 3. Accessories and special or non-standard features and materials which are being furnished.

1.12 PRODUCT SELECTION

- A. Contractor's options for selecting products are limited by Contract Document requirements and governing regulations and are not controlled by industry traditions or procedures experienced by Contractor on previous construction projects. Required procedures include, but are not necessarily limited to, following various methods of specifying:
 - 1. Single Product Manufacturer Named: Provide product indicated. Advise Architect, and obtain instructions before proceeding, when named product is known to be unacceptable or not feasible.
 - 2. Two or More Manufacturers' Products Named: Provide one of the named products, at Contractor's option, but excluding products which do not comply with requirements. Do not provide, nor offer to provide, an unnamed product unless named products do not comply with requirements or are not feasible.

3. "Acceptable Equivalent" or "Or Equal": Where named products are accompanied by this term or words of similar effect, provide named products or propose substitute product according to paragraph 1.10 SUBSTITUTIONS.
 4. Standards, Codes and Regulations: Where specification requires only compliance with a standard, code or regulation, Contractor may select any product which complies with requirements of that standard, code or regulation.
 5. Performance Requirements: Provide products which comply with specific performances indicated and which are recommended by manufacturer (in published product literature or by individual certification) for application intended. Overall performance of product is implied where product is specified with only certain specific performance requirements.
 6. Prescriptive Requirements: Provide products which have been produced in accordance with prescriptive requirements using specified materials and components, and complying with specified requirements for fabricating, finishing, testing and other manufacturing processes.
 7. Visual Matching: Where matching with an established material is required, Architect's judgment of whether proposed product matches established material shall be final. Where product specified does NOT match established material, propose substitute product according to paragraph 1.10 SUBSTITUTIONS. Follow requirements for CHANGE ORDERS, also, if matching product within cost category of specified product is not available.
 8. "Color as Selected by Architect": Unless otherwise noted, where specified product requirements include "Color as Selected by Architect" or words of similar effect, the selection of manufacturer and basic product complying with Contract Documents is Contractor's option and subsequent selection of color is Architect's option.
- B. Inclusion by name, of more than one manufacturer or fabricator, does not necessarily imply acceptability of standard products of those named. All manufacturers, named or proposed, shall conform, with modification as necessary, to criteria established by contract documents for performance, efficiency, materials and special accessories.

1.13 COORDINATION DRAWINGS

- A. Before materials are purchased, fabricated or work is begun, each Subcontractor shall prepare and obtain approval of coordination drawings, and sections for all floors/areas, including buried system/services, resulting in one (1) set of all-Trade-composite at 3/8" scale drawings, showing the size and location of all equipment, in the manner described herein under General Requirements. Architects review and approval of coordination drawings must be obtained prior to any fabrication or installation of any equipment or systems.
- B. The coordination drawings shall be generated from a computer CAD program compatible with AutoCAD Release 2013, in DWG or DXF format. The Plumbing Subcontractor shall take the lead, supervise, and coordinate production of coordinated layout drawings, to show and coordinate all equipment. These drawings shall then be circulated to the Plumbing Subcontractor so that he can indicate all his work as directed by the General Contractor and Architect and as required, to result in a fully coordinated installation.
- C. All costs associated with all aspects of coordination drawings, regardless as to how long they take to produce and how many times they have to be redrawn, shall be borne by the Plumbing Subcontractor.

- D. The Plumbing Subcontractor may purchase the Plumbing AutoCAD computer drawing files from the Plumbing Contract set on disk or via modem from the Engineer at the nominal cost of \$500.00, if he so chooses.

1.14 COORDINATION OF WORK WITH OTHER TRADES

- A. The Plumbing Subcontractor shall compare his drawings and specifications with those of other Trades as well as the Architectural drawings and specifications, and report any discrepancies between them to the Architect and obtain from the Architect written instructions for changes necessary in the Plumbing work.
- B. Coordinate work with that of all other Trades affecting or affected by the work of this Section. Cooperate with such Trades to assure the steady progress of all work under the Contract.
- C. All work shall be installed in cooperation with other Trades installing interrelated work. Before installation, Plumbing Subcontractor shall make proper provisions to avoid interferences in a manner approved by the Architect. All changes required in the work of the Plumbing Subcontractor or that of any other trade caused by the Plumbing Subcontractor's neglect, shall be made by him at his own expense, to the Architect's satisfaction.
- D. The Plumbing Subcontractor must include in his bid sufficient dollar amounts to coordinate the work of this Contract. This project is complex and will require additional time to coordinate all Trades and allow implementation of the Owners Standards and maintenance serviceability requirements. This requirement shall include, but not be limited to, producing the coordination drawings, as many times and as many drawings as required, to ensure serviceability of equipment, as approved by the Architect.
- E. Locations of ductwork and piping distribution, equipment, systems, etc. shall be adjusted to accommodate the work with interferences anticipated and encountered. The Plumbing Subcontractor shall determine the exact routing and location of his systems prior to fabrication or installation of any system component. Accurate measurements and coordination drawings shall be completed to verify dimensions and characteristics of the various systems installations.
- F. Lines which pitch shall have the right-of-way over those which do not pitch. For example, steam piping shall normally have the right-of-way. Lines whose elevations cannot be changed shall have the right-of-way over lines whose elevations can be changed.
- G. Offsets, transitions and changes of direction in all systems shall be made as required to maintain proper headroom and pitch of sloping lines whether or not indicated on the drawings. The Plumbing Subcontractor shall provide elbows, fittings, offsets in ductwork and piping, etc. as required for his work to affect these offsets, transitions and changes in direction.
- H. All work shall be installed in a way to permit removal (without damage to other parts) all other system components provided under this Contract requiring periodic replacement or maintenance. All work shall be done to allow easy access for maintaining equipment. The Owner and Engineer will require proof via the preparation of large scale sections and part plans that pull and junction boxes, etc. are accessible after the work is completed. Any items in the field discovered to be in non-compliance shall be removed and relocated, as required, and as directed by the Architect.

- I. Any equipment shown on the Plumbing and/or Architectural drawings to be provided with services shall be included under this Contract as applicable to make equipment complete and operable. Additional equipment, etc., shall be provided to accomplish the above requirement, as required, all as part of this Contract, at no extra cost to the Owner. This requirement necessitates that the Plumbing Subcontractor review the Architectural drawings and the drawings of other Trades during bidding to ascertain the extent of all requirements, and interface between the Trades and scope of work.
- J. The Plumbing Subcontractor shall coordinate his work with other Trades' work so that all equipment and systems can be easily, safely and properly serviced and maintained. It is imperative that service personnel can safely access all equipment. Provide safety rails, steps, ladders, valve chains, handle extensions, etc. as required, in addition to the ones shown on the drawings, to ensure safe and easy access to all equipment is provided in a manner approved by the Architect.

1.15 WARRANTEE

- A. Attention is directed to provisions of the General Requirements and Supplementary General Requirements regarding and warranties for work under this Contract.
- B. All warranties shall begin on the Date of Substantial Completion of the entire project or the Owner's acceptance of the workmanship and/or material covered by the warranty, whichever is later. The warranty coverage shall continue for the specified period. Refer to individual specification sections for warranty period. If no specific warranty period is specified, the warranty shall extend for a minimum of 365 days.
- C. Manufacturers shall provide their standard warranties for work under the Plumbing Trades. However, such warranties shall be in addition to, and not in lieu of, all other liabilities which the manufacturer and Plumbing Subcontractor may have by law or by other provisions of the Contract Documents.
- D. All materials, items of equipment and workmanship furnished under the Plumbing Section shall carry the standard warranty against all defects in material and workmanship. Any fault due to defective or improper material, equipment, workmanship or design which may develop shall be made good, forthwith, by and at the expense of the Plumbing Subcontractor for the work under his Contract, including all other damage done to areas, materials and other systems resulting from this failure.
- E. The Plumbing Subcontractor shall warranty that all elements of the systems which are to be provided under his Contract, are of sufficient capacity to meet the specified performance requirements as set forth herein or as indicated.
- F. Upon receipt of notice from the Owner or Architect of failure of any part of the systems or equipment during the warranty period, the affected part or parts shall be replaced by the Plumbing Subcontractor for his work or any other work affected by the failure(s).
- G. Plumbing Subcontractor shall furnish, before the final payment is made, a written warranty covering the above requirements in accordance with the General Requirements.

1.16 THE SUBCONTRACTOR

- A. The Plumbing Subcontractor shall visit the site of the proposed new facility and base his bids from his own site examinations and estimates. The Plumbing Subcontractor shall not hold the Architect, Engineer, Owner or their agents or employees responsible for, or bound by, any schedule, estimate or of any plan thereof. The Plumbing Subcontractor shall study the Contract Documents included under this Contract to determine exactly the extent of work provided under this Contract, as well as to ascertain the difficulty to be encountered in performing the work, in installing new equipment and systems and coordinating the work with the other Trades and existing building conditions.
- B. The Plumbing Subcontractor shall faithfully execute his work according to the terms and conditions of the Contract and specifications, and shall take all responsibility for and bear all losses resulting to him in the execution of his work.
- C. The Plumbing Subcontractor shall be responsible for the location and performance of work provided under his Contract as indicated on the Contract Documents. All parties employed directly or indirectly by the Plumbing Subcontractor shall perform their work according to all the conditions as set forth in these specifications.
- D. The Plumbing Subcontractor shall furnish all materials and do all work in accordance with these specifications, and any supplementary documents provided by the Architect. The work shall include everything shown on the drawings and/or required by the specifications as interpreted by the Architect, regardless of where such information is indicated in the Contract Documents (Architectural, Electrical, Fire Protection, HVAC, etc.). Unless specifically indicated otherwise, all work and materials furnished and installed shall be new, unused and of the best quality and workmanship. The Plumbing Subcontractor shall cooperate with the Architect so that no error or discrepancy in the Contract Documents shall cause defective materials to be used or poor workmanship to be performed.

1.17 COORDINATION OF WORK

- A. The Plumbing Subcontractor shall compare his drawings and specifications with those of other Trades as well as the Architectural drawings and specifications, and report any discrepancies between them to the Architect and obtain from the Architect written instructions for changes necessary in the Plumbing work.
- B. Coordinate work with that of all other Trades affecting or affected by the work of this Section. Cooperate with such Trades to assure the steady progress of all work under the Contract.
- C. All work shall be installed in cooperation with other Trades installing interrelated work. Before installation, Plumbing Subcontractor shall make proper provisions to avoid interferences in a manner approved by the Architect. All changes required in the work of the Plumbing Subcontractor or that of any other trade caused by the Plumbing Subcontractor's neglect, shall be made by him at his own expense, to the Architect's satisfaction.
- D. The Plumbing Subcontractor must include in his bid sufficient dollar amounts to coordinate the work of this Contract. This project is complex and will require additional time to coordinate all Trades and allow implementation of the Owners Standards and maintenance serviceability requirements. This requirement shall include, but not be limited to, producing the coordination drawings, as many times and as many drawings as required, to ensure serviceability of equipment, as approved by the Architect.

- E. Locations of ductwork and piping distribution, equipment, systems, etc. shall be adjusted to accommodate the work with interferences anticipated and encountered. The Plumbing Subcontractor shall determine the exact routing and location of his systems prior to fabrication or installation of any system component. Accurate measurements and coordination drawings shall be completed to verify dimensions and characteristics of the various systems installations.
- F. Lines which pitch shall have the right-of-way over those which do not pitch. For example, steam piping shall normally have the right-of-way. Lines whose elevations cannot be changed shall have the right-of-way over lines whose elevations can be changed.
- G. Offsets, transitions and changes of direction in all systems shall be made as required to maintain proper headroom and pitch of sloping lines whether or not indicated on the drawings. The Plumbing Subcontractor shall provide elbows, fittings, offsets in ductwork and piping, etc. as required for his work to affect these offsets, transitions and changes in direction.
- H. All work shall be installed in a way to permit removal (without damage to other parts) all other system components provided under this Contract requiring periodic replacement or maintenance. All work shall be done to allow easy access for maintaining equipment. The Owner and Engineer will require proof via the preparation of large scale sections and part plans that pull and junction boxes, etc. are accessible after the work is completed. Any items in the field discovered to be in non-compliance shall be removed and relocated, as required, and as directed by the Architect.
- I. The Contract Drawings are diagrammatic only intending to show general runs and locations of the ductwork, piping, equipment, systems equipment, etc. and not necessarily showing all required offsets, details and accessories and equipment to be connected. All work shall be accurately laid out with other Trades to avoid conflicts and to obtain a neat and workmanlike installation which will afford maximum accessibility for operation, maintenance and headroom.
- J. Where discrepancies in scope of work as to what Trade provides items, such conflicts shall be reported to the Architect during bidding and prior to signing of the Contract. If such action is not taken, the Plumbing Subcontractor shall furnish such items as part of his work as necessary, for complete and operable systems and equipment, as determined by the Architect.
- K. The Plumbing Subcontractor shall coordinate the installation of all equipment.
- L. Where drawing details, plans, specification requirements and/or scheduled equipment capacities are in conflict or equipment are shown to be different between plans and/or between plans and riser diagrams, details or specifications, the most stringent requirement will be included in the Contract. Plumbing systems and equipment called for in the specification and/or shown on the drawings shall be provided under this Contract as if it were required by both the drawings and specifications. However, prior to ordering or installation of any portion of work which appears to be in conflict, such work shall be brought to Architect's attention for direction as to what is to be provided.
- M. Any equipment shown on the Plumbing and/or Architectural drawings to be provided with services shall be included under this Contract as applicable to make equipment complete and operable. Additional equipment, etc., shall be provided to accomplish the above requirement, as required, all as part of this Contract, at no extra cost to the Owner. This requirement necessitates that the Plumbing Subcontractor

review the Architectural drawings and the drawings of other Trades during bidding to ascertain the extent of all requirements, and interface between the Trades and scope of work.

- N. The Plumbing Subcontractor shall coordinate his work with other Trades' work so that all equipment and systems can be easily, safely and properly serviced and maintained. It is imperative that service personnel can safely access all equipment. Provide safety rails, steps, ladders, valve chains, handle extensions, etc. as required, in addition to the ones shown on the drawings, to ensure safe and easy access to all equipment is provided in a manner approved by the Architect.

1.18 GIVING INFORMATION

- A. Plumbing Subcontractor shall keep himself fully informed as to the shape, size and position of all openings required for his apparatus and shall give information to the General Contractor and other Subcontractors sufficiently in advance of the work so that all openings may be built in advance.

1.19 EQUIPMENT AND MATERIALS

- A. Equipment and materials shall be delivered to the site and stored in original sealed containers, suitably sheltered from the elements, but readily accessible for inspection by the Architect until installed. All items subject to moisture damage such as controls shall be stored in dry, heated spaces.
- B. Equipment shall be tightly covered and protected against dirt, water, and chemical or mechanical injury and theft. At the completion of the work, equipment and materials shall be cleaned and polished thoroughly and turned over to the Owner in a condition satisfactory to the Architect. Damage or defects that develop before acceptance of the work shall be made good at the Plumbing Subcontractor's expense.
- C. The Plumbing Subcontractor shall make necessary field measurements to ascertain space requirements, for equipment and connections to be provided under his respective Trade and shall furnish and install such sizes and shapes of equipment to allow for the final installation to conform to the drawings and specifications.
- D. Manufacturer's directions shall be followed completely in the delivery, storage, protection and installation. Promptly notify the Architect in writing of any conflict between any requirements of the Contract Documents and the manufacturer's directions. Obtain the Architect's written instructions before proceeding with the work. Should Plumbing Subcontractor perform any work that does not comply with the manufacturer's directions or written instructions from the Architect, he shall bear all costs arising in correcting any deficiencies that should arise.
- E. All equipment of one type shall be the products of one manufacturer.
- F. Equipment prepurchased by the General Contractor on behalf of the Owner or by the Owner himself, if assigned to the Plumbing Subcontractor, shall be received, installed, tested, etc., as if the equipment was purchased by the Plumbing Subcontractor. All guarantees, service contracts, etc., shall be the same as for all other equipment provided under this Contract.

1.20 USE OF PREMISES

- A. The Plumbing Subcontractor shall confine all apparatus, storage of materials and construction to the limits as directed by the Architect and he shall not encumber the premises with his materials. The Plumbing Subcontractor shall be held responsible for repairs, patching, or cleaning arising from any unauthorized use of premises.
- B. Notwithstanding any approvals or instructions which must be obtained by the Plumbing Subcontractor from the Architect in connection with the use of the premises, the responsibility for the safe working conditions at the site shall remain that of the Plumbing Subcontractor. The Architect, Engineer or Owner shall not be deemed to have any responsibility or liability in connection with safe working conditions at the site.

1.21 PROTECTION

- A. Materials, equipment, etc., shall be properly protected during construction and all conduit openings shall be temporarily closed so as to prevent obstruction and damage. Post notice prohibiting the use of all systems provided under the Plumbing Contract, prior to completion of work and acceptance of all systems by the Owner except as otherwise, instructed by Architect. Take precautions to protect all materials furnished from damage and theft.
- B. The Plumbing Subcontractor shall furnish, place and maintain proper safety guards for the prevention of accidents that might be caused by the workmanship, materials, equipment or Plumbing systems provided under his Contract.

1.22 DAMAGE TO OTHER WORK

- A. The Plumbing Subcontractor shall be held responsible and shall pay for all damages caused by his work to the building structures, equipment, systems, etc., and all work and finishes installed under this Contract. Repair of such damage shall be done by the General Contractor at the expense of the Plumbing Subcontractor, to the Architect's satisfaction.

1.23 CORRECTION OF WORK

- A. The Plumbing Subcontractor shall promptly correct all work provided under his Contract and rejected by the Architect as defective or as failing to conform to the Contract Documents, whether observed before or after completion of work, and whether or not fabricated, installed or completed.

1.24 EXTRA WORK

- A. No claim for extra work will be allowed unless it is authorized by the Architect before commencement of the extra said work.

1.25 TOUCH-UP PAINTING

- A. All equipment and systems shall be thoroughly cleaned of rust, splatters and other foreign matter of discoloration leaving every part of all systems in an acceptable prime condition. The Plumbing Subcontractor for the work under his Contract shall refinish and restore to the original condition all equipment which has sustained damage to the manufacturer's prime and finish coats of paint and/or enamel during the course of construction, regardless of the source of damage. double check valve

1.26 PARTS LIST AND INSTRUCTIONS FOR OPERATION AND MAINTENANCE

- A. The Plumbing Subcontractor shall thoroughly instruct the Owner, to the complete satisfaction of the Architect, in the proper operation of all systems and equipment provided by him. The Plumbing Subcontractor shall make arrangements, via the Architect, as to whom the instructions are to be given in the operation of the basic and auxiliary systems and the period of time in which they are to be given. The Architect shall be completely satisfied that the Owner has been thoroughly and completely instructed in the proper operation of all systems and equipment before final payment is made. If the Architect determines that complete and thorough instructions have not been given by the Plumbing Subcontractor to the Owner's representative, then the Plumbing Subcontractor shall be directed by the Architect to provide whatever instructions are necessary until the intent of this specification has been complied with.
- B. Plumbing Subcontractor shall submit to the Architect for approval, the required typed sets (see General Conditions and Division 1) bound neatly in loose-leaf binders, of all instructions for the installation, operation, emergency operation, start-up, care and maintenance of all equipment and systems (including instructions for the ordering and stocking of spare parts for all equipment installed under this Contract). The lists shall include part numbers and suggested supplier. Each set shall also include an itemized list of component parts that should be kept on hand and where such parts can be purchased.
- C. Information shall indicate possible problems with equipment and suggested corrective action. The manuals shall be indexed for each type of equipment. Each section shall be clearly divided from the other sections. A sub-index for each section shall also be provided. The methodology of setting-up the manuals shall be submitted to the Architect and Owner for review prior to final submission of manuals.

1.27 MANUFACTURER'S REPRESENTATIVE

- A. The Plumbing Subcontractor shall provide, at the appropriate time or as directed by Architect, the on-site services of a competent factory trained Engineer of the manufacturer of specific equipment, to inspect, test, adjust and place in proper operating condition any and all items of the same manufacturer. No additional compensation will be allowed for such services. A written report shall be issued by the particular manufacturer with his findings for the Architect's record.

1.28 RECORD DRAWINGS/AS-BUILT DRAWINGS

- A. The Plumbing Subcontractor shall maintain current at the site a set of his drawings on which he shall accurately show the actual installation of all work provided under his Contract indicating hereon any variation from the Contract Drawings, in accordance with the General Conditions and Division 1. Changes, whether resulting from formal change orders or other instructions issued by the Architect, shall be recorded. Include changes in sizes, location, and dimensions of equipment, etc.
- B. The Plumbing Subcontractor shall indicate progress by coloring-in equipment and associated appurtenances exactly as they are erected. This process shall incorporate both the changes noted above and all other deviations from the original drawings whether resulting from job conditions encountered or from any other causes.
- C. The marked-up and colored-up prints will be used as a guide for determining the progress of the work installed. They shall be inspected periodically by the Architect and Owner and they shall be corrected immediately if found either inaccurate or incomplete. This procedure is mandatory.

- D. At the completion of the job, these prints shall be submitted to the General Contractor and then to the Architect for final review and comment. The prints will be returned with appropriate comments and recommendations. These corrected prints, together with corrected prints indicating all the revisions, additions and deletions of work, shall form the basis for preparing a set of As-built Record Drawings.
- E. The Subcontractor shall be responsible for generating as-built Record Drawings utilizing CAD based documents in AutoCAD Release 2000 DWG or DXF format. A bound set of plans, as well as the computer files, on disk, shall be turned over to the Architect for review. After acceptance of the as-built documents by the Architect, the Plumbing Subcontractor shall make any corrections necessary to the as-built documents and prepare one reproducible set of drawings as well as bound blueprint set(s) (quantity as determined by the Architect) for distribution to the Owner via the Architect.
- F. The Plumbing Subcontractor may use the computer drawing files used for coordination drawings or purchase the Engineers most recently updated computer drawing files at a nominal charge of \$500.00 per drawing file. The updated drawings may not include all changes made during the course of construction and it shall be the Plumbing Subcontractors responsibility to update the as-built documents to include all changes brought forth to the project resulting from bulletins, request for information (RFI's), change orders, etc. The Plumbing Subcontractor may review the Engineers latest computer files for completeness prior to purchase, however the Engineer will not be responsible for updating the computer files.
- G. Included with the above shall be a complete drawing list and a standard layering system, which shall be required to be maintained within the as-built Record CAD documents.
- H. The Plumbing Subcontractor shall be issued bulletins in the same manner as the original Design Documents described above.
- I. The as-built CAD documents required shall be in addition to other requirements stated elsewhere.

1.29 SAMPLES

- A. Submit samples as requested by Architect.

1.30 GENERAL PRODUCT REQUIREMENTS

- A. Products shall be undamaged and unused at time of installation and shall be complete with accessories, trim, finish, safety guards and other devices and details needed for complete installation and for intended use.
- B. Where available, products shall be standard products of types which have been produced and use previously and successfully on other projects and in similar applications.
- C. Where products by their nature and their use are likely to need replacement parts on future date, for maintenance and repair or replacement work, products shall be standard domestically produced products likely to have such parts available to Owner in future.

- D. Labels and stamps which are required for observation after installation shall be located on accessible surfaces which, in occupied spaces, are not conspicuous. Other labels and stamps shall be located on concealed surfaces.

1.31 COOPERATION AND WORK PROGRESS

- A. The Plumbing work shall be carried on under the usual construction conditions, in conjunction with all other work at the site. The Plumbing Subcontractor shall cooperate with the Architect, General Contractor, all other Subcontractors and equipment suppliers working at the site. The Plumbing Subcontractor shall coordinate the work and proceed in a manner so as not to delay the progress of the project.
- B. The Plumbing Subcontractor shall coordinate his work with the progress of the building and other Trades so that he will complete his work as soon as conditions permit and such that interruptions of the building functions will be at a minimum. Any overtime hours worked or additional costs incurred due to lack of or improper coordination with other Trades or the Owner by the Plumbing Subcontractor, shall be assumed by him without any additional cost to the Owner.
- C. The Plumbing Subcontractor shall furnish information on all equipment that is furnished under this Section but installed under another Section to the installing Subcontractor as specified herein.
- D. The Plumbing Subcontractor shall provide all materials, equipment and workmanship to provide for adequate protection of all Plumbing equipment during the course of construction of the project. This shall also include protection from moisture and all foreign matter. The Plumbing Subcontractor shall also be responsible for damage which he causes to the work of other Trades, and he shall remedy such injury at his own expense.
- E. Waste materials shall be removed promptly from the premises. All material and equipment stored on the premises shall be kept in a neat and orderly fashion. Material or equipment shall not be stored where exposed to the weather. The Plumbing Subcontractor shall be responsible for the security, safekeeping and damages, including acts of vandalism, of all material and equipment stored at the job site.
- F. The Plumbing Subcontractor shall be responsible for unloading all Plumbing equipment and materials delivered to the site. This shall also include all large and heavy items or equipment which require hoisting. Consult with the General Contractor for hoisting/crane requirements. During construction of the building, the Plumbing Subcontractor shall provide additional protection against moisture, dust accumulation and physical damage of the main service and distribution equipment. This shall include furnishing and installing temporary heaters within these units, as approved, to evaporate excessive moisture and ventilate it from the room, as may be required.
- G. It shall be the responsibility of the Plumbing Subcontractor to coordinate the delivery of the Plumbing equipment to the project prior to the time installation of equipment will be required; but he shall also make sure such equipment is not delivered too far in advance of such required installation, to ensure that possible damage and deterioration of such equipment will not occur. Such equipment stored for an excessively long period of time (as determined in the opinion of the Architect) on the project site prior to installation may be subject to rejection by the Architect.

- H. The Plumbing Subcontractor shall erect and maintain, at all times, necessary safeguards for the protection of life and property of the Owner, Workmen, Staff and the Public.
- I. Prior to installation, the Plumbing Subcontractor has the responsibility to coordinate the exact mounting arrangement and location of Plumbing equipment to allow proper space requirements as indicated in the NEC. Particular attention shall be given in the field to group installations. If it is questionable that sufficient space, conflict with the work of other Subcontractors, architectural or structural obstructions will result in an arrangement which will prevent proper access, operation or maintenance of the indicated equipment, the Plumbing Subcontractor shall immediately notify the Contractor and not proceed with this part of the Contract work until definite instructions have been given to him by the Architect.
- J. The Plumbing Subcontractor shall obtain from the Plumbing and Electrical Subcontractors copies of all shop drawing prints showing the ductwork and piping installation as they will be put in place on the project. These drawings shall be thoroughly checked by the Plumbing Subcontractor be coordinated with the work of other trades so as to prevent any installation conflict.

1.32 INSTALLATION

A. General:

- 1. Unless specifically noted or indicated otherwise, all equipment and material specified in Division 22 of this specification or indicated on the drawings shall be installed under this Contract whether or not specifically itemized herein. This Section covers particular installation methods and requirements peculiar to certain items and classes or material and equipment.
- 2. The Plumbing Subcontractor shall obtain detailed information from manufacturers of equipment as to proper methods of installation.
- 3. The Plumbing Subcontractor shall obtain final roughing dimensions and other information as needed for complete installation of items furnished under other Sections or furnished by the Owner.
- 4. The Plumbing Subcontractor shall keep fully informed of size, shape and position of openings required for material and equipment provided under this and other Sections. Ensure that openings required for work of this Section are coordinated with work of other Sections. Provide cutting coring and patching as necessary.
- 5. All miscellaneous hardware and support accessories, including support rods, nuts, bolts, screws and other such items, shall be of a galvanized or cadmium plated finish or of another approved rust-inhibiting coating.
- 6. Throughout this Section where reference is made to steel channel supports, it shall be understood to mean that the minimum size shall be 1 5/8" mild strip steel with minimum wall thickness of 0.105", similar to Unistrut P1000 or equal products manufactured by Kindorf or Husky Products Co.

1.33 MATERIALS AND WORKMANSHIP

- A. All materials and equipment shall be new and unused and shall meet requirements of the latest Standards of NEMA, UL, IPCEA, ANSI and IEEE. Equipment shall have components required or recommended by OSHA, applicable NFPA documents and shall be UL listed and labeled.
- B. Despite references in the specifications or on the drawings to materials or pieces of equipment by name, make or catalog number, such references shall be interpreted as establishing standards of quality for materials and performance.

- C. Finish of materials, components and equipment shall not be less than Industry good practice. When material or equipment is visible or subject to corrosive or atmospheric conditions, the finish shall be as approved by the Architect.
- D. Provide proper access to material or equipment that requires inspection, replacement, repair or service. If proper access cannot be provided, confer with the Architect as to the best method of approach to minimize effects of reduced access.
- E. All work shall be installed in a neat and workmanlike manner and shall be done in accordance with all Local and State Codes.
- F. The Owner will not be responsible for material, equipment or the installation of same before testing and acceptance.

1.34 CLEANING

- A. This Section of the specifications shall include the cleaning of all equipment on a day-to-day basis and final cleaning of all Plumbing equipment prior to turning building over to the Owner. All necessary cleaning referred to herein shall be cleaned to the satisfaction of the Architect.

1.35 FINAL INSPECTION

- A. When all Plumbing work on the project has been completed and is ready for final inspection, such an inspection shall be made. At this time, and in addition to all other requirements in the Contract Documents, the Plumbing Subcontractor, for the work under this Contract, shall demonstrate that the requirements of these specifications have been met to the Architect's satisfaction.

END OF SECTION 220100

SECTION 220516 - EXPANSION FITTINGS AND LOOPS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections:
 - 1. Section 220100 Plumbing General Requirements
 - 2. Section 220517 Sleeves and Sleeve Seals for Plumbing Piping
 - 3. Section 220518 Escutcheons for Plumbing Piping
 - 4. Section 220529 Hangers and Supports for Plumbing Piping and Equipment
 - 5. Section 220548 Vibration and Seismic Controls for Plumbing Piping and Equipment
 - 6. Section 220553 Identification for Plumbing Piping and Equipment
 - 7. Section 220719 Plumbing Piping Insulation
 - 8. Section 221113 Facility Water Distribution Piping
 - 9. Section 221116 Domestic Water Piping
 - 10. Section 221119 Domestic Water Piping Specialties
 - 11. Section 221125 Natural Gas Piping

1.2 SUMMARY

- A. Section Includes:
 - 1. Rubber union connector packless expansion joints.
 - 2. Flexible-hose packless expansion joints.
 - 3. Metal-bellows packless expansion joints.
 - 4. Externally pressurized metal-bellows packless expansion joints.
 - 5. Rubber packless expansion joints.
 - 6. Grooved-joint expansion joints.
 - 7. Alignment guides and anchors.
 - 8. Pipe loops and swing connections.

1.3 PERFORMANCE REQUIREMENTS

- A. Compatibility: Products shall be suitable for piping service fluids, materials, working pressures, and temperatures.
- B. Capability: Products to absorb 200 percent of maximum axial movement between anchors.

1.4 SUBMITTALS

- A. Product Data: For each type of product.
- B. Delegated-Design Submittal: For each anchor and alignment guide, including analysis data, signed and sealed by the qualified professional engineer responsible for their preparation.

1. Design Calculations: Calculate requirements for thermal expansion of piping systems and for selecting and designing expansion joints, loops, and swing connections.
 2. Anchor Details: Detail fabrication of each anchor indicated. Show dimensions and methods of assembly and attachment to building structure.
 3. Alignment Guide Details: Detail field assembly and attachment to building structure.
 4. Schedule: Indicate type, manufacturer's number, size, material, pressure rating, end connections, and location for each expansion joint.
- C. Welding certificates.
- D. Maintenance Data: For expansion joints to include in maintenance manuals.
- 1.5 QUALITY ASSURANCE
- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Pipe and Pressure-Vessel Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Provide products by one of the following.
1. Adscot Manufacturing LLC.
 2. Advanced Thermal Systems, Inc.
 3. American BOA, Inc.
 4. Anvil International, Inc.
 5. Badger Industries, Inc.
 6. Expansion Joint Systems, Inc.
 7. Flex-Hose Co., Inc.
 8. Flexicraft Industries.
 9. Flex-Weld, Inc.
 10. Hyspan Precision Products, Inc.
 11. Mason Industries, Inc.; Mercer Rubber Co.
 12. Metraflex, Inc.
 13. Senior Flexonics Pathway.
 14. Shurjoint Piping Products.
 15. Tozen Corporation.
 16. Unaflex.
 17. Unisource Manufacturing, Inc.
 18. U.S. Bellows, Inc.
 19. Victaulic Company.

2.2 PACKLESS EXPANSION JOINTS

- A. Rubber Union Connector Expansion Joints:
1. Material: Twin reinforced-rubber spheres with external restraining cables.

2. Minimum Pressure Rating: 150 psig at 170 deg F, unless otherwise indicated.
3. End Connections for 2-inch and Smaller: Threaded.

B. Flexible-Hose Packless Expansion Joints:

1. Description: Manufactured assembly with inlet and outlet elbow fittings and two flexible-metal-hose legs joined by long-radius, 180-degree return bend or center section of flexible hose.
2. Flexible Hose: Corrugated-metal inner hoses and braided outer sheaths.
3. Expansion Joints for Copper Tubing 2-inch and Smaller: Copper-alloy fittings with solder-joint end connections.
 - a. Bronze hoses and single-braid bronze sheaths with 450 psig at 70 deg F ratings.
 - b. Bronze hoses and double-braid bronze sheaths with 700 psig at 70 deg F ratings.
4. Expansion Joints for Copper Tubing 2-1/2-inch to 4-inch: Copper-alloy fittings with threaded end connections.
 - a. Stainless-steel hoses and single-braid, stainless-steel sheaths with 300 psig at 70 deg F ratings.
 - b. Stainless-steel hoses and double-braid, stainless-steel sheaths with 420 psig at 70 deg F ratings.
5. Expansion Joints for Steel Piping 2-inch and Smaller: Carbon-steel fittings with threaded end connections.
 - a. Stainless-steel hoses and single-braid, stainless-steel sheaths with 450 psig at 70 deg F ratings.
 - b. Stainless-steel hoses and double-braid, stainless-steel sheaths with 700 psig at 70 deg F ratings.
6. Expansion Joints for Steel Piping 2-1/2-inch to 6-inch: Carbon-steel fittings with welded end connections.
 - a. Stainless-steel hoses and single-braid, stainless-steel sheaths with 200 psig at 70 deg F ratings.
 - b. Stainless-steel hoses and double-braid, stainless-steel sheaths with 275 psig at 70 deg F ratings.
7. Expansion Joints for Steel Piping 8-inch to 12-inch: Carbon-steel fittings with flanged end connections.
 - a. Stainless-steel hoses and single-braid, stainless-steel sheaths with 125 psig at 70 deg F ratings.
 - b. Stainless-steel hoses and double-braid, stainless-steel sheaths with 165 psig at 70 deg F ratings.
8. Expansion Joints for Steel Piping 14-inch and Larger: Carbon-steel fittings with flanged end connections.
 - a. Stainless-steel hoses and double-braid, stainless-steel sheaths with 165 psig at 70 deg F ratings.

C. Metal-Bellows Packless Expansion Joints:

1. Standards: ASTM F 1120 and EJMA's "Standards of the Expansion Joint Manufacturers Association, Inc."
 2. Type: Circular, corrugated bellows with external tie rods.
 3. Minimum Pressure Rating: 175 psig, unless otherwise indicated.
 4. Configuration: Single joint with base and double joint with base class(es), unless otherwise indicated.
 5. Expansion Joints for Copper Tubing: Single or multi-ply phosphor-bronze bellows, copper pipe ends, and brass shrouds.
 - a. End Connections for Copper Tubing 2-inch and Smaller: Solder joint.
 - b. End Connections for Copper Tubing 2-1/2-inch to 4-inch or threaded.
 - c. End Connections for Copper Tubing 5-inch and Larger: Flanged.
 6. Expansion Joints for Steel Piping: Single or multi-ply stainless-steel bellows, steel pipe ends, and carbon-steel shroud.
 - a. End Connections for Steel Pipe 2-inch and Smaller: Threaded.
 - b. End Connections for Steel Pipe 2-1/2-inch and Larger: Welded.
- D. Externally Pressurized Metal-Bellows Packless Expansion Joints:
1. Minimum Pressure Rating: 200 psig, unless otherwise indicated.
 2. Description:
 - a. Totally enclosed, externally pressurized, multi-ply, stainless-steel bellows isolated from fluid flow by an internal pipe sleeve.
 - b. Carbon-steel housing.
 - c. Drain plugs and lifting lug for 3-inch and larger.
 - d. Bellows shall have operating clearance between the internal pipe sleeves and the external shrouds.
 - e. Joint Axial Movement: 4 inches of compression and 1 inch of extension.
 3. Permanent Locking Bolts: Set locking bolts to maintain joint lengths during installation. Temporary welding tabs that are removed after installation in lieu of locking bolts are not acceptable.
 4. End Connection Configuration: Flanged; one raised, fixed and one floating flange.
- E. Rubber Packless Expansion Joints:
1. Standards: ASTM F 1123 and FSA's "Technical Handbook: Non-Metallic Expansion Joints and Flexible Pipe Connectors."
 2. Material: Fabric-reinforced rubber complying with FSA-PSJ-703.
 3. Arch Type: Single or multiple arches with external control rods.
 4. Spherical Type: Single or multiple spheres with external control rods.
 5. Minimum Pressure Rating for 1-1/2-inch to 4-inch: 150 psig at 220 deg F.
 6. Minimum Pressure Rating for 5-inch and 6-inch: 140 psig at 200 deg F.
 7. Material for Fluids Containing Acids, Alkalis, or Chemicals: Chlorosulfonyl-polyethylene rubber.
 8. Material for Fluids Containing Gas, Hydrocarbons, or Oil: Buna-N.
 9. Material for Water: Ethylene-propylene-diene terpolymer rubber.
 10. End Connections: Full-faced, integral steel flanges with steel retaining rings.

2.3 GROOVED-JOINT EXPANSION JOINTS

- A. Description: Factory-assembled expansion joint made of several grooved-end pipe nipples, couplings, and grooved joints.
- B. Standard: AWWA C606, for grooved joints.
- C. Nipples: ASTM A 53/A 53M, Schedule 40, Type E or S, steel pipe with grooved ends.
- D. Couplings: Seven, flexible type for steel-pipe dimensions. Include ferrous housing sections, Buna-N gasket suitable for diluted acid, alkaline fluids, ethylene-propylene-diene terpolymer rubber gasket suitable for cold and hot water, and bolts and nuts.

2.4 ALIGNMENT GUIDES AND ANCHORS

- A. Alignment Guides:
 - 1. Description: Steel, factory-fabricated alignment guide, with bolted two-section outer cylinder and base for attaching to structure; with two-section guiding slider for bolting to pipe.
- B. Anchor Materials:
 - 1. Steel Shapes and Plates: ASTM A 36/A 36M.
 - 2. Bolts and Nuts: ASME B18.10 or ASTM A 183, steel hex head.
 - 3. Washers: ASTM F 844, steel, plain, flat washers.
 - 4. Mechanical Fasteners: Insert-wedge-type stud with expansion plug anchor for use in hardened portland cement concrete, with tension and shear capacities appropriate for application.
 - a. Stud: Threaded, zinc-coated carbon steel.
 - b. Expansion Plug: Zinc-coated steel.
 - c. Washer and Nut: Zinc-coated steel.
 - 5. Chemical Fasteners: Insert-type stud, bonding-system anchor for use with hardened portland cement concrete, with tension and shear capacities appropriate for application.
 - a. Bonding Material: ASTM C 881/C 881M, Type IV, Grade 3, two-component epoxy resin suitable for surface temperature of hardened concrete where fastener is to be installed.
 - b. Stud: ASTM A 307, zinc-coated carbon steel with continuous thread on stud, unless otherwise indicated.
 - c. Washer and Nut: Zinc-coated steel.

PART 3 - EXECUTION

3.1 EXPANSION JOINT INSTALLATION

- A. Install expansion joints of sizes matching sizes of piping in which they are installed.
- B. Install metal-bellows expansion joints according to EJMA's "Standards of the Expansion Joint Manufacturers Association, Inc."
- C. Install rubber packless expansion joints according to FSA-PSJ-703.

- D. Install grooved-joint expansion joints to grooved-end steel piping.

3.2 PIPE LOOP AND SWING CONNECTION INSTALLATION

- A. Install pipe loops cold-sprung in tension or compression as required to partly absorb tension or compression produced during anticipated change in temperature.
- B. Connect risers and branch connections to mains with at least five pipe fittings, including tee in main.
- C. Connect risers and branch connections to terminal units with at least four pipe fittings, including tee in riser.
- D. Connect mains and branch connections to terminal units with at least four pipe fittings, including tee in main.

3.3 ALIGNMENT-GUIDE AND ANCHOR INSTALLATION

- A. Install alignment guides to guide expansion and to avoid end-loading and torsional stress.
- B. Install one guide on each side of pipe expansion fittings and loops. Install guides nearest to expansion joint not more than four pipe diameters from expansion joint.
- C. Attach guides to pipe, and secure guides to building structure.
- D. Install anchors at locations to prevent stresses from exceeding those permitted by ASME B31.9 and to prevent transfer of loading and stresses to connected equipment.
- E. Anchor Attachments:
 - 1. Anchor Attachment to Steel Pipe: Attach by welding. Comply with ASME B31.9 and ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
 - 2. Anchor Attachment to Galvanized-Steel Pipe: Attach with pipe hangers. Use MSS SP-69, Type 42, riser clamp welded to anchor.
 - 3. Anchor Attachment to Copper Tubing: Attach with pipe hangers. Use MSS SP-69, Type 24; U bolts bolted to anchor.
- F. Fabricate and install steel anchors by welding steel shapes, plates, and bars. Comply with ASME B31.9 and AWS D1.1/D1.1M.
 - 1. Anchor Attachment to Steel Structural Members: Attach by welding.
 - 2. Anchor Attachment to Concrete Structural Members: Attach by fasteners. Follow fastener manufacturer's written instructions.
- G. Use grout to form flat bearing surfaces for guides and anchors attached to concrete.

END OF SECTION 22016

SECTION 220517 - SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections:
 - 1. Section 220100 Plumbing General Requirements
 - 2. Section 220518 Escutcheons for Plumbing Piping
 - 3. Section 220719 Plumbing Piping Insulation
 - 4. Section 221113 Facility Water Distribution Piping
 - 5. Section 221116 Domestic Water Piping
 - 6. Section 221125 Natural Gas Piping
 - 7. Section 221313 Facility Sanitary Sewers
 - 8. Section 221316 Sanitary Waste and Vent Piping
 - 9. Section 221413 Storm Drainage Piping
- C. Section Includes:
 - 1. Sleeves.
 - 2. Stack-sleeve fittings.
 - 3. Sleeve-seal systems.
 - 4. Sleeve-seal fittings.
 - 5. Grout.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 SLEEVES

- A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.
- B. Galvanized-Steel Wall Pipes: ASTM A53/A53M, Schedule 40, with plain ends and welded steel collar; zinc coated.
- C. Galvanized-Steel-Pipe Sleeves: ASTM A53/A53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.

2.2 STACK-SLEEVE FITTINGS

- A. Description: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring, bolts, and nuts for membrane flashing.
 - 1. Underdeck Clamp: Clamping ring with setscrews.

2.3 SLEEVE-SEAL SYSTEMS

- A. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.
 - 1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
 - 2. Pressure Plates: Carbon steel.
 - 3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

2.4 SLEEVE-SEAL FITTINGS

- A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for imbedding in concrete slab or wall. Unit has plastic or rubber waterstop collar with center opening to match piping OD.

2.5 GROUT

- A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- B. Characteristics: Nonshrink; recommended for interior and exterior applications.
- C. Design Mix: 5000-psi, 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

- A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.
- B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.
 - 1. Sleeves are not required for core-drilled holes.
- C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.
 - 1. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.

2. Cut sleeves to length for mounting flush with both surfaces.
 - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.
 3. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.
- D. Install sleeves for pipes passing through interior partitions.
1. Cut sleeves to length for mounting flush with both surfaces.
 2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
 3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Section 079200 "Joint Sealants."
- E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 078413 "Penetration Firestopping."

3.2 STACK-SLEEVE-FITTING INSTALLATION

- A. Install stack-sleeve fittings in new slabs as slabs are constructed.
1. Install fittings that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
 2. Secure flashing between clamping flanges for pipes penetrating floors with membrane waterproofing. Comply with requirements for flashing specified in Section 076200 "Sheet Metal Flashing and Trim."
 3. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level.
 4. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
 5. Using grout, seal the space around outside of stack-sleeve fittings.
- B. Fire-Barrier Penetrations: Maintain indicated fire rating of floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 078413 "Penetration Firestopping."

3.3 SLEEVE-SEAL-SYSTEM INSTALLATION

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.
- B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.4 SLEEVE-SEAL-FITTING INSTALLATION

- A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

- B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.
- C. Secure nailing flanges to concrete forms.
- D. Using grout, seal the space around outside of sleeve-seal fittings.

3.5 SLEEVE AND SLEEVE-SEAL SCHEDULE

- A. Use sleeves and sleeve seals for the following piping-penetration applications:
 - 1. Exterior Concrete Walls above Grade:
 - a. Piping Smaller Than 6-inch: Galvanized-steel wall sleeves.
 - b. Piping 6-inch and Larger: Galvanized-steel wall sleeves.
 - 2. Exterior Concrete Walls below Grade:
 - a. Piping Smaller Than 6-inch: Cast-iron wall sleeves with sleeve-seal system.
 - 1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
 - b. Piping 6-inch and Larger: Cast-iron wall sleeves with sleeve-seal system.
 - 1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
 - 3. Concrete Slabs-on-Grade:
 - a. Piping Smaller Than 6-inch: Cast-iron wall sleeves with sleeve-seal system.
 - 1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
 - b. Piping 6-inch and Larger: Cast-iron wall sleeves with sleeve-seal system.
 - 1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
 - 4. Concrete Slabs above Grade:
 - a. Piping Smaller Than 6-inch: Galvanized-steel-pipe sleeves.
 - b. Piping 6-inch and Larger: Galvanized-steel-pipe sleeves.
 - 5. Interior Partitions:
 - a. Piping Smaller Than 6-inch: Galvanized-steel-pipe sleeves.
 - b. Piping 6-inch and Larger: Galvanized-steel-sheet sleeves.

END OF SECTION 220517

SECTION 220518 - ESCUTCHEONS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections:
 - 1. Section 220100 Plumbing General Requirements
 - 2. Section 220517 Sleeves and Sleeve Seals for Plumbing Piping
 - 3. Section 220719 Plumbing Piping Insulation
 - 4. Section 221113 Facility Water Distribution Piping
 - 5. Section 221116 Domestic Water Piping
 - 6. Section 221125 Natural Gas Piping
 - 7. Section 221313 Facility Sanitary Sewers
 - 8. Section 221316 Sanitary Waste and Vent Piping
 - 9. Section 221413 Facility Storm Drainage Piping

1.2 SUMMARY

- A. Section Includes:
 - 1. Escutcheons.
 - 2. Floor plates.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 ESCUTCHEONS

- A. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.
- B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.
- C. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.
- D. Split-Casting Brass Type: With polished, chrome-plated finish and with concealed hinge and setscrew.
- E. Split-Plate, Stamped-Steel Type: With chrome-plated finish, concealed hinge, and spring-clip fasteners.

2.2 FLOOR PLATES

- A. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.
- B. Split-Casting Floor Plates: Cast brass with concealed hinge.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.
- B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of insulated piping and with OD that completely covers opening.
 - 1. Escutcheons for New Piping:
 - a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
 - b. Chrome-Plated Piping: One-piece, cast-brass type with polished, chrome-plated finish.
 - c. Insulated Piping: One-piece, stamped-steel type.
 - d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
 - e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.
 - f. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
 - g. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, stamped-steel type.
 - h. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass finish.
 - i. Bare Piping in Unfinished Service Spaces: One-piece, stamped-steel type.
 - j. Bare Piping in Equipment Rooms: One-piece, cast-brass finish.
 - k. Bare Piping in Equipment Rooms: One-piece, stamped-steel type.
 - 2. Escutcheons for Existing Piping:
 - a. Chrome-Plated Piping: Split-casting brass type with polished, chrome-plated finish.
 - b. Insulated Piping: Split-plate, stamped-steel type with concealed hinge.
 - c. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-casting brass type with polished, chrome-plated finish.
 - d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-plate, stamped-steel type with concealed hinge.
 - e. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-casting brass type with polished, chrome-plated finish.
 - f. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-plate, stamped-steel type with concealed hinge.
 - g. Bare Piping in Unfinished Service Spaces: Split-casting brass type with polished, chrome-plated finish.
 - h. Bare Piping in Unfinished Service Spaces: Split-plate, stamped-steel type with concealed hinge.
 - i. Bare Piping in Equipment Rooms: Split-casting brass type with polished, chrome-plated finish.
 - j. Bare Piping in Equipment Rooms: Split-plate, stamped-steel type with concealed hinge.

- C. Install floor plates for piping penetrations of equipment-room floors.
- D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.
 - 1. New Piping: One-piece, floor-plate type.
 - 2. Existing Piping: Split-casting, floor-plate type.

3.2 FIELD QUALITY CONTROL

- A. Replace broken and damaged escutcheons and floor plates using new materials.

END OF SECTION 220518

SECTION 220519 - METERS AND GAGES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections:
 - 1. Section 220100 Plumbing General Requirements
 - 2. Section 220553 Identification for Plumbing Piping and Equipment
 - 3. Section 221113 Facility Water Distribution Piping
 - 4. Section 221116 Domestic Water Piping
 - 5. Section 221119 Domestic Water Piping Specialties

1.2 SUMMARY

- A. Section Includes:
 - 1. Bimetallic-actuated thermometers.
 - 2. Filled-system thermometers.
 - 3. Liquid-in-glass thermometers.
 - 4. Light-activated thermometers.
 - 5. Thermowells.
 - 6. Dial-type pressure gages.
 - 7. Gage attachments.
 - 8. Test plugs.
 - 9. Test-plug kits.
 - 10. Sight flow indicators.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Product Certificates: For each type of meter and gage, from manufacturer.
- C. Operation and Maintenance Data: For meters and gages to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Provide products by one of the following:
 - 1. Ashcroft Inc.
 - 2. Blue Ribbon Corp.

3. Marsh Bellofram.
4. Miljoco Corporation.
5. Palmer Wahl Instrumentation Group.
6. REOTEMP Instrument Corporation.
7. Tel-Tru Manufacturing Company.
8. Trerice, H. O. Co.
9. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
10. Weiss Instruments, Inc.
11. WIKA Instrument Corporation - USA.

2.2 BIMETALLIC-ACTUATED THERMOMETERS

- A. Standard: ASME B40.200.
- B. Case: Liquid-filled and sealed type(s); stainless steel with 3-inch nominal diameter.
- C. Dial: Nonreflective aluminum with permanently etched scale markings and scales in deg F.
- D. Connector Type(s): Union joint, rigid, back and rigid, bottom, with unified-inch screw threads.
- E. Connector Size: 1/2 inch, with ASME B1.1 screw threads.
- F. Stem: 0.25 in diameter; stainless steel.
- G. Window: Heavy glass.
- H. Ring: Stainless steel.
- I. Element: Bimetal coil.
- J. Pointer: Dark-colored metal.
- K. Accuracy: Plus or minus 1 percent of scale range.

2.3 FILLED-SYSTEM THERMOMETERS

- A. Direct-Mounted, Metal-Case, Vapor-Actuated Thermometers:
 1. Standard: ASME B40.200.
 2. Case: Sealed type, cast aluminum or drawn steel; 4-1/2-inch nominal diameter.
 3. Element: Bourdon tube or other type of pressure element.
 4. Movement: Mechanical, dampening type, with link to pressure element and connection to pointer.
 5. Dial: Nonreflective aluminum with permanently etched scale markings graduated in deg F.
 6. Pointer: Dark-colored metal.
 7. Window: Heavy glass.
 8. Ring: Stainless steel.
 9. Connector Type(s): Union joint, adjustable, 180 degrees in vertical plane, 360 degrees in horizontal plane, with locking device; with ASME B1.1 screw threads.
 10. Thermal System: Liquid-filled bulb in copper-plated steel, aluminum, or brass stem and of length to suit installation.
 - a. Design for Thermowell Installation: Bare stem.

11. Accuracy: Plus or minus 1 percent of scale range.

2.4 LIQUID-IN-GLASS THERMOMETERS

A. Metal-Case, Compact-Style, Liquid-in-Glass Thermometers:

1. Standard: ASME B40.200.
2. Case: Cast aluminum; 6-inch nominal size.
3. Case Form: Back angle or Straight unless otherwise indicated.
4. Tube: Glass with magnifying lens and blue organic liquid.
5. Tube Background: Nonreflective aluminum with permanently etched scale markings graduated in deg F.
6. Window: Glass.
7. Stem: Aluminum or brass and of length to suit installation.
 - a. Design for Thermowell Installation: Bare stem.
8. Connector: 3/4 inch, with ASME B1.1 screw threads.
9. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

B. Metal-Case, Industrial-Style, Liquid-in-Glass Thermometers:

1. Standard: ASME B40.200.
2. Case: Cast aluminum; 9-inch nominal size unless otherwise indicated.
3. Case Form: Back angle or Straight unless otherwise indicated.
4. Tube: Glass with magnifying lens and blue organic liquid.
5. Tube Background: Nonreflective aluminum with permanently etched scale markings graduated in deg F.
6. Window: Glass.
7. Stem: Aluminum and of length to suit installation.
 - a. Design for Thermowell Installation: Bare stem.
8. Connector: 1-1/4 inches, with ASME B1.1 screw threads.
9. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

2.5 THERMOWELLS

A. Thermowells:

1. Standard: ASME B40.200.
2. Description: Pressure-tight, socket-type fitting made for insertion into piping tee fitting.
3. Material for Use with Copper Tubing: CNR.
4. Material for Use with Steel Piping: CRES.
5. Type: Stepped shank unless straight or tapered shank is indicated.
6. External Threads: NPS 1/2, NPS 3/4, or NPS 1, ASME B1.20.1 pipe threads.
7. Internal Threads: 1/2, 3/4, and 1 inch, with ASME B1.1 screw threads.
8. Bore: Diameter required to match thermometer bulb or stem.
9. Insertion Length: Length required to match thermometer bulb or stem.
10. Lagging Extension: Include on thermowells for insulated piping and tubing.
11. Bushings: For converting size of thermowell's internal screw thread to size of thermometer connection.

- B. Heat-Transfer Medium: Mixture of graphite and glycerin.

2.6 PRESSURE GAGES

- A. Direct-Mounted, Metal-Case, Dial-Type Pressure Gages:

1. Standard: ASME B40.100.
2. Case: Liquid-filled; cast aluminum or drawn steel; 4 ½-inch nominal diameter.
3. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
4. Pressure Connection: Brass, with ¼-inch or ½-inch, ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
5. Movement: Mechanical, with link to pressure element and connection to pointer.
6. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi.
7. Pointer: Dark-colored metal.
8. Window: Glass.
9. Ring: Metal.
10. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.

2.7 GAGE ATTACHMENTS

- A. Snubbers: ASME B40.100, brass; with ¼-inch or ½-inch, ASME B1.20.1 pipe threads and piston-type surge-dampening device. Include extension for use on insulated piping.
- B. Valves: Brass ball, with ¼-inch or ½-inch, ASME B1.20.1 pipe threads.

2.8 TEST PLUGS

- A. Description: Test-station fitting made for insertion into piping tee fitting.
- B. Body: Brass or stainless steel with core inserts and gasketed and threaded cap. Include extended stem on units to be installed in insulated piping.
- C. Thread Size: ¼-inch or ½-inch, ASME B1.20.1 pipe thread.
- D. Minimum Pressure and Temperature Rating: 500 psig at 200 deg F.
- E. Core Inserts: Chlorosulfonated polyethylene synthetic and EPDM self-sealing rubber.

2.9 TEST-PLUG KITS

- A. Furnish one test-plug kit(s) containing one thermometer, one pressure gage and adapter, and carrying case. Thermometer sensing elements, pressure gage, and adapter probes shall be of diameter to fit test plugs and of length to project into piping.
- B. Low-Range Thermometer: Small, bimetallic insertion type with 1- to 2-inch-diameter dial and tapered-end sensing element. Dial range shall be at least 25 to 125 deg F.
- C. High-Range Thermometer: Small, bimetallic insertion type with 1- to 2-inch-diameter dial and tapered-end sensing element. Dial range shall be at least 0 to 220 deg F.

- D. Pressure Gage: Small, Bourdon-tube insertion type with 2- to 3-inch-diameter dial and probe. Dial range shall be at least 0 to 200 psig.
- E. Carrying Case: Metal or plastic, with formed instrument padding.

2.10 SIGHT FLOW INDICATORS

- A. Description: Piping inline-installation device for visual verification of flow.
- B. Construction: Bronze or stainless-steel body, with sight glass and ball, flapper, or paddle wheel indicator, and threaded or flanged ends.
- C. Minimum Pressure Rating: 150 psig.
- D. Minimum Temperature Rating: 200 deg F.
- E. End Connections for 2-inch and Smaller: Threaded.
- F. End Connections for 2-1/2-inch and Larger: Flanged.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install thermowells with socket extending to center of pipe and in vertical position in piping tees.
- B. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.
- C. Install thermowells with extension on insulated piping.
- D. Fill thermowells with heat-transfer medium.
- E. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.
- F. Install direct-mounted pressure gages in piping tees with pressure gage located on pipe at the most readable position.
- G. Install valve and snubber in piping for each pressure gage for fluids.
- H. Install test plugs in piping tees.
- I. Install thermometers in the following locations:
 - 1. As indicated on Plumbing Drawings.
- J. Install pressure gages in the following locations:
 - 1. Building water service entrance into building.
 - 2. Inlet and outlet of each pressure-reducing valve.
 - 3. Suction and discharge of each domestic water pump.

3.2 CONNECTIONS

- A. Install meters and gages adjacent to machines and equipment to allow service and maintenance of meters, gages, machines, and equipment.

3.3 ADJUSTING

- A. Adjust faces of meters and gages to proper angle for best visibility.

3.4 THERMOMETER SCALE-RANGE SCHEDULE

- A. Scale Range for Domestic Cold-Water Piping: 0 to 100 deg F.
- B. Scale Range for Domestic Hot-Water and hot water return piping: 0 to 250 deg F.

3.5 PRESSURE-GAGE SCHEDULE

- A. Pressure gages at discharge of water service into building shall be the following:
 - 1. Liquid-filled, direct-mounted, metal case.
- B. Pressure gages at inlet and outlet of each water pressure-reducing valve shall be the following:
 - 1. Liquid-filled, direct-mounted, metal case.
- C. Pressure gages at suction and discharge of each domestic water pump shall be the following:
 - 1. Liquid-filled, direct-mounted, metal case.

3.6 PRESSURE-GAGE SCALE-RANGE SCHEDULE

- A. Scale Range for Water Service Piping: 0 to 160 psi.

END OF SECTION 220519

SECTION 220523 – GENERAL DUTY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections:
 - 1. Section 220100 Plumbing General Requirements
 - 2. Section 220519 Meters and Gauges for Plumbing Piping
 - 3. Section 220529 Hangers and Supports for Plumbing Piping and Equipment
 - 4. Section 220553 Identification for Plumbing Piping and Equipment
 - 5. Section 221113 Facility Water Distribution Piping
 - 6. Section 221116 Domestic Water Piping
 - 7. Section 221119 Domestic Water Piping Specialties

1.2 SUMMARY

- A. Section Includes:
 - 1. Ball valves.
 - 2. Gate valves.
 - 3. Check valves.
 - 4. Globe valves.
 - 5. Butterfly valves.
 - 6. Angle valves.
 - 7. Chain wheels.

1.3 REFERENCES

- A. ASTM International:
 - 1. ASTM D1785 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
 - 2. ASTM D4101 - Standard Specification for Propylene Injection and Extrusion Materials.
- B. Manufacturers Standardization Society of the Valve and Fittings Industry:
 - 1. MSS SP 67 - Butterfly Valves.
 - 2. MSS SP 70 - Cast Iron Gate Valves, Flanged and Threaded Ends.
 - 3. MSS SP 71 - Cast Iron Swing Check Valves, Flanged and Threaded Ends.
 - 4. MSS SP 78 - Cast Iron Plug Valves, Flanged and Threaded Ends.
 - 5. MSS SP 80 - Bronze Gate, Globe, Angle and Check Valves.
 - 6. MSS SP 110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.
- C. Safe Drinking Water Act:
 - 1. SDWA 1417 - Reduction of Lead in Drinking Water.

1.4 DEFINITIONS

- A. CWP: Cold working pressure.
- B. EPDM: Ethylene propylene copolymer rubber.
- C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.
- D. NRS: Nonrising stem.
- E. OS&Y: Outside screw and yoke.
- F. RS: Rising stem.
- G. SWP: Steam working pressure.

1.5 SUBMITTALS

- A. Product Data: For each type of valve.
 - 1. Certification that products comply with NSF 61 Annex G.
 - 2. Product Data: Submit manufacturers catalog information with valve data and ratings for each service.
 - 3. Manufacturer's Installation Instructions: Submit hanging and support methods, joining procedures.
 - 4. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.6 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record actual locations of valves.
- B. Operation and Maintenance Data: Submit installation instructions, spare parts lists, exploded assembly views

1.7 QUALITY ASSURANCE

- A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.
- B. For drinking water service, provide valves complying with NSF 61.
- C. All valves installed on the domestic water distribution system shall comply with SDWA 1417. Exception shall be main shut-off valve at domestic water service entrance that is 2-inches or larger.
- D. All valve manufacturers shall demonstrate that valve products have been certified per NSF/ANSI Standard 372.
- E. All valves installed on the domestic water system shall have labeling of lead content engraved on the valve body.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
 - 1. Protect internal parts against rust and corrosion.
 - 2. Protect threads, flange faces, and soldered ends.
 - 3. Set ball valves open to minimize exposure of functional surfaces.
- B. Use the following precautions during storage:
 - 1. Maintain valve end protection.
 - 2. Store valves indoors and maintain at higher-than-ambient-dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.
- C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use operating handles or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

- A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.
- B. ASME Compliance:
 - 1. ASME B1.20.1 for threads for threaded end valves.
 - 2. ASME B16.1 for flanges on iron valves.
 - 3. ASME B16.5 for flanges on steel valves.
 - 4. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
 - 5. ASME B16.18 for solder-joint connections.
 - 6. ASME B31.9 for building services piping valves.
- C. NSF Compliance: NSF 61 Annex G and NSF 372 for valve materials for potable-water service.
- D. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.
- E. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- F. Valve Sizes: Same as upstream piping unless otherwise indicated.
- G. Valve Actuator Types:
 - 1. Gear Actuator: For quarter-turn valves 4-inch and larger.
 - 2. Handwheel: For valves other than quarter-turn types.
 - 3. Handlever: For quarter-turn valves smaller than 4-inch.
 - 4. Chainwheel: Device for attachment to valve handwheel, stem, or other actuator; of size and with chain for mounting height, as indicated in the "Valve Installation" Article.
- H. Valves in Insulated Piping:

1. Include 2-inch stem extensions.
2. Extended operating handles of nonthermal-conductive material and protective sleeves that allow operation of valves without breaking vapor seals or disturbing insulation.
3. Memory stops that are fully adjustable after insulation is applied.

I. Valve-End Connections:

1. Flanged: With flanges according to ASME B16.1 for iron valves.
2. Grooved: With grooves according to AWWA C606.
3. Solder Joint: With sockets according to ASME B16.18.
4. Threaded: With threads according to ASME B1.20.1.

J. Valve Bypass and Drain Connections: MSS SP-45.

2.2 VALVE MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Hammond Valve.
2. Milwaukee Valve Company
3. American Valve, Inc
4. NIBCO INC
5. Crane Co.; Crane Valve Group; Stockham Division
6. Red-White Valve Corporation
7. Victaulic
8. Tyco
9. Kennedy
10. Apollo Valve Co.
11. Watts
12. Kitz.
13. Jomar.

2.3 BRONZE BALL VALVES

A. Two-Piece, Bronze Ball Valves with Full Port and Stainless-Steel Trim:

1. Description:
 - a. Standard: MSS SP-110.
 - b. CWP Rating: 600 psig.
 - c. Body Design: Two piece.
 - d. Body Material: Bronze.
 - e. Ends: Threaded or soldered.
 - f. Seats: PTFE.
 - g. Stem: Stainless steel.
 - h. Ball: Stainless steel, vented.
 - i. Port: Full.

B. Three-Piece, Bronze Ball Valves with Full Port and Stainless-Steel Trim:

1. Description:
 - a. Standard: MSS SP-110.
 - b. CWP Rating: 600 psig.
 - c. Body Design: Three piece.

- d. Body Material: Bronze.
- e. Ends: Threaded.
- f. Seats: PTFE.
- g. Stem: Stainless steel.
- h. Ball: Stainless steel, vented.
- i. Port: Full.

2.4 STEEL BALL VALVES

- A. Class 150, Steel Ball Valves with Full Port:
 - 1. Description:
 - a. Standard: MSS SP-72.
 - b. CWP Rating: 285 psig.
 - c. Body Design: Split body.
 - d. Body Material: Carbon steel, ASTM A 216, Type WCB.
 - e. Ends: Flanged or threaded.
 - f. Seats: PTFE.
 - g. Stem: Stainless steel.
 - h. Ball: Stainless steel, vented.
 - i. Port: Full.

2.5 IRON BALL VALVES

- A. Class 150, Iron Ball Valves:
 - 1. Description:
 - a. Standard: MSS SP-72.
 - b. CWP Rating: 200 psig.
 - c. Body Design: Split body.
 - d. Body Material: ASTM A 126, gray iron.
 - e. Ends: Flanged or threaded.
 - f. Seats: PTFE.
 - g. Stem: Stainless steel.
 - h. Ball: Stainless steel.
 - i. Port: Full.

2.6 BRONZE GATE VALVES

- A. Class 150, NRS, Bronze Gate Valves:
 - 1. Description:
 - a. Standard: MSS SP-80, Type 1.
 - b. CWP Rating: 300 psig.
 - c. Body Material: Bronze with integral seat and union-ring bonnet.
 - d. Ends: Threaded.
 - e. Stem: Bronze.
 - f. Disc: Solid wedge; bronze.
 - g. Packing: Asbestos free.
 - h. Handwheel: Malleable iron, bronze, or aluminum.

2.7 IRON GATE VALVES

- A. Class 125, NRS, Iron Gate Valves:
 - 1. Description:
 - a. Standard: MSS SP-70, Type I.
 - b. CWP Rating: 200 psig.
 - c. Body Material: Gray iron with bolted bonnet.
 - d. Ends: Flanged.
 - e. Trim: Bronze.
 - f. Disc: Solid wedge.
 - g. Packing and Gasket: Asbestos free.
- B. Class 125, OS&Y, Iron Gate Valves:
 - 1. Description:
 - a. Standard: MSS SP-70, Type I.
 - b. CWP Rating: 200 psig.
 - c. Body Material: Gray iron with bolted bonnet.
 - d. Ends: Flanged.
 - e. Trim: Bronze.
 - f. Disc: Solid wedge.
 - g. Packing and Gasket: Asbestos free.

2.8 CHAINWHEELS

- A. Description: Valve actuation assembly with sprocket rim, chain guides, chain, and attachment brackets for mounting chain wheels directly to hand wheels.
 - 1. Sprocket Rim with Chain Guides: Ductile or cast iron, of type and size required for valve. Include epoxy coating.
 - 2. Chain: Hot-dip galvanized steel, of size required to fit sprocket rim.

2.9 BRONZE LIFT CHECK VALVES

- A. Class 125, Lift Check Valves with Bronze Disc:
 - 1. Description:
 - a. Standard: MSS SP-80, Type 1.
 - b. CWP Rating: 200 psig.
 - c. Body Design: Vertical flow.
 - d. Body Material: ASTM B 61 or ASTM B 62, bronze.
 - e. Ends: Threaded or soldered. See valve schedule articles.
 - f. Disc: Bronze.

2.10 BRONZE SWING CHECK VALVES

- A. Class 125, Bronze, Swing Check Valves with Bronze Disc:
 - 1. Description:
 - a. Standard: MSS SP-80, Type 3.

- b. CWP Rating: 200 psig.
- c. Body Design: Horizontal flow.
- d. Body Material: ASTM B 62, bronze.
- e. Ends: Threaded or soldered. See valve schedule articles.
- f. Disc: Bronze.

B. Class 150, Bronze Swing Check Valves with Bronze Disc:

1. Description:

- a. Standard: MSS SP-80, Type 3.
- b. CWP Rating: 300 psig.
- c. Body Design: Horizontal flow.
- d. Body Material: ASTM B 62, bronze.
- e. Ends: Threaded or soldered. See valve schedule articles.
- f. Disc: Bronze.

2.11 IRON SWING CHECK VALVES

A. Class 125, Iron Swing Check Valves with Metal Seats:

1. Description:

- a. Standard: MSS SP-71, Type I.
- b. CWP Rating: 200 psig.
- c. Body Design: Clear or full waterway.
- d. Body Material: ASTM A 126, gray iron with bolted bonnet.
- e. Ends: Flanged or threaded. See valve schedule articles.
- f. Trim: Bronze.
- g. Gasket: Asbestos free.

2.12 IRON SWING CHECK VALVES WITH CLOSURE CONTROL

A. Class 125, Iron Swing Check Valves with Lever- and Spring-Closure Control:

1. Description:

- a. Standard: MSS SP-71, Type I.
- b. CWP Rating: 200 psig.
- c. Body Design: Clear or full waterway.
- d. Body Material: ASTM A 126, gray iron with bolted bonnet.
- e. Ends: Flanged or threaded. See valve schedule articles.
- f. Trim: Bronze.
- g. Gasket: Asbestos free.
- h. Closure Control: Factory-installed exterior lever and weight.

2.13 IRON, GROOVED-END SWING CHECK VALVES

A. 300 CWP, Iron, Grooved-End Swing Check Valves:

1. Description:

- a. CWP Rating: 300 psig.
- b. Body Material: ASTM A 536, ductile iron.
- c. Seal: EPDM.

- d. Disc: Spring operated, ductile iron or stainless steel.

2.14 IRON, CENTER-GUIDED, SPRING-LOADED CHECK VALVES

A. Class 125, Iron, Compact-Wafer, Center-Guided Check Valves with Metal Seat:

1. Description:

- a. Standard: MSS SP-125.
- b. CWP Rating: 200 psig.
- c. Body Material: ASTM A 126, gray iron.
- d. Style: Compact wafer, spring loaded.
- e. Seat: Bronze.

B. Class 125, Iron, Globe, Center-Guided Check Valves with Metal Seat:

1. Description:

- a. Standard: MSS SP-125.
- b. CWP Rating: 200 psig.
- c. Body Material: ASTM A 126, gray iron.
- d. Style: Globe, spring loaded.
- e. Ends: Flanged.
- f. Seat: Bronze.

C. Class 150, Iron, Compact-Wafer, Center-Guided Check Valves with Metal Seat:

1. Description:

- a. Standard: MSS SP-125.
- b. CWP Rating: 300 psig.
- c. Body Material: ASTM A 395/A 395M or ASTM A 536, ductile iron.
- d. Style: Compact wafer, spring loaded.
- e. Seat: Bronze.

D. Class 150, Iron, Globe, Center-Guided Check Valves with Metal Seat:

1. Description:

- a. Standard: MSS SP-125.
- b. CWP Rating: 300 psig.
- c. Body Material: ASTM A 395/A 395M or ASTM A 536, ductile iron.
- d. Style: Globe, spring loaded.
- e. Ends: Flanged.
- f. Seat: Bronze.

E. Class 125, Iron, Globe, Center-Guided Check Valves with Resilient Seat:

1. Description:

- a. Standard: MSS SP-125.
- b. CWP Rating: 200 psig.
- c. Body Material: ASTM A 126, gray iron.
- d. Style: Globe, spring loaded.
- e. Ends: Flanged.
- f. Seat: EPDM.

F. Class 150, Iron, Globe, Center-Guided Check Valves with Resilient Seat:

1. Description:
 - a. Standard: MSS SP-125.
 - b. CWP Rating: 300 psig.
 - c. Body Material: ASTM A 395/A 395M or ASTM A 536, ductile iron.
 - d. Style: Globe, spring loaded.
 - e. Ends: Flanged.
 - f. Seat: EPDM or NBR.

G. Class 250, Iron, Globe, Center-Guided Check Valves with Resilient Seat:

- a. Standard: MSS SP-125.
- b. CWP Rating: 400 psig.
- c. Body Material: ASTM A 126, gray iron.
- d. Style: Globe, spring loaded.
- e. Ends: Flanged.
- f. Seat: EPDM or NBR.

2.15 BRONZE GLOBE VALVES

A. Class 125, Bronze Globe Valves with Bronze Disc:

- a. Standard: MSS SP-80, Type 1.
- b. CWP Rating: 200 psig.
- c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
- d. Ends: Threaded or solder joint.
- e. Stem and Disc: Bronze.
- f. Packing: Asbestos free.
- g. Handwheel: Malleable iron.

2.16 IRON GLOBE VALVES

A. Class 125, Iron Globe Valves:

- a. Standard: MSS SP-85, Type I.
- b. CWP Rating: 200 psig.
- c. Body Material: ASTM A 126, gray iron with bolted bonnet.
- d. Ends: Flanged.
- e. Trim: Bronze.
- f. Packing and Gasket: Asbestos free.

B. Class 250, Iron Globe Valves:

- a. Standard: MSS SP-85, Type I.
- b. CWP Rating: 500 psig.
- c. Body Material: ASTM A 126, gray iron with bolted bonnet.
- d. Ends: Flanged.
- e. Trim: Bronze.
- f. Packing and Gasket: Asbestos free.

2.17 IRON, FLANGE BUTTERFLY VALVES

- A. 200 CWP, Iron, Flange Butterfly Valves with EPDM Seat and Stainless-Steel Disc:
 - a. Standard: MSS SP-67, Type I.
 - b. CWP Rating: 200 psig.
 - c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
 - d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
 - e. Seat: EPDM.
 - f. Stem: One- or two-piece stainless steel.
 - g. Disc: Stainless steel.

2.18 IRON, GROOVED-END BUTTERFLY VALVES

- A. 175 CWP, Iron, Grooved-End Butterfly Valves:
 - a. Standard: MSS SP-67, Type I.
 - b. CWP Rating: 175 psig.
 - c. Body Material: Coated, ductile iron.
 - d. Stem: Two-piece stainless steel.
 - e. Disc: Coated, ductile iron.
 - f. Seal: EPDM.

2.19 BRONZE ANGLE VALVES

- A. Class 125, Bronze Angle Valves with Bronze Disc:
 - a. Standard: MSS SP-80, Type 1.
 - b. CWP Rating: 200 psig.
 - c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
 - d. Ends: Threaded.
 - e. Stem and Disc: Bronze.
 - f. Packing: Asbestos free.
 - g. Handwheel: Malleable iron.
- B. Class 150, Bronze Angle Valves with Bronze Disc:
 - a. Standard: MSS SP-80, Type 1.
 - b. CWP Rating: 300 psig.
 - c. Body Material: ASTM B 62, bronze with integral seat and union-ring bonnet.
 - d. Ends: Threaded.
 - e. Stem and Disc: Bronze.
 - f. Packing: Asbestos free.
 - g. Handwheel: Malleable iron.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- C. Examine threads on valve and mating pipe for form and cleanliness.
- D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.
- E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

- A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves in horizontal piping with stem at or above center of pipe.
- D. Install valves in position to allow full stem movement.
- E. Install chainwheels on operators for gate valves 4-inch and larger and more than 96 inches above floor. Extend chains to 60 inches above finished floor
- F. Install check valves for proper direction of flow and as follows:
 - 1. Swing Check Valves: In horizontal position with hinge pin level.
 - 2. Center-Guided and Plate-Type Check Valves: In horizontal or vertical position, between flanges.
 - 3. Lift Check Valves: With stem upright and plumb.
- G. Install valve tags. Comply with requirements in Section 220553 "Identification for Plumbing Piping and Equipment" for valve tags and schedules.

3.3 ADJUSTING

- A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. If valves with specified CWP ratings are unavailable, the same types of valves with higher CWP ratings may be substituted.

- B. If valve applications are not indicated, use the following:
 - 1. Shutoff Service: Gate valves.
 - 2. Butterfly Valve Dead-End Service: Single-flange (lug) type.
 - 3. Throttling Service: Globe or ball valves.
- C. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP classes or CWP ratings may be substituted.
- D. Select valves except wafer types with the following end connections:
 - 1. For Copper Tubing, 2-1/2-inch to 4-inch: Flanged ends except where threaded valve-end option is indicated in valve schedules below.
 - 2. For Copper Tubing, 5-inch and Larger: Flanged ends.
 - 3. For Steel Piping, 2-inch and Smaller: Threaded ends.
 - 4. For Steel Piping, 2-1/2-inch to 4-inch: Flanged ends except where threaded valve-end option is indicated in valve schedules below.
 - 5. For Steel Piping, 5-inch and Larger: Flanged ends.

3.5 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE

- A. Pipe 2-inch and Smaller:
 - 1. Bronze Valves: May be provided with solder-joint ends instead of threaded ends.
 - 2. Two-piece, bronze ball valves with full port and stainless-steel trim.
 - 3. Three-piece, bronze ball valves with full port and stainless-steel trim.
- B. Pipe 2-1/2-inch and Larger:
 - 1. Steel and Iron Valves, 2-1/2-inch to 4-inch: May be provided with threaded ends instead of flanged ends.
 - 2. Two-piece, bronze ball valves with full port and stainless-steel trim.
 - 3. Three-piece, bronze ball valves with full port and stainless-steel trim.
 - 4. Class 150, steel ball valves with full port.
 - 5. Class 150, iron ball valves.

3.6 SANITARY-WASTE AND STORM-DRAINAGE VALVE SCHEDULE

- A. Pipe 2-inch and Smaller:
 - 1. Bronze Swing Check Valves: Class 150, bronze disc.
 - 2. Bronze Gate Valves: Class 150, NRS.
 - 3. Bronze Globe Valves: Class 150, bronze disc.
- B. Pipe 2-1/2-inch and Larger:
 - 1. Iron Valves, 2-1/2-inch to 4-inch: May be provided with threaded ends instead of flanged ends.
 - 2. Iron Swing Check Valves: Class 125, metal seats.
 - 3. Iron Swing Check Valves with Closure Control: Class 125, lever and spring.

END OF SECTION 220523

SECTION 220529 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Requirements:
 - 1. Section 055000 "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
- C. Related Sections:
 - 1. Section 220100 Plumbing General Requirements
 - 2. Section 220516 Expansion Fittings and Loops for Plumbing Piping
 - 3. Section 220523 General Duty Valves for Plumbing Piping
 - 4. Section 220548 Vibration and Seismic Controls for Plumbing Piping and Equipment
 - 5. Section 220719 Plumbing Piping Insulation
 - 6. Section 221116 Domestic Water Piping
 - 7. Section 221125 Natural Gas Piping
 - 8. Section 221316 Sanitary Waste and Vent Piping
 - 9. Section 221413 Storm Drainage Piping
 - 10. Section 221423 Storm Drainage Piping Specialties

1.2 SUMMARY

- A. Section Includes:
 - 1. Metal pipe hangers and supports.
 - 2. Trapeze pipe hangers.
 - 3. Fiberglass pipe hangers.
 - 4. Metal framing systems.
 - 5. Fiberglass strut systems.
 - 6. Thermal-hanger shield inserts.
 - 7. Fastener systems.
 - 8. Pipe stands.
 - 9. Pipe positioning systems.
 - 10. Equipment supports.

1.3 DEFINITIONS

- A. MSS: Manufacturers Standardization Society of the Valve and Fittings Industry Inc.

1.4 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance: Hangers and supports for plumbing piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.
 - 1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
 - 2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
 - 3. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show fabrication and installation details and include calculations for the following; include Product Data for components:
 - 1. Trapeze pipe hangers.
 - 2. Metal framing systems.
 - 3. Fiberglass strut systems.
 - 4. Pipe stands.
 - 5. Equipment supports.
- C. Delegated-Design Submittal: For trapeze hangers indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - 1. Detail fabrication and assembly of trapeze hangers.
 - 2. Design Calculations: Calculate requirements for designing trapeze hangers.

1.6 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

1.7 QUALITY ASSURANCE

- A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports (Inside Building):

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

B. Copper Pipe Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

2.2 TRAPEZE PIPE HANGERS

- #### **A.**
- Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.3 METAL FRAMING SYSTEMS

A. MFMA Manufacturer Metal Framing Systems:

1. Description: Shop- or field-fabricated pipe-support assembly for supporting multiple parallel pipes.
2. Standard: MFMA-4.
3. Channels: Continuous slotted steel channel with intumed lips.
4. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
6. Metallic Coating: Hot-dipped galvanized.
7. Paint Coating: Epoxy.
8. Plastic Coating: Epoxy.

B. Non-MFMA Manufacturer Metal Framing Systems:

1. Description: Shop- or field-fabricated pipe-support assembly made of steel channels, accessories, fittings, and other components for supporting multiple parallel pipes.
2. Standard: Comply with MFMA-4.
3. Channels: Continuous slotted steel channel with intumed lips.
4. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
6. Coating: Zinc.

2.4 THERMAL-HANGER SHIELD INSERTS

- A. Insulation-Insert Material for Hot and Cold Piping: ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength and vapor barrier.
- B. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
- C. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.
- D. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.5 FASTENER SYSTEMS

- A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
- B. Mechanical-Expansion Anchors: Insert-wedge-type, stainless-steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.6 PIPE STANDS

- A. General Requirements for Pipe Stands: Shop- or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.
- B. Compact Pipe Stand: One-piece plastic unit with integral-rod roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.
- C. Low-Type, Single-Pipe Stand: One-piece stainless-steel base unit with plastic roller, for roof installation without membrane penetration.
- D. High-Type, Single-Pipe Stand:
 - 1. Description: Assembly of base, vertical and horizontal members, and pipe support, for roof installation without membrane penetration.
 - 2. Base: Stainless steel.
 - 3. Vertical Members: Two or more cadmium-plated-steel or stainless-steel, continuous-thread rods.
 - 4. Horizontal Member: Cadmium-plated-steel or stainless-steel rod with plastic or stainless-steel, roller-type pipe support.
- E. High-Type, Multiple-Pipe Stand:
 - 1. Description: Assembly of bases, vertical and horizontal members, and pipe supports, for roof installation without membrane penetration.
 - 2. Bases: One or more; plastic.
 - 3. Vertical Members: Two or more protective-coated-steel channels.
 - 4. Horizontal Member: Protective-coated-steel channel.
 - 5. Pipe Supports: Galvanized-steel, clevis-type pipe hangers.
- F. Curb-Mounting-Type Pipe Stands: Shop- or field-fabricated pipe supports made from structural-steel shapes, continuous-thread rods, and rollers, for mounting on permanent stationary roof curb.

2.7 PIPE POSITIONING SYSTEMS

- A. Description: IAPMO PS 42, positioning system of metal brackets, clips, and straps for positioning piping in pipe spaces; for plumbing fixtures in commercial applications.

2.8 EQUIPMENT SUPPORTS

- A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.9 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.
- B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
 - 1. Properties: Nonstaining, noncorrosive, and nongaseous.
 - 2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

- A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.
- B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.
 - 1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
 - 2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.
- C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.
- D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- E. Fastener System Installation:
 - 1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
 - 2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- F. Pipe Stand Installation:

1. Pipe Stand Types except Curb-Mounted Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
 2. Curb-Mounted-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb. See Section 077200 "Roof Accessories" for curbs.
- G. Pipe Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture.
- H. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.
- I. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- J. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- K. Install lateral bracing with pipe hangers and supports to prevent swaying.
- L. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, 2-1/2-inch and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.
- M. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- N. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.
- O. Insulated Piping:
1. Attach clamps and spacers to piping.
 - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
 - b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
 - c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
 2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe 4-inch and larger if pipe is installed on rollers.
 3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe 4-inch and larger if pipe is installed on rollers.
 4. Shield Dimensions for Pipe: Not less than the following:
 - a. 1/4-inch to 3-inch: 12 inches long and 0.048 inch thick.

- b. 4-inch: 12 inches long and 0.06 inch thick.
 - c. 5-inch and 6-inch: 18 inches long and 0.06 inch thick.
 - d. 8-inch to 14-inch: 24 inches long and 0.075 inch thick.
 - e. 16-inch to 24-inch: 24 inches long and 0.105 inch thick.
- 5. Pipes 8-inch and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
 - 6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
- B. Grouting: Place grout under supports for equipment and make bearing surface smooth.
- C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 METAL FABRICATIONS

- A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.
- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.5 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - 1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.

- B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 9.
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.6 HANGER AND SUPPORT SCHEDULE

- A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use carbon-steel pipe hangers and supports, metal trapeze pipe hangers and metal framing systems and attachments for general service applications.
- F. Use copper-plated pipe hangers and copper or stainless-steel attachments for copper piping and tubing.
- G. Use padded hangers for piping that is subject to scratching.
- H. Use thermal-hanger shield inserts for insulated piping and tubing.
- I. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes ½-inch to 12-inch.
 - 2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F, pipes 4-inch to 24-inch, requiring up to 4-inches of insulation.
 - 3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes ¾-inch to 12-inch, requiring clamp flexibility and up to 4-inches of insulation.
 - 4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes ½-inch to 12-inch if little or no insulation is required.
 - 5. Pipe Hangers (MSS Type 5): For suspension of pipes ½-inch to 4-inch, to allow off-center closure for hanger installation before pipe erection.
 - 6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes ¾-inch to 8-inch.
 - 7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes ½-inch to 8-inch.
 - 8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes ½-inch to 8-inch.
 - 9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes ½-inch to 8-inch.
 - 10. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes 3/8-inch to 8-inch.
 - 11. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes 3/8-inch to 3-inch.

12. U-Bolts (MSS Type 24): For support of heavy pipes ½-inch to 12-inch.
 13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
 14. Pipe Saddle Supports (MSS Type 36): For support of pipes 4-inch to 12-inch, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
 15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes 4-inch to 12-inch, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
 16. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes 2-1/2-inch to 12-inch if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.
 17. Single-Pipe Rolls (MSS Type 41): For suspension of pipes 1-inch to 12-inch, from two rods if longitudinal movement caused by expansion and contraction might occur.
 18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes 2-1/2-inch to 12-inch, from single rod if horizontal movement caused by expansion and contraction might occur.
 19. Complete Pipe Rolls (MSS Type 44): For support of pipes 2-inch to 12-inch if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
 20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes 2-inch to 12-inch if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.
 21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes 2-inch to 12-inch if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.
- J. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers ¾-inch to 12-inch.
 2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers ¾-inch to 12-inch if longer ends are required for riser clamps.
- K. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6-inches for heavy loads.
 2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
 3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
 4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
 5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.
- L. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
 2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
 3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
 4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
 5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
 6. C-Clamps (MSS Type 23): For structural shapes.

7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
 8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
 9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
 10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
 11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
 12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:
 - a. Light (MSS Type 31): 750 lb.
 - b. Medium (MSS Type 32): 1500 lb.
 - c. Heavy (MSS Type 33): 3000 lb.
 13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
 14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
 15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.
- M. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
 2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
 3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.
- N. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
 2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
 3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
 4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
 5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from hanger.
 6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.
 7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from trapeze support.
 8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:
 - a. Horizontal (MSS Type 54): Mounted horizontally.
 - b. Vertical (MSS Type 55): Mounted vertically.
 - c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.
- O. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

- P. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.
- Q. Use mechanical-expansion anchors instead of building attachments where required in concrete construction.
- R. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

END OF SECTION 220529

SECTION 220548 - VIBRATION AND SEISMIC CONTROLS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections:
 - 1. Section 220100 Plumbing General Requirements
 - 2. Section 220516 Expansion Fittings and Loops for Plumbing Piping
 - 3. Section 220517 Sleeves and Sleeve Seals for Plumbing Piping
 - 4. Section 220529 Hangers and Supports for Plumbing Piping and Equipment
 - 5. Section 221116 Domestic Water Piping
 - 6. Section 221125 Natural Gas Piping
 - 7. Section 221316 Sanitary Waste and Vent Piping
 - 8. Section 221413 Storm Drainage Piping

1.2 SUMMARY

- A. Section Includes:
 - 1. Elastomeric isolation pads.
 - 2. Elastomeric isolation mounts.
 - 3. Restrained elastomeric isolation mounts.
 - 4. Open-spring isolators.
 - 5. Housed-spring isolators.
 - 6. Restrained-spring isolators.
 - 7. Housed-restrained-spring isolators.
 - 8. Pipe-riser resilient supports.
 - 9. Resilient pipe guides.
 - 10. Elastomeric hangers.
 - 11. Spring hangers.
 - 12. Snubbers.
 - 13. Restraint channel bracings.
 - 14. Restraint cables.
 - 15. Seismic-restraint accessories.
 - 16. Mechanical anchor bolts.
 - 17. Adhesive anchor bolts.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.
 - 2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of vibration isolation device and seismic-restraint component required.

- a. Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear as evaluated by an agency acceptable to authorities having jurisdiction.
 - b. Annotate to indicate application of each product submitted and compliance with requirements.
3. Interlocking Snubbers: Include ratings for horizontal, vertical, and combined loads.
- B. Shop Drawings:
 1. Detail fabrication and assembly of equipment bases. Detail fabrication including anchorages and attachments to structure and to supported equipment.
 2. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.
- C. Delegated-Design Submittal: For each vibration isolation and seismic-restraint device.
 1. Include design calculations and details for selecting vibration isolators and seismic restraints complying with performance requirements, design criteria, and analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 2. Design Calculations: Calculate static and dynamic loading due to equipment weight and operation, due to seismic forces required to select vibration isolators, and due to seismic restraints.
 3. Riser Supports: Include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on building structure, spring deflection changes, and seismic loads. Include certification that riser system was examined for excessive stress and that none exists.
 4. Seismic-Restraint Details:
 - a. Design Analysis: To support selection and arrangement of seismic restraints. Include calculations of combined tensile and shear loads.
 - b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to the restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events. Indicate association with vibration isolation devices.
 - c. Coordinate seismic-restraint and vibration isolation details with wind-restraint details required for equipment mounted outdoors. Comply with requirements in other Sections for equipment mounted outdoors.
 - d. Preapproval and Evaluation Documentation: By an evaluation service member of ICC-ES, OSHPD or an agency acceptable to authorities having jurisdiction, showing maximum ratings of restraint items and the basis for approval (tests or calculations).

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Show coordination of vibration isolation device installation and seismic bracing for plumbing piping and equipment with other systems and equipment in the vicinity, including other supports and restraints, if any.
- B. Qualification Data: For professional engineer and testing agency.
- C. Welding certificates.

- D. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7 and that is acceptable to authorities having jurisdiction.
- B. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.
- C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- D. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval OPA number from OSHPD, preapproval by ICC-ES, or preapproval by another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are unavailable, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Seismic-Restraint Loading:
 - 1. Site Class as Defined in the IBC: [A] [B] [C] [D] [E] [F].
 - 2. Assigned Seismic Use Group or Building Category as Defined in the IBC: [I] [II] [III].
 - a. Component Importance Factor: 1.0.
 - b. Component Response Modification Factor: 1.5.
 - c. Component Amplification Factor: 1.0.
 - 3. Design Spectral Response Acceleration at Short Periods (0.2 Second).
 - 4. Design Spectral Response Acceleration at 1.0-Second Period.
 - 5. Rated strengths, features, and applications shall be as defined in reports by an agency acceptable to authorities having jurisdiction.
 - a. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they are subjected.

2.2 ELASTOMERIC ISOLATION PADS

- A. Elastomeric Isolation Pads.
 - 1. Fabrication: Single or multiple layers of sufficient durometer stiffness for uniform loading over pad area.
 - 2. Size: Factory or field cut to match requirements of supported equipment.

3. Pad Material: Oil and water resistant with elastomeric properties.
4. Surface Pattern: Smooth pattern.
5. Infused nonwoven cotton or synthetic fibers.
6. Load-bearing metal plates adhered to pads.
7. Sandwich-Core Material: Resilient and elastomeric.

- a. Surface Pattern: Smooth pattern.
- b. Infused nonwoven cotton or synthetic fibers.

2.3 ELASTOMERIC ISOLATION MOUNTS

A. Double-Deflection, Elastomeric Isolation Mounts.

1. Mounting Plates:
 - a. Top Plate: Encapsulated steel load transfer top plates, factory drilled and threaded with threaded studs or bolts.
 - b. Baseplate: Encapsulated steel bottom plates with holes provided for anchoring to support structure.
2. Elastomeric Material: Molded, oil-resistant rubber, neoprene, or other elastomeric material.

2.4 RESTRAINED ELASTOMERIC ISOLATION MOUNTS

A. Restrained Elastomeric Isolation Mounts.

1. Description: All-directional isolator with seismic restraints containing two separate and opposing elastomeric elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.
 - a. Housing: Cast-ductile iron or welded steel.
 - b. Elastomeric Material: Molded, oil-resistant rubber, neoprene, or other elastomeric material.

2.5 OPEN-SPRING ISOLATORS

A. Freestanding, Laterally Stable, Open-Spring Isolators.

1. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
2. Minimum Additional Travel: 50 percent of the required deflection at rated load.
3. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
4. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
5. Baseplates: Factory-drilled steel plate for bolting to structure with an elastomeric isolator pad attached to the underside. Baseplates shall limit floor load to 500 psig.
6. Top Plate and Adjustment Bolt: Threaded top plate with adjustment bolt and cap screw to fasten and level equipment.

2.6 HOUSED-SPRING ISOLATORS

A. Freestanding, Laterally Stable, Open-Spring Isolators in Two-Part Telescoping Housing.

1. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.

2. Minimum Additional Travel: 50 percent of the required deflection at rated load.
3. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
4. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
5. Two-Part Telescoping Housing: A steel top and bottom frame separated by an elastomeric material and enclosing the spring isolators.
 - a. Drilled base housing for bolting to structure with an elastomeric isolator pad attached to the underside. Bases shall limit floor load to 500 psig.
 - b. Top housing with elastomeric pad.

2.7 RESTRAINED-SPRING ISOLATORS

- A. Freestanding, Laterally Stable, Open-Spring Isolators with Vertical-Limit Stop Restraint.
 1. Housing: Steel housing with vertical-limit stops to prevent spring extension due to weight being removed.
 - a. Base with holes for bolting to structure with an elastomeric isolator pad attached to the underside. Bases shall limit floor load to 500 psig.
 - b. Top plate with elastomeric pad.
 - c. Internal leveling bolt that acts as blocking during installation.
 2. Restraint: Limit stop as required for equipment and authorities having jurisdiction.
 3. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
 4. Minimum Additional Travel: 50 percent of the required deflection at rated load.
 5. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
 6. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

2.8 HOUSED-RESTRAINED-SPRING ISOLATORS

- A. Freestanding, Steel, Open-Spring Isolators with Vertical-Limit Stop Restraint in Two-Part Telescoping Housing.
 1. Two-Part Telescoping Housing: A steel top and bottom frame separated by an elastomeric material and enclosing the spring isolators. Housings are equipped with adjustable snubbers to limit vertical movement.
 - a. Drilled base housing for bolting to structure with an elastomeric isolator pad attached to the underside. Bases shall limit floor load to 500 psig.
 - b. Threaded top housing with adjustment bolt and cap screw to fasten and level equipment.
 2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
 3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
 4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
 5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

2.9 PIPE-RISER RESILIENT SUPPORT

- A. Description: All-directional, acoustical pipe anchor consisting of two steel tubes separated by a minimum 1/2-inch thick neoprene.
1. Vertical-Limit Stops: Steel and neoprene vertical-limit stops arranged to prevent vertical travel in both directions.
 2. Maximum Load Per Support: 500 psig on isolation material providing equal isolation in all directions.

2.10 RESILIENT PIPE GUIDES

- A. Description: Telescopic arrangement of two steel tubes or post and sleeve arrangement separated by a minimum 1/2-inch thick neoprene.
1. Factory-Set Height Guide with Shear Pin: Shear pin shall be removable and reinsertable to allow for selection of pipe movement. Guides shall be capable of motion to meet location requirements.

2.11 ELASTOMERIC HANGERS

- A. Elastomeric Mount in a Steel Frame with Upper and Lower Steel Hanger Rods.
1. Frame: Steel, fabricated with a connection for an upper threaded hanger rod and an opening on the underside to allow for a maximum of 30 degrees of angular lower hanger-rod misalignment without binding or reducing isolation efficiency.
 2. Dampening Element: Molded, oil-resistant rubber, neoprene, or other elastomeric material with a projecting bushing for the underside opening preventing steel to steel contact.

2.12 SPRING HANGERS

- A. Combination Coil-Spring and Elastomeric-Insert Hanger with Spring and Insert in Compression.
1. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
 2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
 3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
 4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
 5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
 6. Elastomeric Element: Molded, oil-resistant rubber or neoprene. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.
 7. Adjustable Vertical Stop: Steel washer with neoprene washer "up-stop" on lower threaded rod.
 8. Self-centering hanger-rod cap to ensure concentricity between hanger rod and support spring coil.

2.13 SNUBBERS

- A. Description: Factory fabricated using welded structural-steel shapes and plates, anchor bolts, and replaceable resilient isolation washers and bushings.
1. Anchor bolts for attaching to concrete shall be seismic-rated, drill-in, and stud-wedge or female-wedge type.

2. Resilient Isolation Washers and Bushings: Oil- and water-resistant neoprene.
3. Maximum 1/4-inch air gap, and minimum 1/4-inch thick resilient cushion.

2.14 RESTRAINT CHANNEL BRACINGS

- A. Description: MFMA-4, shop- or field-fabricated bracing assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; rated in tension, compression, and torsion forces.

2.15 RESTRAINT CABLES

- A. Restraint Cables: ASTM A 603 galvanized-steel cables. End connections made of steel assemblies with thimbles, brackets, swivel, and bolts designed for restraining cable service; with a minimum of two clamping bolts for cable engagement.

2.16 SEISMIC-RESTRAINT ACCESSORIES

- A. Hanger-Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod.
- B. Hinged and Swivel Brace Attachments: Multifunctional steel connectors for attaching hangers to rigid channel bracings and restraint cables.
- C. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchor bolts and studs.
- D. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings, and matched to type and size of attachment devices used.
- E. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

2.17 MECHANICAL ANCHOR BOLTS

- A. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

2.18 ADHESIVE ANCHOR BOLTS

- A. Adhesive Anchor Bolts: Drilled-in and capsule anchor system containing PVC or urethane methacrylate-based resin and accelerator, or injected polymer or hybrid mortar adhesive. Provide anchor bolts and hardware with zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and equipment to receive vibration isolation and seismic-control devices for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

- A. Multiple Pipe Supports: Secure pipes to trapeze member with clamps approved for application by an evaluation service member of ICC-ES, OSHPD or an agency acceptable to authorities having jurisdiction.
- B. Hanger-Rod Stiffeners: Install hanger-rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods due to seismic forces.
- C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength is adequate to carry present and future static and seismic loads within specified loading limits.

3.3 VIBRATION CONTROL AND SEISMIC-RESTRAINT DEVICE INSTALLATION

- A. Coordinate the location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in Division 3.
- B. Installation of vibration isolators must not cause any change of position of equipment or piping resulting in stresses or misalignment.
- C. Comply with requirements in Section 077200 "Roof Accessories" for installation of equipment supports and roof penetrations.
- D. Equipment Restraints:
 - 1. Install seismic snubbers on plumbing equipment mounted on vibration isolators. Locate snubbers as close as possible to vibration isolators and bolt to equipment base and supporting structure.
 - 2. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.
 - 3. Install seismic-restraint devices using methods approved by an evaluation service member of ICC-ES, OSHPD or an agency acceptable to authorities having jurisdiction that provides required submittals for component.
- E. Piping Restraints:
 - 1. Comply with requirements in MSS SP-127.
 - 2. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c.
 - 3. Brace a change of direction longer than 12 feet.

- F. Install cables so they do not bend across edges of adjacent equipment or building structure.
- G. Install seismic-restraint devices using methods approved by an evaluation service member of ICC-ES, OSHPD or an agency acceptable to authorities having jurisdiction that provides required submittals for component.
- H. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.
- I. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.
- J. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.
- K. Drilled-in Anchors:
 - 1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
 - 2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
 - 3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
 - 4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
 - 5. Set anchors to manufacturer's recommended torque, using a torque wrench.
 - 6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.4 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

- A. Install flexible connections in piping where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where the connections terminate with connection to equipment that is anchored to a different structural element from the one supporting the connections as they approach equipment. Comply with requirements in Section 221116 "Domestic Water Piping" and Section 221125 "Natural Gas Pipe" for piping flexible connections.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Perform tests and inspections.
- C. Tests and Inspections:
 - 1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.

2. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless postconnection testing has been approved), and with at least seven days' advance notice.
 3. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
 4. Test at least four of each type and size of installed anchors and fasteners selected by Architect.
 5. Test to 90 percent of rated proof load of device.
 6. Measure isolator restraint clearance.
 7. Measure isolator deflection.
 8. Verify snubber minimum clearances.
- D. Remove and replace malfunctioning units and retest as specified above.
- E. Prepare test and inspection reports.

3.6 ADJUSTING

- A. Adjust isolators after piping system is at operating weight.
- B. Adjust limit stops on restrained-spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.

END OF SECTION 220548

SECTION 220553 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections:
 - 1. Section 220100 Plumbing General Requirements
 - 2. Section 220523 General Duty Valves for Plumbing Piping
 - 3. Section 221116 Domestic Water Piping
 - 4. Section 221125 Natural Gas Piping
 - 5. Section 221316 Sanitary Waste and Vent Piping
 - 6. Section 221413 Storm Drainage Piping

1.2 SUMMARY

- A. Section Includes:
 - 1. Equipment labels.
 - 2. Warning signs and labels.
 - 3. Pipe labels.
 - 4. Valve tags.
 - 5. Warning tags.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For color, letter style, and graphic representation required for each identification material and device.
- C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.
- D. Valve numbering scheme.
- E. Valve Schedules: For each piping system to include in maintenance manuals.

1.4 COORDINATION

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- B. Coordinate installation of identifying devices with locations of access panels and doors.

- C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment:

1. Material and Thickness: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Letter Color: Black.
3. Background Color: White.
4. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
5. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
6. Fasteners: Stainless-steel self-tapping screws.
7. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Plastic Labels for Equipment:

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8-inch-thick, and having predrilled holes for attachment hardware.
2. Letter Color: Black.
3. Background Color: White.
4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
7. Fasteners: Stainless-steel self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

- C. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), and the Specification Section number and title where equipment is specified.

- D. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number, and identify Drawing numbers where equipment is indicated (plans, details, and schedules) and the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

- A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8-inch-thick, and having predrilled holes for attachment hardware.
- B. Letter Color: Black.
- C. Background Color: White.

- D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
- E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
- F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
- G. Fasteners: Stainless-steel self-tapping screws.
- H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- I. Label Content: Include caution and warning information plus emergency notification instructions.

2.3 PIPE LABELS

- A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.
- B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.
- C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.
- D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings; also include pipe size and an arrow indicating flow direction.
 - 1. Flow-Direction Arrows: Integral with piping-system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
 - 2. Lettering Size: Size letters according to ASME A13.1 for piping (minimum of 1/2-inch).

2.4 VALVE TAGS

- A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.
 - 1. Tag Material: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
 - 2. Fasteners: Brass wire-link chain or beaded chain.
- B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.
 - 1. Valve-tag schedule shall be included in operation and maintenance data.

2.5 WARNING TAGS

- A. Description: Preprinted or partially preprinted accident-prevention tags of plasticized card stock with matte finish suitable for writing.
 - 1. Size: Approximately 4 by 7 inches.
 - 2. Fasteners: Reinforced grommet and wire.
 - 3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
 - 4. Color: Safety yellow background with black lettering.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 GENERAL INSTALLATION REQUIREMENTS

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- B. Coordinate installation of identifying devices with locations of access panels and doors.
- C. Install identifying devices before installing acoustical ceilings and similar concealment.

3.3 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.

3.4 PIPE LABEL INSTALLATION

- A. Piping Color Coding: Painting of piping is specified in Division 9.
- B. Stenciled Pipe Label Option: Stenciled labels may be provided instead of manufactured pipe labels, at Installer's option. Install stenciled pipe labels, complying with ASME A13.1, with painted, color-coded bands or rectangles on each piping system.
 - 1. Identification Paint: Use for contrasting background.
- C. Pipe Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
 - 1. Near each valve and control device.

2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
 3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
 4. At access doors, manholes, and similar access points that permit view of concealed piping.
 5. Near major equipment items and other points of origination and termination.
 6. Spaced at maximum intervals of 25 feet along each run. Reduce intervals to 10 feet in areas of congested piping and equipment.
 7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.
- D. Directional Flow Arrows: Arrows shall be used to indicate direction of flow in pipes, including pipes where flow is allowed in both directions.
- E. Pipe Label Color Schedule:
1. Domestic Water Piping
 - a. Background: Safety green.
 - b. Letter Colors: White.
 2. Sanitary Waste and Storm Drainage Piping:
 - a. Background Color: Safety white.
 - b. Letter Color: Black.
 3. Natural Gas Piping:
 - a. Background Color: Yellow
 - b. Letter Color: Black

3.5 VALVE-TAG INSTALLATION

- A. Install tags on valves and control devices in piping systems, except check valves, valves within factory-fabricated equipment units, shutoff valves, faucets, convenience and lawn-watering hose connections, and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.
- B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:
1. Valve-Tag Size and Shape:
 - a. Hot and Cold Water: 1-1/2 inches, round.
 - b. Natural Gas: 1-1/2 inches, round.
 2. Valve-Tag Colors:
 - a. Cold Water: Natural.
 - b. Hot Water: Natural.
 3. Letter Colors:
 - a. Hot and Cold Water: Black.
 - b. Natural Gas: Black

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3.6 WARNING-TAG INSTALLATION

- A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION 220553

SECTION 220719 - PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections:
 - 1. Section 220100 Plumbing General Requirements
 - 2. Section 220523 General Duty Valves for Plumbing Piping
 - 3. Section 220529 Hangers and Supports for Plumbing Piping and Equipment
 - 4. Section 220553 Identification for Plumbing Piping and Equipment
 - 5. Section 221116 Domestic Water Piping
 - 6. Section 221413 Storm Drainage Piping
 - 7. Section 221423 Storm Drainage Piping Specialties
 - 8. Section 224300 Plumbing Fixtures

1.2 SUMMARY

- A. Section includes insulating the following plumbing piping services:
 - 1. Domestic cold-water piping.
 - 2. Domestic hot-water piping.
 - 3. Domestic recirculating hot-water piping.
 - 4. Domestic chilled-water piping for drinking fountains.
 - 5. Sanitary waste piping exposed to freezing conditions.
 - 6. Storm-water piping exposed to freezing conditions.
 - 7. Roof drains and rainwater leaders.
 - 8. Supplies and drains for handicap-accessible lavatories and sinks.

1.3 REFERENCE STANDARDS

- A. ASTM International (ASTM).
- B. American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc. (ASHRAE).
- C. North American Insulation Manufacturers Association (NAIMA).
- D. NAIMA – "Guide to Insulating Chilled Water Piping Systems with Mineral Fiber Pipe Insulation."
- E. "National Commercial & Industrial Insulation Standards" – MICA Manual.
- F. National Fire Protection Association (NFPA).
- G. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA).
- H. Underwriter's Laboratories (UL).

- I. Underwriter's Laboratories Environmental (UL Environment).

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied, if any).
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
 - 2. Detail attachment and covering of heat tracing inside insulation.
 - 3. Detail insulation application at pipe expansion joints for each type of insulation.
 - 4. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
 - 5. Detail removable insulation at piping specialties, equipment connections, and access panels.
 - 6. Detail application of field-applied jackets.
 - 7. Detail application at linkages of control devices.
- C. Samples: For each type of insulation and jacket indicated. Identify each Sample, describing product and intended use. Sample sizes are as follows:
 - 1. Preformed Pipe Insulation Materials: 12 inches long by 2-inches.
 - 2. Jacket Materials for Pipe: 12 inches long by 2-inches.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.
- C. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.
- B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
 - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
 - 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

- C. Mockups: Before installing insulation, build mockups for each type of insulation and finish listed below to demonstrate quality of insulation application and finishes. Build mockups in the location indicated or, if not indicated, as directed by Architect. Use materials indicated for the completed Work.

1. Piping Mockups:

- a. One 10-foot section of 2-inch straight pipe.
- b. One each of a 90-degree threaded, welded, and flanged elbow.
- c. One each of a threaded, welded, and flanged tee fitting.
- d. One 2-inch or smaller valve, and one 2-1/2-inch or larger valve.
- e. Four support hangers including hanger shield and insert.
- f. One threaded strainer and one flanged strainer with removable portion of insulation.
- g. One threaded reducer and one welded reducer.
- h. One pressure temperature tap.
- i. One mechanical coupling.

2. For each mockup, fabricate cutaway sections to allow observation of application details for insulation materials, adhesives, mastics, attachments, and jackets.
3. Notify Architect seven days in advance of dates and times when mockups will be constructed.
4. Obtain Architect's approval of mockups before starting insulation application.
5. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
7. Demolish and remove mockups when directed.

- D. Comply with the following applicable standards and other requirements specified for miscellaneous components:

1. Supply and Drain Protective Shielding Guards: ANSI A117.1.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.8 COORDINATION

- A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
- B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.
- C. Coordinate installation and testing of heat tracing with Electrical Contractor.

1.9 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Fiberglass: Inorganic, incombustible, molded of heavy density resin bonded inorganic glass fibers.
 - 1. Density: ASTM C 302.
 - 2. Operating Temp. Range: ASTM C 411.
 - 3. Jacket Temp Limitation: ASTM C 1136.
 - 4. Jacket Permeance: ASTM E 96.
- B. Mineral-Fiber, Preformed Pipe Insulation:
 - 1. Type I, 850 Deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ-SSL.
- C. Phenolic:
 - 1. Preformed pipe insulation of rigid, expanded, closed-cell structure. Comply with ASTM C 1126, Type III, Grade 1.
 - 2. Block insulation of rigid, expanded, closed-cell structure. Comply with ASTM C 1126, Type II, Grade 1.
 - 3. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.
 - 4. Factory-Applied Jacket: Requirements are specified in "Factory-Applied Jackets" Article.
- D. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials shall be applied.
- E. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- F. Composite surface burning characteristic shall comply with ASTM E84.
- G. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

2.2 INSULATING CEMENTS

- A. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.
- B. Expanded or Exfoliated Vermiculite Insulating Cement: Comply with ASTM C 196.
- C. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449.

2.3 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.
- B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. PVC Jacket Adhesive: Compatible with PVC jacket.

1. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.4 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.

1. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
2. Service Temperature Range: Minus 20 to plus 180 deg F.
3. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
4. Color: White.

C. Vapor-Barrier Mastic: Solvent based; suitable for indoor use on below-ambient services.

1. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 35-mil dry film thickness.
2. Service Temperature Range: 0 to 180 deg F.
3. Solids Content: ASTM D 1644, 44 percent by volume and 62 percent by weight.
4. Color: White.

D. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.

1. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch (1.6-mm) dry film thickness.
2. Service Temperature Range: Minus 20 to plus 180 deg F.
3. Solids Content: 60 percent by volume and 66 percent by weight.
4. Color: White.

2.5 SEALANTS

A. Joint Sealants:

1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Permanently flexible, elastomeric sealant.
3. Service Temperature Range: Minus 100 to plus 300 deg F.
4. Color: White or gray.
5. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

6. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. PVC Jacket Flashing Sealants:

1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Fire- and water-resistant, flexible, elastomeric sealant.
3. Service Temperature Range: Minus 40 to plus 250 deg F.
4. Color: White.
5. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
6. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.6 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
 2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
 3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

2.7 FIELD-APPLIED JACKETS

- A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.
- B. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.
1. Adhesive: As recommended by jacket material manufacturer.
 2. Color: White.
 3. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.
 - a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

2.8 TAPES

- A. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.
1. Width: 2 inches.
 2. Thickness: 6 mils.
 3. Adhesion: 64 ounces force/inch in width.
 4. Elongation: 500 percent.
 5. Tensile Strength: 18 lbf/inch in width.

2.9 SECUREMENTS

- A. Bands:
 - 1. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304; 0.015-inch-thick, 1/2-inch-wide with wing seal or closed seal.
 - 2. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020-inch-thick, 1/2-inch-wide with wing seal or closed seal.
- B. Staples: Outward-clinching insulation staples, nominal 3/4-inch-wide, stainless steel or Monel.
- C. Wire: 0.062-inch soft-annealed, stainless steel.

2.10 PROTECTIVE SHIELDING GUARDS

- A. Protective Shielding Pipe Covers:
 - 1. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
 - 1. Verify that systems to be insulated have been tested and are free of defects.
 - 2. Verify that surfaces to be insulated are clean and dry.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:
 - 1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils thick and an epoxy finish 5 mils thick if operating in a temperature range between 140 and 300 deg F. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
 - 2. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
- C. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

- D. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Keep insulation materials dry during application and finishing.
- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.
- J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.
 - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
 - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
 - 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- L. All indoor exposed plumbing piping that requires insulation shall be provided with a PVC jacket.
- M. Install insulation with factory-applied jackets as follows:
 - 1. Draw jacket tight and smooth.
 - 2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
 - 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.

- a. For below-ambient services, apply vapor-barrier mastic over staples.
- 4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
- 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.
- N. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- O. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- P. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- Q. For above-ambient services, do not install insulation to the following:
 - 1. Vibration-control devices.
 - 2. Testing agency labels and stamps.
 - 3. Nameplates and data plates.
 - 4. Cleanouts.

3.4 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
 - 1. Seal penetrations with flashing sealant.
 - 2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
- B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.
- C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
 - 1. Seal penetrations with flashing sealant.
 - 2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 - 3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
 - 4. Seal jacket to wall flashing with flashing sealant.
- D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
 - 1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

F. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

- D. Install removable insulation covers at locations indicated. Installation shall conform to the following:
1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
 2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
 3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
 4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
 5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.6 INSTALLATION OF FIBERGLASS INSULATION

A. General Installation Requirements:

1. Secure single-layer insulation with stainless-steel bands at 12-inch intervals and tighten bands without deforming insulation materials.
2. Install 2-layer insulation with joints tightly butted and staggered at least 3 inches. Secure inner layer with 0.062-inch wire spaced at 12-inch intervals. Secure outer layer with stainless-steel bands at 12-inch intervals.

B. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient services, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets with vapor retarders on below-ambient services, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

C. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of block insulation of same material and thickness as pipe insulation.

D. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed insulation sections of same material as straight segments of pipe insulation. Secure according to manufacturer's written instructions.

E. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed insulation sections of same material as straight segments of pipe insulation. Secure according to manufacturer's written instructions.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.

3.7 INSTALLATION OF MINERAL-FIBER INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.8 FIELD-APPLIED JACKET INSTALLATION

- A. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints. Seal with manufacturer's recommended adhesive.
 - 1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.
- B. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.9 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Perform tests and inspections.
- C. Tests and Inspections:
 - 1. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.
- D. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.10 PIPING INSULATION SCHEDULE, GENERAL

- A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.
- B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
 - 1. Drainage piping located in crawl spaces.
 - 2. Underground piping.
 - 3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.11 INDOOR PIPING INSULATION SCHEDULE

- A. Domestic Cold Water:
 - 1. 1-inch and Smaller: Insulation shall be one of the following:
 - a. Fiberglass: 1/2-inch thick.
 - b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1/2-inch thick.
 - 2. 1 1/4-inch and Larger: Insulation shall be one of the following:

- a. Fiberglass: 1-inch thick.
 - b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1-inch thick.
- B. Domestic Hot and Recirculated Hot Water:
 - 1. 1 1/4-inch and Smaller: Insulation shall be one of the following:
 - a. Fiberglass: 1 inch thick.
 - b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1-inch thick.
 - 2. 1-1/2-inch and Larger: Insulation shall be one of the following:
 - a. Fiberglass: 1-1/2 inches thick.
 - b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1-1/2 inches thick.
- C. Storm-water and Overflow (Horizontal piping and first 3 feet of vertical drop):
 - 1. All Pipe Sizes: Insulation shall be one of the following:
 - a. Fiberglass: 1-inch thick.
 - b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
 - c. Phenolic: 1 inch thick.
- D. Roof Drain and Overflow Drain Bodies:
 - 1. All Pipe Sizes: Insulation shall be one of the following:
 - a. Fiberglass: 1-inch thick.
 - b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
 - c. Phenolic: 1 inch thick.
- E. Exposed Sanitary Drains, Domestic Water, Domestic Hot Water, and Stops for Plumbing Fixtures for People with Disabilities:
 - 1. All Pipe Sizes: Insulation shall be PVC.
- F. Gresase Waste Piping Where Heat Tracing Is Installed:
 - 1. All Pipe Sizes: Insulation shall be one of the following:
 - a. Fiberglass: 1 1/2-inch thick.
 - b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1-1/2 inches thick.
- G. Floor Drains, Traps, and Sanitary Drain Piping within 10 Feet of Drain Receiving Condensate and Equipment Drain Water below 60 Deg F:
 - 1. All Pipe Sizes: Insulation shall be one of the following:
 - a. Fiberglass: 1-inch thick.
 - b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch-thick.
- H. Hot Service Drains:
 - 1. All Pipe Sizes: Insulation shall be one of the following:

- a. Fiberglass: 1-inches thick.
- b. Mineral-Fiber, Preformed Pipe, Type I or II: 1-inch thick.

3.12 INDOOR, FIELD-APPLIED JACKET SCHEDULE

- A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.
- B. If more than one material is listed, selection from materials listed is Contractor's option.
- C. Piping, Exposed:
 - 1. PVC: 20 mils thick.

END OF SECTION 220719

SECTION 221116 - DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections:
 - 1. Section 220100 Plumbing General Requirements
 - 2. Section 220516 Expansion Fittings and Loops for Plumbing Piping
 - 3. Section 220517 Sleeves and Sleeve Seals for Plumbing Piping
 - 4. Section 220518 Escutcheons for Plumbing Piping
 - 5. Section 220519 Meters and Gauges for Plumbing Piping
 - 6. Section 220523 General Duty Valves for Plumbing Piping
 - 7. Section 220529 Hangers and Supports for Plumbing Piping and Equipment
 - 8. Section 220548 Vibration and Seismic Controls for Plumbing Piping and Equipment
 - 9. Section 220553 Identification for Plumbing Piping and Equipment
 - 10. Section 220719 Plumbing Piping Insulation
 - 11. Section 221119 Domestic Water Piping Specialties
 - 12. Section 224300 Plumbing Fixtures

1.2 SUMMARY

- A. Section Includes:
 - 1. Under-building-slab and aboveground domestic water pipes, tubes, and fittings inside buildings.
 - 2. Encasement for piping.

1.3 REFERENCES

- A. American Society of Mechanical Engineers:
 - 1. ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings.
 - 2. ASME B16.3 - Malleable Iron Threaded Fittings.
 - 3. ASME B16.4 - Gray Iron Threaded Fittings.
 - 4. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.
 - 5. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
 - 6. ASME B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes.
 - 7. ASME B31.9 - Building Services Piping.
 - 8. ASME B36.10M - Welded and Seamless Wrought Steel Pipe.
- B. ASTM International:
 - 1. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings.
 - 2. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 - 3. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.

4. ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures.
 5. ASTM A536 - Standard Specification for Ductile Iron Castings.
 6. ASTM B32 - Standard Specification for Solder Metal.
 7. ASTM B42 - Standard Specification for Seamless Copper Pipe, Standard Sizes.
 8. ASTM B43 - Standard Specification for Seamless Red Brass Pipe, Standard Sizes.
 9. ASTM B75 - Standard Specification for Seamless Copper Tube.
 10. ASTM B88 - Standard Specification for Seamless Copper Water Tube.
 11. ASTM B251 - Standard Specification for General Requirements for Wrought Seamless Copper and Copper-Alloy Tube.
 12. ASTM B302 - Standard Specification for Threadless Copper Pipe, Standard Sizes.
- C. American Welding Society:
1. AWS A5.8 - Specification for Filler Metals for Brazing and Braze Welding.
 2. AWS D1.1 - Structural Welding Code - Steel.
- D. American Water Works Association:
1. AWWA C104 - American National Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
 2. AWWA C105 - American National Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems.
 3. AWWA C110 - American National Standard for Ductile-Iron and Grey-Iron Fittings, 3 in. through 48 in. (75 mm through 1200 mm), for Water and Other Liquids.
 4. AWWA C111 - American National Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
 5. AWWA C151 - American National Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water.
- E. NSF International:
1. NSF 61 - Standard for Drinking Water System Components - Health Effects.
- F. Safe Drinking Water Act:
1. SDWA 1417 - Standard for Lead Free Drinking Water.
- 1.4 SUBMITTALS
- A. Product Data: For the following products:
1. Transition fittings.
 2. Dielectric fittings.
- B. System purging and disinfecting activities report.
- C. Field quality-control reports.
- 1.5 PERFORMANCE REQUIREMENTS
- A. Seismic Performance: Domestic water piping and support and installation shall withstand effects of earthquake motions determined according to ASCE/SEI 7.

1.6 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NSF 61 for potable domestic water piping and components.
- C. All components of the potable domestic water system shall meet the requirements of SDWA-1417.

1.7 FIELD CONDITIONS

- A. Interruption of Existing Water Service: Do not interrupt water service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water service according to requirements indicated:
 - 1. Notify Architect, Construction Manager and Owner no fewer than two days in advance of proposed interruption of water service.
 - 2. Do not interrupt water service without Architect's, Construction Manager's and Owner's written permission.

1.8 COORDINATION

- A. Coordinate sizes and locations of concrete bases with actual equipment provided.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 COPPER TUBE AND FITTINGS

- A. Hard Copper Tube: ASTM B 88, Type L water tube, drawn temper.
- B. Soft Copper Tube: ASTM B 88, Type K or ASTM B 88, Type L water tube, annealed temper.
- C. Cast-Copper, Solder-Joint Fittings: ASME B16.18, pressure fittings.
- D. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.
- E. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.
- F. Joints: ASTM B32, Alloy Grade Sb5 tin-antimony, or Alloy Grade Sn95 tin-silver, lead free solder AWS A5.8 Classification BCuP-3 or BCuP-4 silver braze.
- G. Copper Unions:
 - 1. MSS SP-123.
 - 2. Cast-copper-alloy, hexagonal-stock body.

3. Ball-and-socket, metal-to-metal seating surfaces.
4. Solder-joint or threaded ends.

H. Copper-Tube, Extruded-Tee Connections:

1. Description: Tee formed in copper tube according to ASTM F 2104.

I. Appurtenances for Grooved-End Copper Tubing:

1. Bronze Fittings for Grooved-End, Copper Tubing: ASTM B 75 copper tube or ASTM B 584 bronze castings.
2. Mechanical Couplings for Grooved-End Copper Tubing:
 - a. Copper-tube dimensions and design similar to AWWA C606.
 - b. Ferrous housing sections.
 - c. EPDM-rubber gaskets suitable for hot and cold water.
 - d. Bolts and nuts.
 - e. Minimum Pressure Rating: 300 psig.

J. Press Fit Connections:

1. Press Fitting: Copper and copper alloy press fittings conforming to ASME B16.18 or ASME B16.22. Sealing elements for press fittings shall be EPDM and factory installed. Press ends shall have SC feature design (leakage path) to assure detection and easy identification of leakage of liquids from inside the system past the sealing element of an unpressed connection.

2.3 DUCTILE-IRON PIPE AND FITTINGS

A. Mechanical-Joint, Ductile-Iron Pipe:

1. AWWA C151/A21.51, with mechanical-joint bell and plain spigot end unless grooved or flanged ends are indicated.
2. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

2.4 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials:

1. AWWA C110/A21.10, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free unless otherwise indicated.
2. Full-face or ring type unless otherwise indicated.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Solder Filler Metals: ASTM B 32, lead-free alloys.

D. Flux: ASTM B 813, water flushable.

E. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

2.5 ENCASEMENT FOR PIPING

- A. Standard: ASTM A 674 or AWWA C105/A21.5.
- B. Form: Sheet or tube.
- C. Color: Black or natural.

2.6 TRANSITION FITTINGS

- A. General Requirements:
 - 1. Same size as pipes to be joined.
 - 2. Pressure rating at least equal to pipes to be joined.
 - 3. End connections compatible with pipes to be joined.
- B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
- C. Sleeve-Type Transition Coupling: AWWA C219.

2.7 DIELECTRIC FITTINGS

- A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
- B. Dielectric Unions:
 - 1. Standard: ASSE 1079.
 - 2. Pressure Rating: 125 psig minimum at 180 deg F 150 psig.
 - 3. End Connections: Solder-joint copper alloy and threaded ferrous.
- C. Dielectric Flanges:
 - 1. Standard: ASSE 1079.
 - 2. Factory-fabricated, bolted, companion-flange assembly.
 - 3. Pressure Rating: 125 psig minimum at 180 deg F 150 psig.
 - 4. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.
- D. Dielectric-Flange Insulating Kits:
 - 1. Nonconducting materials for field assembly of companion flanges.
 - 2. Pressure Rating: 150 psig.
 - 3. Gasket: Neoprene or phenolic.
 - 4. Bolt Sleeves: Phenolic or polyethylene.
 - 5. Washers: Phenolic with steel backing washers.
- E. Dielectric Nipples:
 - 1. Standard: IAPMO PS 66.
 - 2. Electroplated steel nipple complying with ASTM F 1545.
 - 3. Pressure Rating and Temperature: 300 psig at 225 deg F.
 - 4. End Connections: Male threaded or grooved.
 - 5. Lining: Inert and noncorrosive, propylene.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Comply with requirements in Section 312000 "Earth Moving" for excavating, trenching, and backfilling.

3.2 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."
- C. Install ductile-iron piping under building slab with restrained joints according to AWWA C600 and AWWA M41.
- D. Install underground copper tube and ductile-iron pipe in PE encasement according to ASTM A 674 or AWWA C105/A21.5.
- E. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve inside the building at each domestic water-service entrance. Comply with requirements for pressure gages in Section 220519 "Meters and Gages for Plumbing Piping" and with requirements for drain valves and strainers in Section 221119 "Domestic Water Piping Specialties."
- F. Install shutoff valve immediately upstream of each dielectric fitting.
- G. Install water-pressure-reducing valves downstream from shutoff valves. Comply with requirements for pressure-reducing valves in Section 221119 "Domestic Water Piping Specialties."
- H. Install domestic water piping level with 0.25 percent slope downward toward drain and plumb.
- I. Rough-in domestic water piping for water-meter installation according to utility company's requirements.
- J. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- K. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.
- L. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- M. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.
- N. Install piping to permit valve servicing.
- O. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.

- P. Install piping free of sags and bends.
- Q. Install fittings for changes in direction and branch connections.
- R. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.
- S. Install pressure gages on suction and discharge piping for each plumbing pump and packaged booster pump. Comply with requirements for pressure gages in Section 220519 "Meters and Gages for Plumbing Piping."
- T. Install thermometers on inlet and outlet piping from each water heater. Comply with requirements for thermometers in Section 220519 "Meters and Gages for Plumbing Piping."
- U. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- V. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- W. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.3 JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- D. Brazed Joints for Copper Tubing: Comply with CDA's "Copper Tube Handbook," "Braze Joints" chapter.
- E. Soldered Joints for Copper Tubing: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."
- F. Extruded-Tee Connections: Form tee in copper tube according to ASTM F 1044. Use tool designed for copper tube; drill pilot hole, form collar for outlet, dimple tube to form seating stop, and braze branch tube into collar.
- G. Joint Construction for Grooved-End Copper Tubing: Make joints according to AWWA C606. Roll groove ends of tubes. Lubricate and install gasket over ends of tubes or tube and fitting. Install coupling housing sections over gasket with keys seated in tubing grooves. Install and tighten housing bolts.
- H. Joint Construction for Grooved-End, Ductile-Iron Piping: Make joints according to AWWA C606. Cut round-bottom grooves in ends of pipe at gasket-seat dimension required for specified (flexible or rigid) joint. Lubricate and install gasket over ends of pipes or pipe and fitting. Install coupling housing sections over gasket with keys seated in piping grooves. Install and tighten housing bolts.

- I. Joint Construction for Grooved-End Copper Piping: Make joints according to AWWA C606. Square cut Roll groove ends of pipe as specified. Lubricate and install gasket over ends of pipes or pipe and fitting. Install coupling housing sections over gasket with keys seated in piping grooves. Install and tighten housing bolts.
- J. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.
- K. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

3.4 TRANSITION FITTING INSTALLATION

- A. Install transition couplings at joints of dissimilar piping.
- B. Transition Fittings in Underground Domestic Water Piping:
 - 1. Fittings for 1-1/2-inch and Smaller: Fitting-type coupling.
 - 2. Fittings for 2-inch and Larger: Sleeve-type coupling.
- C. Transition Fittings in Aboveground Domestic Water Piping 2-inch and Smaller: Plastic-to-metal transition fittings or unions.

3.5 DIELECTRIC FITTING INSTALLATION

- A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
- B. Dielectric Fittings for 2-inch and Smaller: Use dielectric couplings couplings or nipples.
- C. Dielectric Fittings for 2-1/2-inch to 4-inch: Use dielectric flanges flange kits.
- D. Dielectric Fittings for 5-inch and Larger: Use dielectric flange kits.

3.6 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements for seismic-restraint devices in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- B. Comply with requirements for pipe hanger, support products, and installation in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
 - 1. Vertical Piping: MSS Type 8 or 42, clamps.
 - 2. Individual, Straight, Horizontal Piping Runs:
 - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer than 100 Feet: MSS Type 43, adjustable roller hangers.
 - c. Longer than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.
 - 3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
 - 4. Base of Vertical Piping: MSS Type 52, spring hangers.

- C. Support vertical piping and tubing at base and at each floor.
- D. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch.
- E. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
 - 1. 3/4-inch and Smaller: 60 inches with 3/8-inch rod.
 - 2. 1-inch and 1-1/4-inch: 72 inches with 3/8-inch rod.
 - 3. 1-1/2-inch and 2-inch: 96 inches with 3/8-inch rod.
 - 4. 2-1/2-inch: 108 inches with 1/2-inch rod.
 - 5. 3-inch to 5-inch: 10 feet with 1/2-inch rod.
 - 6. 6-inch: 10 feet with 5/8-inch rod.
 - 7. 8-inch: 10 feet with 3/4-inch rod.
- F. Install supports for vertical copper tubing every 10 feet.
- G. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:
 - 1. 1-1/4-inch and Smaller: 84 inches with 3/8-inch rod.
 - 2. 1-1/2-inch: 108 inches with 3/8-inch rod.
 - 3. 2-inch: 10 feet with 3/8-inch rod.
 - 4. 2-1/2-inch: 11 feet with 1/2-inch rod.
 - 5. 3-inch: 12 feet with 1/2-inch rod.
 - 6. 4-inch and 5-inch: 12 feet with 5/8-inch rod.
 - 7. 6-inch: 12 feet with 3/4-inch rod.
 - 8. 8-inch to 12-inch: 12 feet with 7/8-inch rod.
- H. Install supports for vertical steel piping every 15 feet.
- I. Support piping and tubing not listed in this article according to MSS SP-69 and manufacturer's written instructions.

3.7 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.
- C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.
- D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:
 - 1. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code.
 - 2. Equipment: Cold- and hot-water-supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for 2-1/2-inch and larger.

3.8 IDENTIFICATION

- A. Identify system components. Comply with requirements for identification materials and installation in Section 220553 "Identification for Plumbing Piping and Equipment."
- B. Label pressure piping with system operating pressure.

3.9 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Piping Inspections:
 - a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
 - b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
 - 1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.
 - 2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.
 - c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
 - d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
 - 2. Piping Tests:
 - a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
 - b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
 - c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
 - d. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
 - e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
 - f. Prepare reports for tests and for corrective action required.
- B. Domestic water piping will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

3.10 ADJUSTING

A. Perform the following adjustments before operation:

1. Close drain valves, hydrants, and hose bibbs.
2. Open shutoff valves to fully open position.
3. Open throttling valves to proper setting.
4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.
 - a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide hot-water flow in each branch.
 - b. Adjust calibrated balancing valves to flows indicated.
5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
8. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.11 CLEANING

A. Clean and disinfect potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:
 - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
 - b. Fill and isolate system according to either of the following:
 - 1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
 - 2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.
 - c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
 - d. Repeat procedures if biological examination shows contamination.
 - e. Submit water samples in sterile bottles to authorities having jurisdiction.

B. Clean non-potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging procedures prescribed by authorities having jurisdiction or; if methods are not prescribed, follow procedures described below:
 - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
 - b. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.

- C. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.
- D. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.12 PIPING SCHEDULE

- A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
- B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.
- C. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.
- D. Under-building-slab, domestic water, building-service piping, 3-inch and smaller, shall be the following:
 - 1. Soft copper tube, ASTM B 88, Type K; wrought-copper, solder-joint fittings; and brazed joints.
- E. Under-building-slab, domestic water, building-service piping, 4-inch to 8-inch, shall be the following:
 - 1. Mechanical-joint, ductile-iron pipe; standard-pattern, mechanical-joint fittings; and mechanical joints.
- F. Under-building-slab, combined domestic water, building-service, and fire-service-main piping, 6-inch to 12-inch, shall be one of the following:
 - 1. Mechanical-joint, ductile-iron pipe; standard pattern, mechanical-joint fittings; and mechanical joints.
 - 2. Push-on-joint, ductile-iron pipe; standard pattern, push-on-joint fittings; and gasketed joints.
 - 3. Plain-end, ductile-iron pipe; grooved-joint, ductile-iron-pipe appurtenances; and grooved joints.
- G. Under-building-slab, domestic water piping, 2-inch and smaller, shall be the following:
 - 1. Soft Hard copper tube, ASTM B 88, Type K; wrought-copper, solder-joint fittings; and brazed joints.
- H. Aboveground domestic water piping, 2-inch and smaller, shall be one of the following:
 - 1. Hard copper tube, ASTM B 88, Type L; wrought-copper, solder-joint fittings; and soldered brazed joints.
 - 2. Hard copper tube, ASTM B 88, Type L; wrought-copper, press-fit fittings; and press-fit joints.
 - 3. Hard copper tube, ASTM B 88, Type L; wrought-copper, grooved end tubing and fittings; and mechanical couplings.
- I. Aboveground domestic water piping, 2-1/2-inch to 4-inch, shall be one of the following:
 - 1. Hard copper tube, ASTM B 88, Type L; wrought-copper, solder-joint fittings; and soldered brazed joints.
 - 2. Hard copper tube, ASTM B 88, Type L; wrought-copper, press-fit fittings; and press-fit joints.
 - 3. Hard copper tube, ASTM B 88, Type L; wrought-copper, grooved end tubing and fittings; and mechanical couplings.

3.13 VALVE SCHEDULE

- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
 - 1. Shutoff Duty: Use ball valves for piping 2-inch and smaller. Use ball, or gate valves with flanged ends for piping 2-1/2-inch and larger.
 - 2. Throttling Duty: Use ball valves for piping 2-inch and smaller. Use ball valves with flanged ends for piping 2-1/2-inch and larger.
 - 3. Hot-Water Circulation Piping, Balancing Duty: Calibrated Memory-stop balancing valves.
 - 4. Drain Duty: Hose-end drain valves.
- B. Use check valves to maintain correct direction of domestic water flow to and from equipment.
- C. Iron grooved-end valves may be used with grooved-end piping.

END OF SECTION 221116

SECTION 221119 - DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections:
 - 1. Section 220100 Plumbing General Requirements
 - 2. Section 220519 Meters and Gauges for Plumbing Piping
 - 3. Section 220523 General Duty Valves for Plumbing Piping
 - 4. Section 220529 Hangers and Supports for Plumbing Piping and Equipment
 - 5. Section 220553 Identification for Plumbing Piping and Equipment
 - 6. Section 221116 Domestic Water Piping
 - 7. Section 224300 Plumbing Fixtures

1.2 SUMMARY

- A. Section Includes:
 - 1. Vacuum breakers.
 - 2. Backflow preventers.
 - 3. Water pressure-reducing valves.
 - 4. Balancing valves.
 - 5. Temperature-actuated, water mixing valves.
 - 6. Strainers.
 - 7. Hose bibbs.
 - 8. Drain valves.
 - 9. Water-hammer arresters.
 - 10. Air vents.
 - 11. Trap-seal primer valves.
 - 12. Trap-seal primer systems.
 - 13. Trap guards.
 - 14. Specialty valves.
 - 15. Flexible connectors.

1.3 PERFORMANCE REQUIREMENTS

- A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig, unless otherwise indicated.

1.4 SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For domestic water piping specialties.

1. Include diagrams for power, signal, and control wiring.
- C. Field quality-control test reports.
- D. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. NSF Compliance:
 1. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9."

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

- A. Potable-water piping and components shall comply with NSF 61 Annex G and NSF 14.

2.2 VACUUM BREAKERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Febco.
 2. Watts.
 3. Conbraco.
- B. Pipe-Applied, Atmospheric-Type Vacuum Breakers:
 1. Standard: ASSE 1001.
 2. Size: 1/4-inch to 3-inch, as required to match connected piping.
 3. Body: Bronze.
 4. Inlet and Outlet Connections: Threaded.
 5. Finish: Chrome plated.
- C. Hose-Connection Vacuum Breakers:
 1. Standard: ASSE 1011.
 2. Body: Bronze, nonremovable, with manual drain.
 3. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
 4. Finish: Chrome.

2.3 BACKFLOW PREVENTERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Febco.

2. Watts.
 3. Conbraco.
- B. Intermediate Atmospheric-Vent Backflow Preventers:
1. Standard: ASSE 1012.
 2. Operation: Continuous-pressure applications.
 3. Size: Refer to Plumbing Drawings.
 4. Body: Bronze.
 5. End Connections: Solder joint.
 6. Finish: Rough bronze.
- C. Reduced-Pressure-Principle Backflow Preventers:
1. Standard: ASSE 1013.
 2. Operation: Continuous-pressure applications.
 3. Pressure Loss: 12 psig maximum, through middle third of flow range.
 4. Size: Refer to Plumbing Drawings.
 5. Body: Bronze for 2-inch and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved for 2-1/2-inch and larger.
 6. End Connections: Threaded for 2-inch and smaller; flanged or grooved for 2-1/2-inch and larger.
 7. Configuration: Designed for horizontal, straight-through flow.
 8. Accessories:
 - a. Valves 2-inch and Smaller: Ball type with threaded ends on inlet and outlet.
 - b. Valves 2-1/2-inch and Larger: Outside-screw and yoke-gate type with flanged ends on inlet and outlet.
 - c. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.
- D. Double-Check, Backflow-Prevention Assemblies:
1. Standard: ASSE 1015.
 2. Operation: Continuous-pressure applications unless otherwise indicated.
 3. Pressure Loss: 5 psig maximum, through middle third of flow range.
 4. Size: Refer to Plumbing Drawings.
 5. Body: Bronze for 2-inch and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved for 2-1/2-inch and larger.
 6. End Connections: Threaded for 2-inch and smaller; flanged or Grooved for 2-1/2-inch and larger.
 7. Configuration: Designed for horizontal, straight-through flow.
 8. Accessories:
 - a. Valves 2-inch and Smaller: Ball type with threaded ends on inlet and outlet.
 - b. Valves 2-1/2-inch and Larger: Outside-screw and yoke-gate type with flanged ends on inlet and outlet.
- E. Beverage-Dispensing-Equipment Backflow Preventers:
1. Operation: Continuous-pressure applications.
 2. Size: 1/4-inch or 3/8-inch.
 3. Body: Stainless steel.
 4. End Connections: Threaded.
- F. Dual-Check-Valve Backflow Preventers:
1. Standard: ASSE 1024.
 2. Operation: Continuous-pressure applications.
 3. Size: Refer to Plumbing Drawings.
 4. Body: Bronze with union inlet.
- G. Carbonated-Beverage-Dispenser, Dual-Check-Valve Backflow Preventers:

1. Standard: ASSE 1032.
2. Operation: Continuous-pressure applications.
3. Size: 1/4-inch or NPS 3/8-inch.
4. Body: Stainless steel.
5. End Connections: Threaded.

H. Double-Check, Detector-Assembly Backflow Preventers:

1. Standard: ASSE 1048 and is FM Global approved or UL listed.
2. Operation: Continuous-pressure applications.
3. Pressure Loss: 5 psig maximum, through middle third of flow range.
4. Size: Refer to Plumbing Drawings.
5. Body: Cast iron with interior lining that complies with AWWA C550 or that is FDA approved.
6. End Connections: Flanged.
7. Configuration: Designed for horizontal, straight-through flow.
8. Accessories:
 - a. Valves: Outside-screw and yoke-gate type with flanged ends on inlet and outlet.
 - b. Bypass: With displacement-type water meter, shutoff valves, and reduced-pressure backflow preventer.

I. Hose-Connection Backflow Preventers:

1. Operation: Up to 10-foot head of water back pressure.
2. Inlet Size: 1/2-inch or 3/4-inch.
3. Outlet Size: Garden-hose thread complying with ASME B1.20.7.
4. Capacity: At least 3-gpm flow.

J. Backflow-Preventer Test Kits:

1. Description: Factory calibrated, with gages, fittings, hoses, and carrying case with test-procedure instructions.

2.4 WATER PRESSURE-REDUCING VALVES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cash Acme.
2. Watts.
3. Conbraco.
4. CLA-VAL Automatic Control Valves.

B. Water Regulators:

1. Standard: ASSE 1003.
2. Pressure Rating: Initial working pressure of 150 psig.
3. Size: Refer to Plumbing Drawings.
4. Body: Bronze for 2-inch and smaller; cast iron for 2-1/2-inch and 3-inch.
5. Valves for Booster Heater Water Supply: Include integral bypass.
6. End Connections: Threaded for 2-inch and smaller; flanged for 2-1/2-inch and 3-inch.

C. Water-Control Valves:

1. Description: Pilot-operated, diaphragm-type, single-seated, main water-control valve.
2. Pressure Rating: Initial working pressure of 150 psig minimum with AWWA C550 or FDA-approved, interior epoxy coating. Include small pilot-control valve, restrictor device, specialty fittings, and sensor piping.
3. Main Valve Body: Cast- or ductile-iron body with AWWA C550 or FDA-approved, interior epoxy coating; or stainless-steel body.

- a. Size: Refer to Plumbing Drawings.
- b. Pattern: Globe Angle-valve design.
- c. Trim: Stainless steel.
4. .
5. End Connections: Threaded for 2-inch and smaller; flanged for 2-1/2-inch and larger.

2.5 BALANCING VALVES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Armstrong International, Inc.
 2. Watts.
 3. ITT Industries; Bell & Gossett Div.
 4. Taco Inc.
 5. Flo Fab Inc.
- B. Copper-Alloy Calibrated Balancing Valves:
 1. Type: Ball Y-pattern globe valve with two readout ports and memory-setting indicator.
 2. Body: Bronze.
 3. Size: Same as connected piping, but not larger than 2-inch.
 4. Accessories: Meter hoses, fittings, valves, differential pressure meter, and carrying case.
- C. Cast-Iron Calibrated Balancing Valves:
 1. Type: Adjustable with Y-pattern globe valve, two readout ports, and memory-setting indicator.
 2. Size: Same as connected piping, but not smaller than 2-1/2-inch.
- D. Accessories: Meter hoses, fittings, valves, differential pressure meter, and carrying case.
- E. Memory-Stop Balancing Valves:
 1. Standard: MSS SP-110 for two-piece, copper-alloy ball valves.
 2. Pressure Rating: 400-psig minimum CWP.
 3. Size: 2-inch or smaller.
 4. Body: Copper alloy.
 5. Port: Standard or full port.
 6. Ball: Chrome-plated brass.
 7. Seats and Seals: Replaceable.
 8. End Connections: Solder joint or threaded.
 9. Handle: Vinyl-covered steel with memory-setting device.

2.6 TEMPERATURE-ACTUATED, WATER MIXING VALVES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Armstrong International, Inc.
 2. Lawler.
 3. Leonard.
 4. Watts.
 5. Symmons.
 6. Powers.
- B. Water-Temperature Limiting Devices:
 1. Standard: ASSE 1017.
 2. Pressure Rating: 125 psig.
 3. Type: Thermostatically controlled, water mixing valve.
 4. Material: Bronze body with corrosion-resistant interior components.

5. Connections: Threaded or union inlets and outlet.
 6. Accessories: Check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.
 7. Tempered-Water Setting: 110 deg F.
 8. Valve Finish: Chrome plated.
- C. Primary, Thermostatic, Water Mixing Valves:
1. Standard: ASSE 1017.
 2. Pressure Rating: 125 psig minimum unless otherwise indicated.
 3. Type: Exposed-mounted, thermostatically controlled, water mixing valve.
 4. Material: Bronze body with corrosion-resistant interior components.
 5. Connections: Threaded or union inlets and outlet.
 6. Accessories: Manual temperature control, check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.
 7. Tempered-Water Setting: 110 deg F.
 8. Valve Finish: Chrome plated.
 9. Piping Finish: Copper.
 10. Cabinet: Factory fabricated, stainless steel, for recessed or surface mounting and with hinged, stainless-steel door.

2.7 STRAINERS FOR DOMESTIC WATER PIPING

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Cash Acme.
 2. Watts.
 3. Conbraco.
 4. CLA-VAL Automatic Control Valves.
- B. Y-Pattern Strainers:
1. Pressure Rating: 125 psig minimum unless otherwise indicated.
 2. Body: Bronze for 2-inch and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved, epoxy coated and for 2-1/2-inch and larger.
 3. End Connections: Threaded for 2-inch and smaller; flanged for 2-1/2-inch and larger.
 4. Screen: Stainless steel with round perforations unless otherwise indicated.
 5. Perforation Size:
 - a. Strainers 2-inch and Smaller: 0.020 inch.
 - b. Strainers 2-1/2-inch to 4-inch: 0.045 inch.
 - c. Strainers 5-inch and Larger: 0.10 inch.
 6. Drain: Factory-installed, hose-end drain valve or Pipe plug.

2.8 HOSE BIBBS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Josam Company.
 2. JR Smith.
 3. Watts.
 4. Woodford.

B. Hose Bibbs:

1. Standard: ASME A112.18.1 for sediment faucets.
2. Body Material: Bronze.
3. Seat: Bronze, replaceable.
4. Supply Connections: ½-inch or ¾-inch threaded or solder-joint inlet.
5. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
6. Pressure Rating: 125 psig.
7. Vacuum Breaker: Integral or field-installation, non-removable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
8. Finish for Equipment Rooms: Rough bronze, or chrome or nickel plated.
9. Finish for Service Areas: Chrome or nickel plated.
10. Finish for Finished Rooms: Chrome or nickel plated.
11. Operation for Equipment Rooms: Wheel handle.
12. Operation for Service Areas: Wheel handle.
13. Include integral wall flange with each chrome- or nickel-plated hose bibb.
 - a. .

2.9 DRAIN VALVES

A. Ball-Valve-Type, Hose-End Drain Valves:

1. Standard: MSS SP-110 for standard-port, two-piece ball valves.
2. Pressure Rating: 400-psig minimum CWP.
3. Size: 3/4-inch.
4. Body: Copper alloy.
5. Ball: Chrome-plated brass.
6. Seats and Seals: Replaceable.
7. Handle: Vinyl-covered steel.
8. Inlet: Threaded or solder joint.
9. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

B. Gate-Valve-Type, Hose-End Drain Valves:

1. Standard: MSS SP-80 for gate valves.
2. Pressure Rating: Class 125.
3. Size: 3/4-inch.
4. Body: ASTM B 62 bronze.
5. Inlet: 3/4-inch threaded or solder joint.
6. Outlet: Garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

C. Stop-and-Waste Drain Valves:

1. Standard: MSS SP-110 for ball valves or MSS SP-80 for gate valves.
2. Pressure Rating: 200-psig minimum CWP or Class 125.
3. Size: 3/4-inch.
4. Body: Copper alloy or ASTM B 62 bronze.
5. Drain: 1/8-inch side outlet with cap.

2.10 WATER-HAMMER ARRESTERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Josam Company.
2. PPP Inc.
3. Watts.
4. JR Smith.
5. Sioux Chief.

B. Water-Hammer Arresters:

1. Standard: ASSE 1010 or PDI-WH 201.
2. Type: Copper tube with piston.
3. Size: ASSE 1010, Sizes AA and A through F, or PDI-WH 201, Sizes A through F.

2.11 AIR VENTS

A. Bolted-Construction Automatic Air Vents:

1. Body: Bronze.
2. Pressure Rating and Temperature: 125-psig minimum pressure rating at 140 deg F.
3. Float: Replaceable, corrosion-resistant metal.
4. Mechanism and Seat: Stainless steel.
5. Size: 1/2-inch minimum inlet.
6. Inlet and Vent Outlet End Connections: Threaded.

B. Welded-Construction Automatic Air Vents:

1. Body: Stainless steel.
2. Pressure Rating: 150-psig minimum pressure rating.
3. Float: Replaceable, corrosion-resistant metal.
4. Mechanism and Seat: Stainless steel.
5. Size: 3/8-inch minimum inlet.
6. Inlet and Vent Outlet End Connections: Threaded.

2.12 TRAP-SEAL PRIMER DEVICE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. JR Smith.
2. PPP Inc.
3. Watts.
4. Sioux Chief.

B. Supply-Type, Trap-Seal Primer Device:

1. Standard: ASSE 1018.
2. Pressure Rating: 125 psig minimum.
3. Body: Bronze.
4. Inlet and Outlet Connections: 1/2-inch threaded, union, or solder joint.
5. Gravity Drain Outlet Connection: 1/2-inch threaded or solder joint.
6. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

- C. Drainage-Type, Trap-Seal Primer Device:
 - 1. Standard: ASSE 1044, lavatory P-trap with 3/8-inch minimum, trap makeup connection.
 - 2. Size: 1-1/4-inch minimum.
 - 3. Material: Chrome-plated, cast brass.

2.13 TRAP-SEAL PRIMER SYSTEMS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. JR Smith.
 - 2. PPP Inc.
 - 3. Watts.
 - 4. Sioux Chief.
- B. Trap-Seal Primer Systems:
 - 1. Standard: ASSE 1044.
 - 2. Piping: 3/4-inch, ASTM B 88, Type L; copper, water tubing.
 - 3. Cabinet: Surface or Recessed-mounted steel box with stainless-steel cover.
 - 4. Electric Controls: 24-hour timer, solenoid valve, and manual switch for 120-V ac power.
 - a. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 - 5. Vacuum Breaker: ASSE 1001.
 - 6. Number Outlets: Four.
 - 7. Size Outlets: 1/2-inch.

2.14 TRAP-GUARDS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Sure Seal.
 - 2. ProSet.
 - 3. JR Smith.
- B. Trap-Guard Device:
 - 1. Standard: ASSE 1072.
 - 2. Commercial grade UV and Ozone resistant ABS plastic housing with EPDM rubber diaphragm and soft rubber sealing gasket.
 - 3. Size: Refer to Plumbing Drawings.

2.15 SPECIALTY VALVES

- A. Comply with requirements for general-duty metal valves in Section 220523.12 "Ball Valves for Plumbing Piping," Section 220523.13 "Butterfly Valves for Plumbing Piping," Section 220523.14 "Check Valves for Plumbing Piping," and Section 220523.15 "Gate Valves for Plumbing Piping."

2.16 FLEXIBLE CONNECTORS

- A. Bronze-Hose Flexible Connectors: Corrugated-bronze tubing with bronze wire-braid covering and ends brazed to inner tubing.
 - 1. Working-Pressure Rating: Minimum 200 psig.
 - 2. End Connections 2-inch and Smaller: Threaded copper pipe or plain-end copper tube.
 - 3. End Connections 2-1/2-inch and Larger: Flanged copper alloy.
- B. Stainless-Steel-Hose Flexible Connectors: Corrugated-stainless-steel tubing with stainless-steel wire-braid covering and ends welded to inner tubing.
 - 1. Working-Pressure Rating: Minimum 200 psig.
 - 2. End Connections 2-inch and Smaller: Threaded steel-pipe nipple.
 - 3. End Connections 2-1/2-inch and Larger: Flanged steel nipple.

2.17 WATER METERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Neptune.
 - 2. Badger.
 - 3. Zenner.
 - 4. Dwyer.
- B. Displacement-Type Water Meters:
 - 1. Description:
 - a. Standard: AWWA C700.
 - b. Pressure Rating: 150-psig working pressure.
 - c. Body Design: Nutating disc; totalization meter.
 - d. Registration: In gallons or cubic feet as required by utility company.
 - e. Case: Bronze.
 - f. End Connections: Threaded.
- C. Turbine-Type Water Meters:
 - 1. Description:
 - a. Standard: AWWA C701.
 - b. Pressure Rating: 150-psig working pressure.
 - c. Body Design: Turbine; totalization meter.
 - d. Registration: In gallons or cubic feet as required by utility company.
 - e. Case: Bronze.
 - f. End Connections for Meters 2-inch and Smaller: Threaded.
 - g. End Connections for Meters 2-1/2-inch and Larger: Flanged.
- D. Compound-Type Water Meters:
 - 1. Description:
 - a. Standard: AWWA C702.
 - b. Pressure Rating: 150-psig working pressure.
 - c. Body Design: With integral mainline and bypass meters; totalization meter.
 - d. Registration: In gallons or cubic feet as required by utility company.

- e. Case: Bronze.
 - f. Pipe Connections: Flanged.
- E. Remote Registration System: Direct-reading type complying with AWWA C706; modified with signal-transmitting assembly, low-voltage connecting wiring, and remote register assembly as required by utility company.
- F. Remote Registration System: Encoder type complying with AWWA C707; modified with signal-transmitting assembly, low-voltage connecting wiring, and remote register assembly as required by utility company.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.
- 1. Locate backflow preventers in same room as connected equipment or system.
 - 2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe-to-floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are unacceptable for this application.
 - 3. Do not install bypass piping around backflow preventers.
- B. Install water regulators with inlet and outlet shutoff valves and bypass with memory-stop balancing valve. Install pressure gages on inlet and outlet.
- C. Install water-control valves with inlet and outlet shutoff valves. Install pressure gages on inlet and outlet.
- D. Install balancing valves in locations where they can easily be adjusted.
- E. Install temperature-actuated, water mixing valves with check stops or shutoff valves on inlets and with shutoff valve on outlet.
- 1. Install cabinet-type units recessed in or surface mounted on wall as specified.
- F. Install Y-pattern strainers for water on supply side of each control valve, water pressure-reducing valve and solenoid valve.
- G. Install outlet boxes recessed in wall or surface mounted on wall. Install 2-by-4-inch fire-retardant-treated-wood blocking, wall reinforcement between studs. Comply with requirements for fire-retardant-treated-wood blocking in Section 061000 "Rough Carpentry."
- H. Install water-hammer arresters in water piping according to PDI-WH 201.
- I. Install air vents at high points of water piping.
- J. Install supply-type, trap-seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.

- K. Install drainage-type, trap-seal primer valves as lavatory trap with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting.
- L. Install trap-seal primer systems with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust system for proper flow.

3.2 CONNECTIONS

- A. Comply with requirements for ground equipment in Section 260526 "Grounding and Bonding for Electrical Systems."
- B. Fire-retardant-treated-wood blocking is specified in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for electrical connections.

3.3 LABELING AND IDENTIFYING

- A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:
 - 1. Pressure vacuum breakers.
 - 2. Intermediate atmospheric-vent backflow preventers.
 - 3. Reduced-pressure-principle backflow preventers.
 - 4. Double-check, backflow-prevention assemblies.
 - 5. Carbonated-beverage-machine backflow preventers.
 - 6. Dual-check-valve backflow preventers.
 - 7. Reduced-pressure-detector, fire-protection, backflow-preventer assemblies.
 - 8. Double-check, detector-assembly backflow preventers.
 - 9. Water pressure-reducing valves.
 - 10. Calibrated balancing valves.
 - 11. Primary, thermostatic, water mixing valves.
 - 12. Primary water tempering valves.
 - 13. Supply-type, trap-seal primer valves.
 - 14. Trap-seal primer systems.
- B. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.4 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Test each pressure vacuum breaker, reduced-pressure-principle backflow preventer, double-check, backflow-prevention assembly and double-check according to authorities having jurisdiction and the device's reference standard.
- B. Domestic water piping specialties will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

3.5 ADJUSTING

- A. Set field-adjustable pressure set points of water pressure-reducing valves.
- B. Set field-adjustable flow set points of balancing valves.
- C. Set field-adjustable temperature set points of temperature-actuated, water mixing valves.

END OF SECTION 221119

SECTION 221316 - SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections:
 - 1. Section 220100 Plumbing General Requirements
 - 2. Section 220517 Sleeves and Sleeve Seals for Plumbing Piping
 - 3. Section 220518 Escutcheons for Plumbing Piping
 - 4. Section 220529 Hangers and Supports for Plumbing Piping and Equipment
 - 5. Section 220548 Vibration and Seismic Controls for Plumbing Piping and Equipment
 - 6. Section 220553 Identification for Plumbing Piping and Equipment
 - 7. Section 221313 Facility Sanitary Sewers
 - 8. Section 221319 Sanitary Waste Piping Specialties

1.2 SUMMARY

- A. Section Includes:
 - 1. Hub-and-spigot, cast-iron soil pipe and fittings.
 - 2. Hubless, cast-iron soil pipe and fittings.
 - 3. Copper tube and fittings.
 - 4. Specialty pipe fittings.

1.3 REFERENCES

- A. American Society of Mechanical Engineers:
 - 1. ASME B16.12 - Cast Iron Threaded Drainage Fittings.
 - 2. ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fitting DWV.
 - 3. ASME B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes.
 - 4. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fitting DWV.
- B. ASTM International:
 - 1. ASTM A74 - Standard Specification for Cast Iron Pipe.
 - 2. ASTM A888 - Standard Specification for Cast Iron Pipe.
 - 3. ASTM B32 - Standard Specification for Solder Metal.
 - 4. ASTM B42 - Standard Specification for Seamless Copper Pipe, Standard Sizes.
 - 5. ASTM B43 - Standard Specification for Seamless Red Brass Pipe, Standard Sizes.
 - 6. ASTM B75 - Standard Specification for Seamless Copper Tube.
 - 7. ASTM B88 - Standard Specification for Seamless Copper Water Tube.
 - 8. ASTM B251 - Standard Specification for General Requirements for Wrought Seamless Copper and Copper-Alloy Tube.
 - 9. ASTM B302 - Standard Specification for Threadless Copper Pipe, Standard Sizes.

- C. Cast Iron Soil Pipe Institute:
 - 1. CISPI 301 – Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications.
 - 2. CISPI 10 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications.


1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.5 INFORMATIONAL SUBMITTALS

- A. Seismic Qualification Certificates: For waste and vent piping, accessories, and components, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - 2. Detailed description of piping anchorage devices on which the certification is based and their installation requirements.
- B. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- B. All pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute  and listed by NSF® International.

1.7 FIELD CONDITIONS

- A. Interruption of Existing Sanitary Waste Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
 - 1. Notify Owner Construction Manager no fewer than three days in advance of proposed interruption of sanitary waste service.
 - 2. Do not proceed with interruption of sanitary waste service without Owners written permission.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:
 - 1. Soil, Waste, and Vent Piping: 10-foot head of water.

- B. Seismic Performance: Soil, waste, and vent piping and support and installation shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

2.2 PIPING MATERIALS

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.3 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 74, Service and Extra Heavy class(es).
- B. Gaskets: ASTM C 564, rubber.
- C. Calking Materials: ASTM B 29, pure lead and oakum or hemp fiber.

2.4 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 888 or CISPI 301.
- B. CISPI, Hubless-Piping Couplings:
 - 1. Standards: ASTM C 1277 and CISPI 310.
 - 2. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.
- C. Heavy-Duty, Hubless-Piping Couplings:
 - 1. Standards: ASTM C 1277 and ASTM C 1540.
 - 2. Description: Stainless-steel shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

2.5 COPPER TUBE AND FITTINGS

- A. Copper Type DWV Tube: ASTM B 306, drainage tube, drawn temper.
- B. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings.
- C. Hard Copper Tube: ASTM B 88, Type L and Type M, water tube, drawn temper.
- D. Soft Copper Tube: ASTM B 88, Type L, water tube, annealed temper.
- E. Copper Pressure Fittings:
 - 1. Copper Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
 - 2. Copper Unions: MSS SP-123, copper-alloy, hexagonal-stock body with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

- F. Copper Flanges: ASME B16.24, Class 150, cast copper with solder-joint end.
 - 1. Flange Gasket Materials: ASME B16.21, full-face, flat, nonmetallic, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
 - 2. Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.
- G. Solder: ASTM B 32, lead free with ASTM B 813, water-flushable flux.

2.6 SPECIALTY PIPE FITTINGS

- A. Transition Couplings:
 - 1. General Requirements: Fitting or device for joining piping with small differences in OD's or of different materials. Include end connections same size as and compatible with pipes to be joined.
 - 2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
 - 3. Unshielded, Nonpressure Transition Couplings:
 - a. Standard: ASTM C 1173.
 - b. Description: Elastomeric, sleeve-type, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
 - c. End Connections: Same size as and compatible with pipes to be joined.
 - d. Sleeve Materials:
 - 1) For Cast-Iron Soil Pipes: ASTM C 564, rubber.
 - 4. Shielded, Nonpressure Transition Couplings:
 - a. Standard: ASTM C 1460.
 - b. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.
 - c. End Connections: Same size as and compatible with pipes to be joined.
- B. Dielectric Fittings:
 - 1. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
 - 2. Dielectric Unions:
 - a. Description:
 - 1) Standard: ASSE 1079.
 - 2) Pressure Rating: 125 psig minimum at 180 deg F.
 - 3) End Connections: Solder-joint copper alloy and threaded ferrous.
 - 3. Dielectric Flanges:
 - a. Description:
 - 1) Standard: ASSE 1079.
 - 2) Factory-fabricated, bolted, companion-flange assembly.
 - 3) Pressure Rating: 125 psig minimum at 180 deg F.
 - 4) End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

4. Dielectric-Flange Insulating Kits:
 - a. Description:
 - 1) Nonconducting materials for field assembly of companion flanges.
 - 2) Pressure Rating: 150 psig.
 - 3) Gasket: Neoprene or phenolic.
 - 4) Bolt Sleeves: Phenolic or polyethylene.
 - 5) Washers: Phenolic with steel backing washers.
5. Dielectric Nipples:
 - a. Description:
 - 1) Standard: IAPMO PS 66.
 - 2) Electroplated steel nipple.
 - 3) Pressure Rating: 300 psig at 225 deg F.
 - 4) End Connections: Male threaded or grooved.
 - 5) Lining: Inert and noncorrosive, propylene.

PART 3 - EXECUTION

3.1 EARTH MOVING

- A. Comply with requirements for excavating, trenching, and backfilling specified in Section 312000 "Earth Moving."

3.2 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems.
 1. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations.
 2. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Install piping to permit valve servicing.
- F. Install piping at indicated slopes.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.

- I. Install piping to allow application of insulation.
- J. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- K. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends.
 - 1. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal too vertical.
 - 2. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe.
 - a. Straight tees, elbows, and crosses may be used on vent lines.
 - 3. Do not change direction of flow more than 90 degrees.
 - 4. Use proper size of standard increasers and reducers if pipes of different sizes are connected.
 - a. Reducing size of waste piping in direction of flow is prohibited.
- L. Lay buried building waste piping beginning at low point of each system.
 - 1. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream.
 - 2. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
 - 3. Maintain swab in piping and pull past each joint as completed.
- M. Install soil and waste and vent piping at the following minimum slopes unless otherwise indicated:
 - 1. Building Sanitary Waste: 2 percent downward in direction of flow for piping 2 ½-inch and smaller; 1 percent downward in direction of flow for piping 3-inch and larger.
 - 2. Horizontal Sanitary Waste Piping: 1 percent downward in direction of flow.
 - 3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.
 - 4. Grease Waste Piping: 2 percent downward in direction of flow.
- N. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
 - 1. Install encasement on underground piping according to ASTM A 674 or AWWA C105/A 21.5.
- O. Install aboveground copper tubing according to CDA's "Copper Tube Handbook."
- P. Install engineered soil and waste and vent piping systems as follows:
 - 1. Combination Waste and Vent: Comply with standards of authorities having jurisdiction.
 - 2. Hubless, Single-Stack Drainage System: Comply with ASME B16.45 and hubless, single-stack aerator fitting manufacturer's written installation instructions.
 - 3. Reduced-Size Venting: Comply with standards of authorities having jurisdiction.
- Q. Plumbing Specialties:
 - 1. Install backwater valves in sanitary waster gravity-flow piping.

- a. Comply with requirements for backwater valves specified in Section 221319 "Sanitary Waste Piping Specialties."
2. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary waste gravity-flow piping.
 - a. Install cleanout fitting with closure plug inside the building in sanitary drainage force-main piping.
 - b. Comply with requirements for cleanouts specified in Section 221319 "Sanitary Waste Piping Specialties."
3. Install drains in sanitary waste gravity-flow piping.
 - a. Comply with requirements for drains specified in Section 221319 "Sanitary Waste Piping Specialties."
- R. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
- S. Install sleeves for piping penetrations of walls, ceilings, and floors.
 1. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- T. Install sleeve seals for piping penetrations of concrete walls and slabs.
 1. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- U. Install escutcheons for piping penetrations of walls, ceilings, and floors.
 1. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.3 JOINT CONSTRUCTION

- A. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.
- B. Join hub-and-spigot, cast-iron soil piping with calked joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead-and-oakum calked joints.
- C. Join hubless, cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.
- D. Join copper tube and fittings with soldered joints according to ASTM B 828. Use ASTM B 813, water-flushable, lead-free flux and ASTM B 32, lead-free-alloy solder.
- E. Grooved Joints: Cut groove ends of pipe according to AWWA C606. Lubricate and install gasket over ends of pipes or pipe and fitting. Install coupling housing sections, over gasket, with keys seated in piping grooves. Install and tighten housing bolts.

- F. Flanged Joints: Align bolt holes. Select appropriate gasket material, size, type, and thickness. Install gasket concentrically positioned. Use suitable lubricants on bolt threads. Torque bolts in cross pattern.

3.4 SPECIALTY PIPE FITTING INSTALLATION

A. Transition Couplings:

1. Install transition couplings at joints of piping with small differences in ODs.
2. In Waste Drainage Piping: Shielded, nonpressure transition couplings.
3. In Aboveground Force Main Piping: Fitting-type transition couplings.
4. In Underground Force Main Piping:
 - a. 1-1/2-inch and Smaller: Fitting-type transition couplings.
 - b. 2-inch and Larger: Pressure transition couplings.

B. Dielectric Fittings:

1. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
2. Dielectric Fittings for 2-inch and Smaller: Use dielectric nipples or unions.
3. Dielectric Fittings for 2-1/2-inch to 4-inch: Use dielectric flanges flange kits or nipples.
4. Dielectric Fittings for 6-inch and Larger: Use dielectric flange kits.

3.5 VALVE INSTALLATION

- A. Comply with requirements in Section 220523.12 "Ball Valves for Plumbing Piping," Section 220523.13 "Butterfly Valves for Plumbing Piping," Section 220523.14 "Check Valves for Plumbing Piping," and Section 220523.15 "Gate Valves for Plumbing Piping" for general-duty valve installation requirements.

B. Shutoff Valves:

1. Install shutoff valve on each sewage pump discharge.
2. Install gate or full-port ball valve for piping 2-inch and smaller.
3. Install gate valve for piping 2-1/2-inch and larger.

- C. Check Valves: Install swing check valve, between pump and shutoff valve, on each sewage pump discharge.

D. Backwater Valves: Install backwater valves in piping subject to backflow.

1. Horizontal Piping: Horizontal backwater valves, use normally closed type unless otherwise indicated.
2. Floor Drains: Drain outlet backwater valves unless drain has integral backwater valve.
3. Install backwater valves in accessible locations.
4. Comply with requirements for backwater valve specified in Section 221319 "Sanitary Waste Piping Specialties."

3.6 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

- B. Comply with requirements for pipe hanger and support devices and installation specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment. "Also Section 220548.13 "Vibration Controls for Plumbing Piping and Equipment."
1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
 2. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.
 3. Install stainless-steel pipe support clamps for vertical piping in corrosive environments.
 4. Vertical Piping: MSS Type 8 or Type 42, clamps.
 5. Install individual, straight, horizontal piping runs:
 - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
 - c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.
 6. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
 7. Base of Vertical Piping: MSS Type 52, spring hangers.
- C. Support horizontal piping and tubing within 12 inches of each fitting, valve, and coupling.
- D. Support vertical piping and tubing at base and at each floor.
- E. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.
- F. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:
1. 1-1/2 and 2-inch: 60 inches with 3/8-inch rod.
 2. 3-inch: 60 inches with 1/2-inch rod.
 3. 4 and 5-inch: 60 inches with 5/8-inch rod.
 4. 6 and 8-inch: 60 inches with 3/4-inch rod.
 5. 10 and 12-inch: 60 inches with 7/8-inch rod.
 6. Spacing for 10-foot lengths may be increased to 10 feet. Spacing for fittings is limited to 60 inches.
- G. Install supports for vertical cast-iron soil piping every 15 feet.
- H. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
1. 1-1/4-inch: 72 inches with 3/8-inch rod.
 2. 1-1/2 and 2-inch: 96 inches with 3/8-inch rod.
 3. 2-1/2-inch: 108 inches with 1/2-inch rod.
 4. 3 to 5-inch: 10 feet with 1/2-inch rod.
 5. 6-inch: 10 feet with 5/8-inch rod.
 6. 8-inch: 10 feet with 3/4-inch rod.
- I. Install supports for vertical copper tubing every 10 feet.
- J. Support piping and tubing not listed above according to MSS SP-58 and manufacturer's written instructions.

3.7 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.
- C. Connect waste and vent piping to the following:
 - 1. Plumbing Fixtures: Connect waste piping in sizes indicated, but not smaller than required by plumbing code.
 - 2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
 - 3. Plumbing Specialties: Connect waste and vent piping in sizes indicated, but not smaller than required by plumbing code.
 - 4. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.
 - 5. Install horizontal backwater valves with cleanout cover flush with floor.
 - 6. Comply with requirements for backwater valves, cleanouts and drains specified in Section 221319 "Sanitary Waste Piping Specialties."
 - 7. Equipment: Connect waste piping as indicated.
 - a. Provide shutoff valve if indicated and union for each connection.
 - b. Use flanges instead of unions for connections 2-1/2-inch and larger.
- D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.
- E. Make connections according to the following unless otherwise indicated:
 - 1. Install unions, in piping 2-inch and smaller, adjacent to each valve and at final connection to each piece of equipment.
 - 2. Install flanges, in piping 2-1/2-inch and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3.8 IDENTIFICATION

- A. Identify exposed sanitary waste and vent piping.
- B. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.9 FIELD QUALITY CONTROL

- A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
 - 1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
 - 2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

- B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
- C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- D. Test sanitary waste and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
 - 1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired.
 - a. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
 - 2. Leave uncovered and unconcealed new, altered, extended, or replaced waste and vent piping until it has been tested and approved.
 - a. Expose work that was covered or concealed before it was tested.
 - 3. Roughing-in Plumbing Test Procedure: Test waste and vent piping except outside leaders on completion of roughing-in.
 - a. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water.
 - b. From 15 minutes before inspection starts to completion of inspection, water level must not drop.
 - c. Inspect joints for leaks.
 - 4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight.
 - a. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg.
 - b. Use U-tube or manometer inserted in trap of water closet to measure this pressure.
 - c. Air pressure must remain constant without introducing additional air throughout period of inspection.
 - d. Inspect plumbing fixture connections for gas and water leaks.
 - 5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
 - 6. Prepare reports for tests and required corrective action.

3.10 CLEANING AND PROTECTION

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect sanitary waste and vent piping during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.
- D. Repair damage to adjacent materials caused by waste and vent piping installation.

3.11 PIPING SCHEDULE

- A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.
- B. Aboveground, soil, waste and grease waste piping 4-inch and smaller shall be any of the following:
 - 1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
 - 2. Hubless, cast-iron soil pipe and fittings; CISPI heavy-duty hubless-piping couplings; and coupled joints.
 - 3. Copper Type DWV tube, copper drainage fittings, and soldered joints.
 - 4. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.
- C. Aboveground, soil, waste and grease waste piping 5-inch and larger shall be any of the following:
 - 1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
 - 2. Hubless, cast-iron soil pipe and fittings; CISPI heavy-duty hubless-piping couplings; and coupled joints.
 - 3. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.
- D. Aboveground, vent piping 4-inch and smaller shall be any of the following:
 - 1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
 - 2. Hubless, cast-iron soil pipe and fittings; CISPI heavy-duty hubless-piping couplings; and coupled joints.
 - 3. Copper Type DWV tube, copper drainage fittings, and soldered joints.
 - a. Option for Vent Piping, 2-1/2-inch and 4-inch: Hard copper tube, Type M; copper pressure fittings; and soldered joints.
 - 4. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.
- E. Aboveground, vent piping 5-inch and larger shall be any of the following:
 - 1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
 - 2. Hubless, cast-iron soil pipe and fittings; CISPI heavy-duty hubless-piping couplings; and coupled joints.
 - 3. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.
- F. Underground, soil, waste, and vent piping 4-inch and smaller shall be any of the following:
 - 1. Service Extra Heavy class, cast-iron soil piping; gaskets; and gasketed calking materials;
 - 2. Hubless, cast-iron soil pipe and fittings; CISPI heavy-duty cast-iron hubless-piping couplings; and coupled joints.
 - 3. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.
- G. Underground, Grease waste piping 5-inch and larger shall be any of the following:
 - 1. Service Extra Heavy class, cast-iron soil piping; gaskets; and gasketed joints.
 - 2. Dissimilar Pipe-Material Couplings: shielded, nonpressure transition couplings.
- H. Underground Grease waste piping 4-inch and smaller shall be any of the following:
 - 1. Service Extra Heavy class, cast-iron soil piping; gaskets; and gasketed calking materials;

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2. Hubless, cast-iron soil pipe and fittings; CISPI heavy-duty cast-iron hubless-piping couplings; and coupled joints.
3. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

END OF SECTION 221316

SECTION 221319 - SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Backwater valves.
 - 2. Cleanouts.
 - 3. Air-admittance valves.
 - 4. Roof flashing assemblies.
 - 5. Through-penetration firestop assemblies.
 - 6. Miscellaneous sanitary drainage piping specialties.

PART 2 - PRODUCTS

2.1 BACKWATER VALVES

- A. Horizontal, Cast-Iron Backwater Valves:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Jay R. Smith Mfg. Co.
 - b. Josam Company.
 - c. MIFAB, Inc.
 - d. Tyler Pipe; a subsidiary of McWane Inc.
 - e. WATTS.
 - 2. Standard: ASME A112.14.1.
 - 3. Size: Same as connected piping.
 - 4. Body: Cast iron.
 - 5. Cover: Cast iron with bolted or threaded access check valve.
 - 6. End Connections: Hub and spigot Hub and spigot or hubless.
 - 7. Type Check Valve: Removable, bronze, swing check, factory assembled or field modified to hang closed.
 - 8. Extension: ASTM A 74, Service class; full-size, cast-iron, soil-pipe extension to field-installed cleanout at floor; replaces backwater valve cover.

2.2 CLEANOUTS

- A. Cast-Iron Exposed Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Jay R. Smith Mfg. Co.
 - b. Josam Company.
 - c. MIFAB, Inc.
 - d. Tyler Pipe; a subsidiary of McWane Inc.
 - e. WATTS.
2. Standard: ASME A112.36.2M.
3. Size: Same as connected drainage piping
4. Body Material: Hub-and-spigot, cast-iron soil pipe T-branch or Hubless, cast-iron soil pipe test tee as required to match connected piping.
5. Closure: Countersunk or raised-head, brass plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.

B. Cast-Iron Exposed Floor Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Jay R. Smith Mfg. Co.
 - b. Josam Company.
 - c. Oatey.
 - d. Sioux Chief Manufacturing Company, Inc.
 - e. Tyler Pipe; a subsidiary of McWane Inc.
 - f. WATTS.
2. Standard: ASME A112.36.2M for heavy-duty, adjustable housing cleanout.
3. Size: Same as connected branch.
4. Type: Heavy-duty, adjustable housing.
5. Body or Ferrule: Cast iron.
6. Clamping Device: Not required.
7. Outlet Connection: Inside calk or Spigot.
8. Closure: Brass plug with straight threads and gasket or Brass plug with taper.
9. Adjustable Housing Material: Cast iron with setscrews or another device.
10. Frame and Cover Material and Finish: Nickel-bronze, copper alloy.
11. Frame and Cover Shape: Round.
12. Top Loading Classification: Heavy Duty.
13. Riser: ASTM A 74, Service class, cast-iron drainage pipe fitting and riser to cleanout.

2.3 AIR-ADMITTANCE VALVES

A. Fixture Air-Admittance Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Ayrlett, LLC.
 - b. Durgo, Inc.
 - c. Oatey.
 - d. ProSet Systems Inc.
 - e. RectorSeal.
 - f. Studor, Inc.

2. Standard: ASSE 1051, Type A for single fixture or Type B for branch piping.
3. Housing: Plastic.
4. Operation: Mechanical sealing diaphragm.
5. Size: Same as connected fixture or branch vent piping.

2.4 ROOF FLASHING ASSEMBLIES

A. Roof Flashing Assemblies:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Acorn Engineering Company.
 - b. Thaler Metal Industries Ltd.
2. Description: Manufactured assembly made of 4.0-lb/sq. ft., 0.0625-inch-thick, lead flashing collar and skirt extending at least 6 inches from pipe, with galvanized-steel boot reinforcement and counterflashing fitting.
 - a. Open-Top Vent Cap: Without cap.
 - b. Low-Silhouette Vent Cap: With vandal-proof vent cap.
 - c. Extended Vent Cap: With field-installed, vandal-proof vent cap.

2.5 THROUGH-PENETRATION FIRESTOP ASSEMBLIES

A. Through-Penetration Firestop Assemblies:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. ProSet Systems Inc.
2. Standard: UL 1479 assembly of sleeve-and-stack fitting with firestopping plug.
3. Size: Same as connected soil, waste, or vent stack.
4. Sleeve: Molded-PVC plastic, of length to match slab thickness and with integral nailing flange on one end for installation in cast-in-place concrete slabs.
5. Stack Fitting: ASTM A 48/A 48M, gray-iron, hubless-pattern wye branch with neoprene O-ring at base and gray-iron plug in thermal-release harness. Include PVC protective cap for plug.
6. Special Coating: Corrosion resistant on interior of fittings.

2.6 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. Open Drains:

1. Description: Shop or field fabricate from ASTM A 74, Service class, hub-and-spigot, cast-iron soil-pipe fittings. Include P-trap, hub-and-spigot riser section; and where required, increaser fitting joined with ASTM C 564 rubber gaskets.
2. Size: Same as connected waste piping with increaser fitting of size indicated.

B. Floor-Drain, Trap-Seal Primer Fittings:

1. Description: Cast iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.

2. Size: Same as floor drain outlet with NPS 1/2 side inlet.

C. Air-Gap Fittings:

1. Standard: ASME A112.1.2, for fitting designed to ensure fixed, positive air gap between installed inlet and outlet piping.
2. Body: Bronze or cast iron.
3. Inlet: Opening in top of body.
4. Outlet: Larger than inlet.
5. Size: Same as connected waste piping and with inlet large enough for associated indirect waste piping.

D. Sleeve Flashing Device:

1. Description: Manufactured, cast-iron fitting, with clamping device that forms sleeve for pipe floor penetrations of floor membrane. Include galvanized-steel pipe extension in top of fitting that will extend 1 inch above finished floor and galvanized-steel pipe extension in bottom of fitting that will extend through floor slab.
2. Size: As required for close fit to riser or stack piping.

E. Expansion Joints:

1. Standard: ASME A112.6.4.
2. Body: Cast iron with bronze sleeve, packing, and gland.
3. End Connections: Matching connected piping.
4. Size: Same as connected soil, waste, or vent piping.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install backwater valves in building drain piping.

1. For interior installation, provide cleanout deck plate flush with floor and centered over backwater valve cover, and of adequate size to remove valve cover for servicing.

B. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:

1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
2. Locate at each change in direction of piping greater than 45 degrees.
3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
4. Locate at base of each vertical soil and waste stack.

C. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

D. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

E. Install fixture air-admittance valves on fixture drain piping.

- F. Install stack air-admittance valves at top of stack vent and vent stack piping.
- G. Install roof flashing assemblies on sanitary stack vents and vent stacks that extend through roof. Comply with requirements in Section 076200 "Sheet Metal Flashing and Trim."
- H. Install flashing fittings on sanitary stack vents and vent stacks that extend through roof. Comply with requirements in Section 076200 "Sheet Metal Flashing and Trim."
- I. Install through-penetration firestop assemblies in steel conductors and stacks at floor penetrations.
 - 1. Comply with requirements in Section 078413 "Penetration Firestopping."
- J. Assemble open drain fittings and install with top of hub 2 inches above floor.
- K. Install deep-seal traps on floor drains and other waste outlets, if indicated.
- L. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.
 - 1. Exception: Fitting may be omitted if trap has trap-seal primer connection.
 - 2. Size: Same as floor drain inlet.
- M. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.
- N. Install sleeve and sleeve seals with each riser and stack passing through floors with waterproof membrane.
- O. Install vent caps on each vent pipe passing through roof.
- P. Install expansion joints on vertical stacks and conductors. Position expansion joints for easy access and maintenance.
- Q. Install wood-blocking reinforcement for wall-mounting-type specialties.
- R. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

3.2 CONNECTIONS

- A. Comply with requirements in Section 221316 "Sanitary Waste and Vent Piping" for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment to allow service and maintenance.
- C. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
- D. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.3 FLASHING INSTALLATION

- A. Comply with requirements in Section 076200 "Sheet Metal Flashing and Trim."
- B. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required.

- C. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.
 - 1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches, and skirt or flange extending at least 8 inches around pipe.
 - 2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches around sleeve.
 - 3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches around specialty.
- D. Set flashing on floors and roofs in solid coating of bituminous cement.
- E. Secure flashing into sleeve and specialty clamping ring or device.
- F. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings, according to Section 076200 "Sheet Metal Flashing and Trim."
- G. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.

3.4 LABELING AND IDENTIFYING

- 1. Nameplates and signs are specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.5 FIELD QUALITY CONTROL

- A. Tests and Inspections:
 - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.6 PROTECTION

- A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.
- B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 221319

SECTION 221433 - SODA MACHINE PIPING CONDUIT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Nonmetal conduit, tubing and fittings.

1.3 ACTION SUBMITTALS

- A. Product Data: For surface Conduit and fittings.
- B. Shop Drawings: For custom pathway of conduits from soda machine equipment to soda bottle filling area. Include plans, elevations, sections, and attachment details.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:
 - 1. Structural members in paths of conduit groups with common supports.
 - 2. HVAC and electrical items and architectural features in paths of conduit groups with common supports.
 - 3. Coordinate final locations with Food Service vending contractor of equipment locations and storage bottle locations.

PART 2 - PRODUCTS

2.1 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. AFC Cable Systems; a part of Atkore International.
 - 2. RACO; Hubbell.
 - 3. Thomas & Betts Corporation; A Member of the ABB Group.
- B. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.
- C. Fittings for RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.

- D. Solvents and Adhesives: As recommended by conduit manufacturer.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

- A. Indoors: Apply raceway products as specified below unless otherwise indicated:
1. Exposed Conduit: Type EPC-40-PVC.
 2. Concealed Conduit, Aboveground: Type EPC-40-PVC.
 3. Underground Conduit: Type EPC-40-PVC, Type EPC-80-PVC, direct buried, concrete encased.
 - a. Loading dock.
 - b. Corridors used for traffic.
 - c. Mechanical rooms.
 4. Concealed in Ceilings and Interior Walls and Partitions: Type EPC-40-PVC.
- B. Minimum Raceway Size: 6-inch trade size.

3.2 INSTALLATION

- A. Keep conduit at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- B. Complete raceway installation before starting conductor installation.
- C. Comply with requirements in Section "Hangers and Supports for Plumbing Systems" for hangers and supports.
- D. Arrange stub-ups so curved portions of bends are not visible above finished slab.
- E. Conceal PVC conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
- F. Support conduit within 12 inches of enclosures to which attached.
- G. Stub-ups to Above Recessed Ceilings:
1. Use PVC stub up minimum 12 inches above floor. Coordinate with soda vender.
- H. Install pull tag line in empty conduit. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull tag line.
- I. Comply with manufacturer's written instructions for solvent welding PVC pipe and fittings.

3.3 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR PVC CONDUIT PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section "Sleeves and Sleeve Seals for PLUMBING PIPING."

3.4 FIRESTOPPING

- A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section "Penetration Firestopping."

END OF SECTION 221433

SECTION 224300 - PLUMBING FIXTURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following conventional plumbing fixtures and related components:
 - 1. Service basins.
 - 2. Owner-furnished fixtures.
- B. Related Sections include the following:
 - 1. Division 22 Section "Domestic Water Piping Specialties" for backflow preventers, floor drains, and specialty fixtures not included in this Section.
 - 2. Division 22 Section "Emergency Plumbing Fixtures."

1.3 DEFINITIONS

- A. Accessible Fixture: Plumbing fixture that can be approached, entered, and used by people with disabilities.
- B. Cast Polymer: Cast-filled-polymer-plastic material. This material includes cultured-marble and solid-surface materials.
- C. Cultured Marble: Cast-filled-polymer-plastic material with surface coating.
- D. Fitting: Device that controls the flow of water into or out of the plumbing fixture. Fittings specified in this Section include supplies and stops, faucets and spouts, shower heads and tub spouts, drains and tailpieces, and traps and waste pipes. Piping and general-duty valves are included where indicated.
- E. Solid Surface: Nonporous, homogeneous, cast-polymer-plastic material with heat-, impact-, scratch-, and stain-resistance qualities.

1.4 SUBMITTALS

- A. Product Data: For each type of plumbing fixture indicated. Include selected fixture and trim, fittings, accessories, appliances, appurtenances, equipment, and supports. Indicate materials and finishes, dimensions, construction details, and flow-control rates.

- B. Shop Drawings: Diagram power, signal, and control wiring.
- C. Operation and Maintenance Data: For plumbing fixtures to include in emergency, operation, and maintenance manuals.
- D. Warranty: Special warranty specified in this Section.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain plumbing fixtures, faucets, and other components of each category through one source from a single manufacturer.
 - 1. Exception: If fixtures, faucets, or other components are not available from a single manufacturer, obtain similar products from other manufacturers specified for that category.
- B. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities"; Public Law 90-480, "Architectural Barriers Act"; and Public Law 101-336, "Americans with Disabilities Act"; for plumbing fixtures for people with disabilities.
- C. Regulatory Requirements: Comply with requirements in Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures.
- D. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.
- E. Comply with the following applicable standards and other requirements specified for plumbing fixtures:
 - 1. Plastic Mop-Service Basins: ANSI Z124.6.
- F. Comply with the following applicable standards and other requirements specified for miscellaneous fittings:
 - 1. Atmospheric Vacuum Breakers: ASSE 1001.
 - 2. Brass and Copper Supplies: ASME A112.18.1.

1.6 WARRANTY

- A. Special Warranties: Manufacturer's standard form in which manufacturer agrees to repair or replace components of whirlpools that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures of unit shell.
 - b. Faulty operation of controls, blowers, pumps, heaters, and timers.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal use.
 - 2. Warranty Period for Commercial Applications: One year(s) from date of Substantial Completion.

1.7 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Faucet Washers and O-Rings: Equal to 10 percent of amount of each type and size installed.
 - 2. Faucet Cartridges and O-Rings: Equal to 5 percent of amount of each type and size installed.

1.8 SERVICE BASINS

- A. Service Basins:
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Acorn Engineering Company.
 - b. Crane Plumbing, L.L.C./Fiat Products.
 - c. Precast Terrazzo Enterprises, Inc.
 - d. Stern-Williams Co., Inc.
 - e. Florestone Products Co., Inc.
 - f. Mustee, E. L. & Sons, Inc.
 - 2. Description: Flush-to-wall, floor-mounting, precast terrazzo fixture with rim guard.
 - a. Shape: Square.
 - b. Size: 36 by 36 inches.
 - c. Height: 10 inches with dropped front.
 - d. Tiling Flange: Not required.
 - e. Rim Guard: On all top surfaces.
 - f. Color: Not applicable.
 - g. Faucet: with integral vacuum breaker.
 - h. Drain: Grid with NPS 3 outlet.

PART 2 - EXECUTION

2.1 EXAMINATION

- A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before plumbing fixture installation.
- B. Examine cabinets, counters, floors, and walls for suitable conditions where fixtures will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

2.2 INSTALLATION

- A. Assemble plumbing fixtures, trim, fittings, and other components according to manufacturers' written instructions.
- B. Install fixtures level and plumb according to roughing-in drawings.

- C. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.
 - 1. Exception: Use ball, gate, or globe valves if supply stops are not specified with fixture. Valves are specified in Division 22 Section "General-Duty Valves for Plumbing Piping."
- D. Install traps on fixture outlets.
 - 1. Exception: Omit trap on fixtures with integral traps.
 - 2. Exception: Omit trap on indirect wastes, unless otherwise indicated.
- E. Install escutcheons at piping wall ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings. Escutcheons are specified in Division 22 Section "Escutcheons for Plumbing Piping."
- F. Seal joints between fixtures and walls, floors, and countertops using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Sealants are specified in Division 07 Section "Joint Sealants."

2.3 CONNECTIONS

- A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

2.4 CONTROL

- A. Verify that installed plumbing fixtures are categories and types specified for locations where installed.
- B. Check that plumbing fixtures are complete with trim, faucets, fittings, and other specified components.
- C. Inspect installed plumbing fixtures for damage. Replace damaged fixtures and components.
- D. Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.

2.5 ADJUSTING

- A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.
- B. Replace washers and seals of leaking and dripping faucets and stops.

2.6 CLEANING

- A. Clean fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials. Do the following:

1. Remove faucet spouts and strainers, remove sediment and debris, and reinstall strainers and spouts.
 2. Remove sediment and debris from drains.
- B. After completing installation of exposed, factory-finished fixtures, faucets, and fittings, inspect exposed finishes and repair damaged finishes.

2.7 PROTECTION

- A. Provide protective covering for installed fixtures and fittings.
- B. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION 224000

SECTION 224500 - EMERGENCY PLUMBING FIXTURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Eyewash equipment.
 - 2. Water-tempering equipment.

1.3 DEFINITIONS

- A. Accessible Fixture: Emergency plumbing fixture that can be approached, entered, and used by people with disabilities.
- B. Plumbed Emergency Plumbing Fixture: Fixture with fixed, potable-water supply.
- C. Self-Contained Emergency Plumbing Fixture: Fixture with flushing-fluid-solution supply.
- D. Tepid: Moderately warm.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include flow rates and capacities, furnished specialties, and accessories.
- B. Product Certificates: Submit certificates of performance testing specified in "Source Quality Control" Article.
- C. Field quality-control test reports.
- D. Operation and Maintenance Data: For emergency plumbing fixtures to include in operation and maintenance manuals.

1.5 QUALITY ASSURANCE

- A. ANSI Standard: Comply with ANSI Z358.1, "Emergency Eyewash and Shower Equipment."
- B. NSF Standard: Comply with NSF 61, "Drinking Water System Components - Health Effects," for fixture materials that will be in contact with potable water.

- C. Regulatory Requirements: Comply with requirements in ICC/ANSI A117.1, "Accessible and Usable Buildings and Facilities"; Public Law 90-480, "Architectural Barriers Act"; and Public Law 101-336, "Americans with Disabilities Act"; for plumbing fixtures for people with disabilities.

PART 2 - PRODUCTS

2.1 EMERGENCY

A. Wall-Mounted, Plumbed Drench Hoses:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Acorn Safety; a division of Acorn Engineering Company.
 - b. Bradley Corporation.
 - c. Guardian Equipment Co.
 - d. Haws Corporation.
 - e. Speakman Company.
2. Capacity: Not less than 3.0 gpm for at least 15 minutes.
3. Supply Fitting: NPS 1/2 brass with flow regulator.
4. Drench Hose: Hand-held spray head with squeeze-handle actuation and hose.
5. Mounting: Wall bracket.

2.2 WATER-TEMPERING EQUIPMENT

A. Hot- and Cold-Water, Water-Tempering Equipment:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Acorn Safety; a division of Acorn Engineering Company.
 - b. Bradley Corporation.
 - c. Guardian Equipment Co.
 - d. Haws Corporation.
 - e. Lawler Manufacturing Co., Inc.
 - f. Leonard Valve Company.
 - g. Powers; a division of Watts Water Technologies, Inc.
 - h. Speakman Company.
2. Description: Factory-fabricated equipment with thermostatic mixing valve.
 - a. Thermostatic Mixing Valve: Designed to provide 85 deg F tepid, potable water at emergency plumbing fixtures, to maintain temperature at plus or minus 5 deg F throughout required 15-minute test period, and in case of unit failure to continue cold-water flow, with union connections, controls, metal piping, and corrosion-resistant enclosure.
 - b. Supply Connections: For hot and cold water.

2.3 SOURCE QUALITY CONTROL

- A. Certify performance of emergency plumbing fixtures by independent testing organization acceptable to authorities having jurisdiction.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in for water piping systems to verify actual locations of piping connections before plumbed emergency plumbing fixture installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 EMERGENCY PLUMBING FIXTURE INSTALLATION

- A. Assemble emergency plumbing fixture piping, fittings, control valves, and other components.
- B. Install fixtures level and plumb.
- C. Fasten fixtures to substrate.
- D. Install shutoff valves in water-supply piping to fixtures. Use ball, gate, or globe valve if specific type valve is not indicated. Install valves chained or locked in open position if permitted. Install valves in locations where they can easily be reached for operation. Comply with requirements for valves specified in Division 22 Section "General-Duty Valves for Plumbing Piping."
 - 1. Exception: Omit shutoff valve on supply to group of plumbing fixtures that includes emergency equipment.
 - 2. Exception: Omit shutoff valve on supply to emergency equipment if prohibited by authorities having jurisdiction.
- E. Install dielectric fitting in supply piping to emergency equipment if piping and equipment connections are made of different metals. Comply with requirements for dielectric fittings specified in Division 22 Section "Domestic Water Piping."
- F. Install thermometers in supply and outlet piping connections to water-tempering equipment. Comply with requirements for thermometers specified in Division 22 Section "Meters and Gages for Plumbing Piping."
- G. Install escutcheons on piping wall and ceiling penetrations in exposed, finished locations. Comply with requirements for escutcheons specified in Division 22 Section "Escutcheons for Plumbing Piping."

3.3 CONNECTIONS

- A. Connect hot- and cold-water-supply piping to hot- and cold-water, water-tempering equipment. Connect output from water-tempering equipment to emergency plumbing fixtures. Comply with requirements for hot- and cold-water piping specified in Division 22 Section "Domestic Water Piping."

- B. Where installing piping adjacent to emergency plumbing fixtures, allow space for service and maintenance of fixtures.

3.4 IDENTIFICATION

- A. Install equipment nameplates or equipment markers on emergency plumbing fixtures and equipment and equipment signs on water-tempering equipment. Comply with requirements for identification materials specified in Division 22 Section "Identification for Plumbing Piping and Equipment."

3.5 FIELD QUALITY CONTROL

- A. Mechanical-Component Testing: After plumbing connections have been made, test for compliance with requirements. Verify ability to achieve indicated capacities.
- B. Tests and Inspections:
 - 1. Perform each visual and mechanical inspection.
 - 2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Emergency plumbing fixtures and water-tempering equipment will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

3.6 ADJUSTING

- A. Adjust or replace fixture flow regulators for proper flow.
- B. Adjust equipment temperature settings.

END OF SECTION 224500

SECTION 230100 – MECHANICAL GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. All of the Contract Documents, as listed on the Table of Contents and including General and Supplementary Conditions and Division 1, General Requirements, shall be included in, and made part of, this Section.

1.2 DESCRIPTION OF WORK

- A. Carefully examine all of the Contract Documents, criteria sheets and all other Sections of the specifications for requirements which affect work under this Section, whether or not such work is specifically mentioned in this Section.
- B. The work under this Contract shall include all labor, materials, tools, equipment, transportation, insurance, temporary protection, supervision and incidental items essential for proper installation and operation, even though not specifically mentioned or indicated on the drawings, but which are usually provided or are essential for proper installation and operation, of all systems as indicated on the drawings and specified herein.
- C. The specifications and drawings describe the minimum requirements that must be met by the HVAC Subcontractor for the installation of all work as shown on the drawings and as specified hereinunder.
- D. Coordinate work with that of all other Trades affecting or affected by the work of this Section. Cooperate with such Trades to assure the steady progress of all work under the Contract.

1.3 RELATED WORK

- A. For work to be included as part of this Section, to be furnished and installed by the HVAC Subcontractor, refer to the following Sections:

Section 230130	HVAC AIR DUCT CLEANING
Section 230400	GENERAL CONDITIONS FOR MECHANICAL TRADES
Section 230513	COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT
Section 230516	EXPANSION FITTINGS AND LOOPS FOR HVAC PIPING
Section 230517	SLEEVES AND SLEEVE SEALS FOR HVAC PIPING
Section 230519	METERS AND GAGES FOR HVAC PIPING
Section 230523	GENERAL-DUTY VALVES FOR HVAC PIPING
Section 230529	HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT
Section 230548	VIBRATION AND SEISMIC CONTROLS FOR HVAC PIPING AND EQUIPMENT
Section 230553	IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT
Section 230593	TESTING, ADJUSTING, AND BALANCING FOR HVAC
Section 230713	DUCT INSULATION

Section 230719	HVAC PIPING INSULATION
Section 232113	HYDRONIC PIPING
Section 232116	HYDRONIC PIPING SPECIALTIES
Section 232123	HYDRONIC PUMPS
Section 233113	METAL DUCTS
Section 233300	AIR DUCT ACCESSORIES
Section 233346	FLEXIBLE DUCTS
Section 233713.13	AIR DIFFUSERS
Section 233713.23	REGISTERS, AND GRILLES
Section 238216.11	HYDRONIC AIR COILS
Section 238239.19	WALL AND CEILING UNIT HEATERS

- B. For work related to, and to be coordinated with the HVAC work, but not included in this Section and required to be performed under other designated Sections, see the following:

1. Division 4 Section "Masonry Work" for HVAC construction.
2. Division 7 Section "Firestopping".
3. Division 7 Section "Caulking, Flashing, Waterproofing, Roofing and setting of Roof Drains".
4. Division 8 Section "Access Panels".
5. Division 9 Section "Painting".

1.4 REFERENCES

- A. All materials and workmanship shall comply with all applicable Codes, Specifications, Local and State Ordinances, Industry Standards and Utility Company Regulations, latest editions.
- B. In case of difference between Building Codes, State Laws, Local Ordinances, Industry Standards and Utility Company Regulations and the Contract Documents, the HVAC Subcontractor shall promptly notify the Architect in writing of any such difference.
- C. In case of conflict between the Contract Documents and the requirements of any Code or Authorities having jurisdiction, the most stringent requirements of the aforementioned shall govern.
- D. Should the HVAC Subcontractor perform any work that does not comply with the requirements of the applicable Building Codes, State Laws, Local Ordinances, Industry Standards and Utility Company Regulations, he shall bear all costs arising in correcting the deficiencies, as approved by the Architect/Owner.
- E. Applicable Codes and Standards shall include all State Laws, Local Ordinances, Utility Company Regulations, and the applicable requirements of the latest adopted edition of the following Codes and Standards, without limiting the number, as follows:
1. National Electrical Code (NEC)
 2. Environmental Protection Agency (EPA)
 3. New York - Environmental Air Quality Protection Agency
 4. New York - Energy Code
 5. New York - Building Code (Latest Adopted Edition), including all adopted New York - Supplements
 6. New York - Fire Prevention Regulations and Elevator Regulations

7. Local Ordinances, Regulations of the Local Building Department and Fire Department
 8. International Mechanical Code
 9. Recommendations of the National Fire Protection Association (NFPA), latest applicable edition adopted, in general and in particular:
 - a. Life Safety, NFPA 101
 - b. HVAC, NFPA 90A, 90B
 - c. Equipment, NFPA 96
 10. Recommendations of ASHRAE (American Society of Heating, Refrigeration and Air Conditioning Engineers), including:
 - a. ASHRAE 90.1
 - b. ANSI/ASHRAE 62-Ventilation for Acceptable Indoor Air Quality
 - c. ANSI/ASHRAE 15-Safety Code for Mechanical Refrigeration
- F. ANSI/ASHRAE 55-Thermal Environmental Conditions for Human Occupancy. In these specifications, references made to the following Industry Standards and Code Bodies are intended to indicate the latest volume or publication of the Standard. All equipment, materials and details of installation shall comply with the requirements and latest revisions of the following Bodies, as applicable:
- | | |
|-------|---------------------------------------|
| ANSI: | American National Standards Institute |
| ASTM: | American Society of Testing Materials |
| FM: | Factory Mutual |
| UL: | Underwriters' Laboratories |
| IRI: | Industrial Risk Insurers |
| ISO: | Insurance Services Office |
| NBS: | National Bureau of Standards |
| NSC: | National Safety Council |
- G. HVAC Subcontractor for the work in his scope of work shall give all necessary notices, obtain all permits, pay all governmental taxes, fees and other costs in connection with his work; file for necessary approvals with the jurisdiction under which the work is to be performed. HVAC Subcontractor shall obtain all required Certificates of Inspection for his respective work and deliver same to the Architect before request for acceptance of his portion of work is made and before final payment.

1.5 QUALITY ASSURANCE

- A. The manufacturers listed within these specifications have been preselected for use on this project. No submittal will be accepted from a manufacturer other than specified.
- B. HVAC Subcontractor shall furnish and install all equipment, accessories, connections and incidental items necessary to fully complete the work under his Contract for use, occupancy and operation by the Owner.
- C. Where equipment of a substitute manufacturer differ from that specified and require different arrangement or connections from those shown, it shall be the responsibility of the Subcontractor responsible for the substitution to modify the installation of the equipment/system to operate properly and in harmony with the original intent of the drawings and specifications. When directed by the Architect, the HVAC Subcontractor shall submit drawings showing the proposed, substitute installation. If the proposed installation is accepted, the HVAC Subcontractor shall make all necessary changes in all affected related work provided under his and other Sections including location of roughing-in connections by other Trades, supports, etc. All changes shall be made at no increase in the Contract amount or additional cost to the Owner. The General Contractor shall be

responsible to assure that the Subcontractor responsible for the substitution bears the cost arising to all other Trades as a result of the substitution.

- D. Unless specifically indicated otherwise, all equipment and materials required for installation under these specifications shall be new, unused and without blemish or defect. Equipment and materials shall be products which will meet with the acceptance of the Authorities having jurisdiction over the work and as specified hereinbefore. Where such acceptance is contingent upon having the products listed and/or labeled by FM or UL or another testing laboratory, the products shall be so listed and/or labeled. Where no specific indication as to the type or quality of material or equipment is indicated, a first class standard article shall be provided.

1.6 WARRANTY

- A. Attention is directed to provisions of the General Requirements and Supplementary General Requirements regarding and warranties for work under this Contract.
- B. All warranties shall begin on the Date of Substantial Completion of the entire project or the Owner's acceptance of the workmanship and/or material covered by the warranty, whichever is later. The warranty coverage shall continue for the specified period. Refer to individual specification sections for warranty period. If no specific warranty period is specified, the warranty shall extend for a minimum of 365 days.
- C. Manufacturers shall provide their standard warranties for work under the HVAC Trades. However, such warranties shall be in addition to, and not in lieu of, all other liabilities which the manufacturer and HVAC Subcontractor may have by law or by other provisions of the Contract Documents.
- D. All materials, items of equipment and workmanship furnished under the HVAC Section shall carry the standard warranty against all defects in material and workmanship. Any fault due to defective or improper material, equipment, workmanship or design which may develop shall be made good, forthwith, by and at the expense of the HVAC Subcontractor for the work under his Contract, including all other damage done to areas, materials and other systems resulting from this failure.
- E. The HVAC Subcontractor shall warranty that all elements of the systems which are to be provided under his Contract, are of sufficient capacity to meet the specified performance requirements as set forth herein or as indicated.
- F. Upon receipt of notice from the Owner or Architect of failure of any part of the systems or equipment during the warranty period, the affected part or parts shall be replaced by the HVAC Subcontractor for his work or any other work affected by the failure(s).
- G. HVAC Subcontractor shall furnish, before the final payment is made, a written warranty covering the above requirements in accordance with the General Requirements.

1.7 DEFINITIONS

- A. Words in the singular shall also mean and include the plural, wherever the context so indicates, and words in the plural shall mean the singular, wherever the context so indicates.
- B. Wherever the terms "shown on drawings" are used in the specifications, they shall mean "noted", "indicated", "scheduled", "detailed", or any other diagrammatic or written reference made on the drawings.

- C. Wherever the term "provide" is used in the specifications it will mean "furnish" and "install", "connect", "apply", "erect", "construct", or similar terms, unless otherwise indicated in the specifications.
- D. "Work": Labor, materials, equipment, apparatus, controls and accessories required for proper and complete installation.
- E. "Concealed": Embedded in masonry or other construction; or installed in furred spaces, trenches or crawl spaces; or installed within double partitions or hung ceilings; or in enclosures.
- F. "Exposed": Visible to building occupants, excluding mechanical room and utility tunnel locations.
- G. "Acceptable equivalent" or "Equal": Of weight, size, design, capacity and efficiency to meet requirements specified and shown, and of acceptable manufacturer, as determined in the opinion of the Architect.
- H. "Acceptable": Acceptable, as determined in the opinion of the Architect.
- I. "Contractor": General Contractor.
- J. "Named" Product: Manufacturer's name for product, as recorded in published documents of latest issue as of date of Contract Documents. Obtain Architect's permission before using products of later or earlier model.
- K. Wherever the term "material" is used in the specifications it will mean any "product", "equipment", "device", "assembly", or "item" required under the Contract, as indicated by trade or brand name, manufacturer's name, standard specification reference or other description.
- L. The terms "approved", or "approval" shall mean the written approval of the Architect.
- M. The term "Contract Documents" shall mean the entire set of Drawings and Specifications as listed in the Table of Contents of the General Conditions including all bound and unbound material and all items officially issued to date such as addenda, bulletins, job modifications, etc.
- N. The term "specification" shall mean all information contained in the bound or unbound volume, including all "Contract Documents" defined therein, except for the drawings.
- O. The terms "directed", "required", "permitted", "ordered", "designated", "prescribed", and similar words shall mean the direction, requirement, permission, order, designation or prescription of the Architect; the terms "approved", "acceptable", "satisfactory", and similar words shall mean approved by, acceptable or satisfactory to the Architect; and, the terms "necessary", "reasonable", "proper", "correct", and similar words shall mean necessary, reasonable, proper or correct in the judgment of the Architect.
- P. "Accessible" indicates ease of access with or without the use of ladders and without requiring extensive removal of other equipment, such as ductwork, piping, etc. to gain access. "Accessible ceiling" indicates acoustic tile type hung ceilings. Concealed spline or sheetrock ceilings with access panels shall not be considered accessible ceilings.
- Q. "Concealed" means hidden from sight in chases, furred spaces, shafts, hung ceilings, embedded in construction or in crawl spaces.
- R. "Exposed" means not installed underground or "concealed" as defined above.

- S. "HVAC Subcontractor" refers to the Subcontractor responsible for furnishing and installation of all work indicated on the HVAC drawings and in the HVAC specifications.
- T. "Architect" shall refer to the Architect: "Phase Zero" and/or the Engineer "Innovative Engineering Services, LLC."
- U. "Owner" shall refer to the Owner or designated representative.
- V. "Other Work Contractor" (O.W.C.) refers to the Contractor(s), or Subcontractor(s) performing work under other Sections of the Contract Documents.

1.8 THE SUBCONTRACTOR

- A. The HVAC Subcontractor shall visit the site of the proposed new facility and base his bids from his own site examinations and estimates. The HVAC Subcontractor shall not hold the Architect, Engineer, Owner or their agents or employees responsible for, or bound by, any schedule, estimate or of any plan thereof. The HVAC Subcontractor shall study the Contract Documents included under this Contract to determine exactly the extent of work provided under this Contract, as well as to ascertain the difficulty to be encountered in performing the work, in installing new equipment and systems and coordinating the work with the other Trades and existing building conditions.
- B. The HVAC Subcontractor shall faithfully execute his work according to the terms and conditions of the Contract and specifications, and shall take all responsibility for and bear all losses resulting to him in the execution of his work.
- C. The HVAC Subcontractor shall be responsible for the location and performance of work provided under his Contract as indicated on the Contract Documents. All parties employed directly or indirectly by the HVAC Subcontractor shall perform their work according to all the conditions as set forth in these specifications.
- D. The HVAC Subcontractor shall furnish all materials and do all work in accordance with these specifications, and any supplementary documents provided by the Architect. The work shall include everything shown on the drawings and/or required by the specifications as interpreted by the Architect, regardless of where such information is indicated in the Contract Documents (Architectural, Electrical, Plumbing, Fire Protection, etc.). Unless specifically indicated otherwise, all work and materials furnished and installed shall be new, unused and of the best quality and workmanship. The HVAC Subcontractor shall cooperate with the Architect so that no error or discrepancy in the Contract Documents shall cause defective materials to be used or poor workmanship to be performed.

1.9 COORDINATION OF WORK

- A. The HVAC Subcontractor shall compare his drawings and specifications with those of other Trades as well as the Architectural drawings and specifications, and report any discrepancies between them to the Architect and obtain from the Architect written instructions for changes necessary in the HVAC work.
- B. Coordinate work with that of all other Trades affecting or affected by the work of this Section. Cooperate with such Trades to assure the steady progress of all work under the Contract.
- C. All work shall be installed in cooperation with other Trades installing interrelated work. Before installation, HVAC Subcontractor shall make proper provisions to avoid interferences in a manner approved by the Architect. All changes required in the work of the HVAC Subcontractor or that of

any other trade caused by the HVAC Subcontractor's neglect, shall be made by him at his own expense, to the Architect's satisfaction.

- D. The HVAC Subcontractor must include in his bid sufficient dollar amounts to coordinate the work of this Contract. This project is complex and will require additional time to coordinate all Trades and allow implementation of the Owners Standards and maintenance serviceability requirements. This requirement shall include, but not be limited to, producing the coordination drawings, as many times and as many drawings as required, to ensure serviceability of equipment, as approved by the Architect.
- E. Locations of ductwork and piping distribution, equipment, systems, etc. shall be adjusted to accommodate the work with interferences anticipated and encountered. The HVAC Subcontractor shall determine the exact routing and location of his systems prior to fabrication or installation of any system component. Accurate measurements and coordination drawings shall be completed to verify dimensions and characteristics of the various systems installations.
- F. Lines which pitch shall have the right-of-way over those which do not pitch. For example, steam piping shall normally have the right-of-way. Lines whose elevations cannot be changed shall have the right-of-way over lines whose elevations can be changed.
- G. Offsets, transitions and changes of direction in all systems shall be made as required to maintain proper headroom and pitch of sloping lines whether or not indicated on the drawings. The HVAC Subcontractor shall provide elbows, fittings, offsets in ductwork and piping, etc. as required for his work to affect these offsets, transitions and changes in direction.
- H. All work shall be installed in a way to permit removal (without damage to other parts) all other system components provided under this Contract requiring periodic replacement or maintenance. All work shall be done to allow easy access for maintaining equipment. The Owner and Engineer will require proof via the preparation of large scale sections and part plans that pull and junction boxes, etc. are accessible after the work is completed. Any items in the field discovered to be in non-compliance shall be removed and relocated, as required, and as directed by the Architect.
- I. The Contract Drawings are diagrammatic only intending to show general runs and locations of the ductwork, piping, equipment, systems equipment, etc. and not necessarily showing all required offsets, details and accessories and equipment to be connected. All work shall be accurately laid out with other Trades to avoid conflicts and to obtain a neat and workmanlike installation which will afford maximum accessibility for operation, maintenance and headroom.
- J. Where discrepancies in scope of work as to what Trade provides items, such conflicts shall be reported to the Architect during bidding and prior to signing of the Contract. If such action is not taken, the HVAC Subcontractor shall furnish such items as part of his work as necessary, for complete and operable systems and equipment, as determined by the Architect.
- K. The HVAC Subcontractor shall coordinate the installation of all equipment.
- L. Where drawing details, plans, specification requirements and/or scheduled equipment capacities are in conflict or equipment are shown to be different between plans and/or between plans and riser diagrams, details or specifications, the most stringent requirement will be included in the Contract. HVAC systems and equipment called for in the specification and/or shown on the drawings shall be provided under this Contract as if it were required by both the drawings and specifications. However, prior to ordering or installation of any portion of work which appears to be in conflict, such work shall be brought to Architect's attention for direction as to what is to be provided.

- M. Any equipment shown on the HVAC and/or Architectural drawings to be provided with services shall be included under this Contract as applicable to make equipment complete and operable. Additional equipment, etc., shall be provided to accomplish the above requirement, as required, all as part of this Contract, at no extra cost to the Owner. This requirement necessitates that the HVAC Subcontractor review the Architectural drawings and the drawings of other Trades during bidding to ascertain the extent of all requirements, and interface between the Trades and scope of work.
- N. The HVAC Subcontractor shall coordinate his work with other Trades' work so that all equipment and systems can be easily, safely and properly serviced and maintained. It is imperative that service personnel can safely access all equipment. Provide safety rails, steps, ladders, valve chains, handle extensions, etc. as required, in addition to the ones shown on the drawings, to ensure safe and easy access to all equipment is provided in a manner approved by the Architect.

1.10 GIVING INFORMATION

- A. HVAC Subcontractor shall keep himself fully informed as to the shape, size and position of all openings required for his apparatus and shall give information to the General Contractor and other Subcontractors sufficiently in advance of the work so that all openings may be built in advance.

1.11 EQUIPMENT AND MATERIALS

- A. Equipment and materials shall be delivered to the site and stored in original sealed containers, suitably sheltered from the elements, but readily accessible for inspection by the Architect until installed. All items subject to moisture damage such as controls shall be stored in dry, heated spaces.
- B. Equipment shall be tightly covered and protected against dirt, water, and chemical or mechanical injury and theft. At the completion of the work, equipment and materials shall be cleaned and polished thoroughly and turned over to the Owner in a condition satisfactory to the Architect. Damage or defects that develop before acceptance of the work shall be made good at the HVAC Subcontractor's expense.
- C. The HVAC Subcontractor shall make necessary field measurements to ascertain space requirements, for equipment and connections to be provided under his respective Trade and shall furnish and install such sizes and shapes of equipment to allow for the final installation to conform to the drawings and specifications.
- D. Manufacturer's directions shall be followed completely in the delivery, storage, protection and installation. Promptly notify the Architect in writing of any conflict between any requirements of the Contract Documents and the manufacturer's directions. Obtain the Architect's written instructions before proceeding with the work. Should HVAC Subcontractor perform any work that does not comply with the manufacturer's directions or written instructions from the Architect, he shall bear all costs arising in correcting any deficiencies that should arise.
- E. All equipment of one type shall be the products of one manufacturer.
- F. Equipment prepurchased by the General Contractor on behalf of the Owner or by the Owner himself, if assigned to the HVAC Subcontractor, shall be received, installed, tested, etc., as if the equipment was purchased by the HVAC Subcontractor. All guarantees, service contracts, etc., shall be the same as for all other equipment provided under this Contract.

1.12 USE OF PREMISES

- A. The HVAC Subcontractor shall confine all apparatus, storage of materials and construction to the limits as directed by the Architect and he shall not encumber the premises with his materials. The HVAC Subcontractor shall be held responsible for repairs, patching, or cleaning arising from any unauthorized use of premises.
- B. Notwithstanding any approvals or instructions which must be obtained by the HVAC Subcontractor from the Architect in connection with the use of the premises, the responsibility for the safe working conditions at the site shall remain that of the HVAC Subcontractor. The Architect, Engineer or Owner shall not be deemed to have any responsibility or liability in connection with safe working conditions at the site.

1.13 PROTECTION

- A. Materials, equipment, etc., shall be properly protected during construction and all conduit openings shall be temporarily closed so as to prevent obstruction and damage. Post notice prohibiting the use of all systems provided under the HVAC Contract, prior to completion of work and acceptance of all systems by the Owner except as otherwise, instructed by Architect. Take precautions to protect all materials furnished from damage and theft.
- B. The HVAC Subcontractor shall furnish, place and maintain proper safety guards for the prevention of accidents that might be caused by the workmanship, materials, equipment or HVAC systems provided under his Contract.

1.14 DAMAGE TO OTHER WORK

- A. The HVAC Subcontractor shall be held responsible and shall pay for all damages caused by his work to the building structures, equipment, systems, etc., and all work and finishes installed under this Contract. Repair of such damage shall be done by the General Contractor at the expense of the HVAC Subcontractor, to the Architect's satisfaction.

1.15 CORRECTION OF WORK

- A. The HVAC Subcontractor shall promptly correct all work provided under his Contract and rejected by the Architect as defective or as failing to conform to the Contract Documents, whether observed before or after completion of work, and whether or not fabricated, installed or completed.

1.16 EXTRA WORK

- A. No claim for extra work will be allowed unless it is authorized by the Architect before commencement of the extra said work.

1.17 TOUCH-UP PAINTING

- A. All equipment and systems shall be thoroughly cleaned of rust, splatters and other foreign matter of discoloration leaving every part of all systems in an acceptable prime condition. The HVAC Subcontractor for the work under his Contract shall refinish and restore to the original condition all equipment which has sustained damage to the manufacturer's prime and finish coats of paint and/or enamel during the course of construction, regardless of the source of damage.

1.18 PARTS LIST AND INSTRUCTIONS FOR OPERATION AND MAINTENANCE

- A. The HVAC Subcontractor shall thoroughly instruct the Owner, to the complete satisfaction of the Architect, in the proper operation of all systems and equipment provided by him. The HVAC Subcontractor shall make arrangements, via the Architect, as to whom the instructions are to be given in the operation of the basic and auxiliary systems and the period of time in which they are to be given. The Architect shall be completely satisfied that the Owner has been thoroughly and completely instructed in the proper operation of all systems and equipment before final payment is made. If the Architect determines that complete and thorough instructions have not been given by the HVAC Subcontractor to the Owner's representative, then the HVAC Subcontractor shall be directed by the Architect to provide whatever instructions are necessary until the intent of this specification has been complied with.
- B. HVAC Subcontractor shall submit to the Architect for approval, the required typed sets (see General Conditions and Division 1) bound neatly in loose-leaf binders, of all instructions for the installation, operation, emergency operation, start-up, care and maintenance of all equipment and systems (including instructions for the ordering and stocking of spare parts for all equipment installed under this Contract). The lists shall include part numbers and suggested supplier. Each set shall also include an itemized list of component parts that should be kept on hand and where such parts can be purchased.
- C. Information shall indicate possible problems with equipment and suggested corrective action. The manuals shall be indexed for each type of equipment. Each section shall be clearly divided from the other sections. A sub-index for each section shall also be provided. The methodology of setting-up the manuals shall be submitted to the Architect and Owner for review prior to final submission of manuals.

1.19 MANUFACTURER'S REPRESENTATIVE

- A. The HVAC Subcontractor shall provide, at the appropriate time or as directed by Architect, the on-site services of a competent factory trained Engineer of the manufacturer of specific equipment, to inspect, test, adjust and place in proper operating condition any and all items of the same manufacturer. No additional compensation will be allowed for such services. A written report shall be issued by the particular manufacturer with his findings for the Architect's record.

1.20 COORDINATION DRAWINGS

- A. Before materials are purchased, fabricated or work is begun, each Subcontractor shall prepare and obtain approval of coordination drawings, and sections for all floors/areas, including buried system/services, resulting in one (1) set of all-Trade-composite at 3/8" scale drawings, showing the size and location of all equipment, in the manner described hereinunder General Requirements. Architects review and approval of coordination drawings must be obtained prior to any fabrication or installation of any equipment or systems.
- B. The coordination drawings shall be generated from a computer CAD program compatible with AutoCAD Release 2013, in DWG or DXF format. The HVAC Subcontractor shall take the lead, supervise, and coordinate production of coordinated layout drawings, to show and coordinate all equipment. These drawings shall then be circulated to the HVAC Subcontractor so that he can indicate all his work as directed by the General Contractor and Architect and as required, to result in a fully coordinated installation.

- C. All costs associated with all aspects of coordination drawings, regardless as to how long they take to produce and how many times they have to be redrawn, shall be borne by the HVAC Subcontractor.
- D. The HVAC Subcontractor may purchase the HVAC AutoCAD computer drawing files from the HVAC Contract set on disk or via modem from the Engineer at the nominal cost of \$500.00, if he so chooses.

1.21 RECORD DRAWINGS/AS-BUILT DRAWINGS

- A. The HVAC Subcontractor shall maintain current at the site a set of his drawings on which he shall accurately show the actual installation of all work provided under his Contract indicating hereon any variation from the Contract Drawings, in accordance with the General Conditions and Division 1. Changes, whether resulting from formal change orders or other instructions issued by the Architect, shall be recorded. Include changes in sizes, location, and dimensions of equipment, etc.
- B. The HVAC Subcontractor shall indicate progress by coloring-in equipment and associated appurtenances exactly as they are erected. This process shall incorporate both the changes noted above and all other deviations from the original drawings whether resulting from job conditions encountered or from any other causes.
- C. The marked-up and colored-up prints will be used as a guide for determining the progress of the work installed. They shall be inspected periodically by the Architect and Owner and they shall be corrected immediately if found either inaccurate or incomplete. This procedure is mandatory.
- D. At the completion of the job, these prints shall be submitted to the General Contractor and then to the Architect for final review and comment. The prints will be returned with appropriate comments and recommendations. These corrected prints, together with corrected prints indicating all the revisions, additions and deletions of work, shall form the basis for preparing a set of As-built Record Drawings.
- E. The Subcontractor shall be responsible for generating as-built Record Drawings utilizing CAD based documents in AutoCAD Release 2013 DWG or DXF format. A bound set of plans, as well as the computer files, on disk, shall be turned over to the Architect for review. After acceptance of the as-built documents by the Architect, the HVAC Subcontractor shall make any corrections necessary to the as-built documents and prepare one reproducible set of drawings as well as bound blueprint set(s) (quantity as determined by the Architect) for distribution to the Owner via the Architect.
- F. The HVAC Subcontractor may use the computer drawing files used for coordination drawings or purchase the Engineers most recently updated computer drawing files at a nominal charge of \$500.00 per drawing file. The updated drawings may not include all changes made during the course of construction and it shall be the HVAC Subcontractors responsibility to update the as-built documents to include all changes brought forth to the project resulting from bulletins, request for information (RFI's), change orders, etc. The HVAC Subcontractor may review the Engineers latest computer files for completeness prior to purchase, however the Engineer will not be responsible for updating the computer files.
- G. Included with the above shall be a complete drawing list and a standard layering system, which shall be required to be maintained within the as-built Record CAD documents.
- H. The HVAC Subcontractor shall be issued bulletins in the same manner as the original Design Documents described above.

- I. The as-built CAD documents required shall be in addition to other requirements stated elsewhere.

1.22 SUBMITTALS

- A. Prepare and submit shop drawings in accordance with the requirements hereinbefore specified, and with Division 1 Section "Submittal Procedures" in the manner described therein, modified as noted hereinafter.
- B. The selection and intention to use a product specified by name shall not excuse the need for timely submission of shop drawings for that product.
- C. Prior to submitting shop drawings, submit for review preliminary list of intended or proposed manufacturers for all items for which shop drawings are required.
- D. Submission of shop drawings of an unnamed manufacture or shop drawings at variance with the Contract Documents is not a proper request for substitution.
- E. Samples that are submitted in lieu of shop drawings shall be clearly identified and shall be submitted in duplicate. Only one sample will be returned and that accepted sample shall be kept available at appropriate job site office. Accepted sample retained by Architect will be kept available at Architect's home office.
- F. Upon completion of shop drawing review, shop drawings will be returned, marked with one of following notations: No Exception Taken, Revise as Noted, Revise and Resubmit, or Rejected. Only products whose shop drawings are marked "No Exception Taken" or "Revise as Noted" shall be used on the project.
- G. Submittals shall include the following information:
 - 1. Descriptive and product data necessary to verify compliance with Contract Documents.
 - 2. Manufacturer's specifications including materials of construction, metal gauge, thickness and finish.
 - 3. Certified dimensional drawings including clearances required for maintenance or access.
 - 4. Performance data, ratings, operating characteristics, and operating limits.
 - 5. Electrical ratings and characteristics.
 - 6. Wiring and control diagrams, where applicable.
 - 7. Certifications requested, including UL label or listing.
 - 8. List of accessories, which are required but are not being provided by the product manufacturer or are not being furnished under this Section. Identify the Section(s) under which the accessories are being furnished.
- H. In addition, submittals shall be clearly marked for the following:
 - 1. Specification Section and Paragraph, or Drawing Schedule/Note/Detail/etc., where equipment is specified.
 - 2. Equipment or fixture identification corresponding to that used in Contract Documents.
 - 3. Accessories and special or non-standard features and materials which are being furnished.

1.23 INTENT

- A. It is the intent of the Contract Documents to require finished work, tested and ready for operation.
- B. It is not intended that Contract Documents show every pipe, fitting and appurtenance; however, such parts as may be necessary to complete the systems in accordance with best trade practice and Code requirements and to Architect's satisfaction shall be deemed to be included.
- C. Drawings are diagrammatic and indicate the general arrangement of systems and work included in the Contract. DO NOT SCALE THE DRAWINGS.

1.24 PRODUCT SELECTION

- A. Contractor's options for selecting products are limited by Contract Document requirements and governing regulations and are not controlled by industry traditions or procedures experienced by Contractor on previous construction projects. Required procedures include, but are not necessarily limited to, following various methods of specifying:
 - 1. Single Product Manufacturer Named: Provide product indicated. Advise Architect, and obtain instructions before proceeding, when named product is known to be unacceptable or not feasible.
 - 2. Two or More Manufacturers' Products Named: Provide one of the named products, at Contractor's option, but excluding products which do not comply with requirements. Do not provide, nor offer to provide, an unnamed product unless named products do not comply with requirements or are not feasible.
 - 3. "Acceptable Equivalent" or "Or Equal": Where named products are accompanied by this term or words of similar effect, provide named products or propose substitute product according to paragraph 1.25, SUBSTITUTIONS.
 - 4. Standards, Codes and Regulations: Where specification requires only compliance with a standard, code or regulation, Contractor may select any product which complies with requirements of that standard, code or regulation.
 - 5. Performance Requirements: Provide products which comply with specific performances indicated and which are recommended by manufacturer (in published product literature or by individual certification) for application intended. Overall performance of product is implied where product is specified with only certain specific performance requirements.
 - 6. Prescriptive Requirements: Provide products which have been produced in accordance with prescriptive requirements using specified materials and components, and complying with specified requirements for fabricating, finishing, testing and other manufacturing processes.
 - 7. Visual Matching: Where matching with an established material is required, Architect's judgment of whether proposed product matches established material shall be final. Where product specified does NOT match established material, propose substitute product according to paragraph 1.25, SUBSTITUTIONS. Follow requirements for CHANGE ORDERS, also, if matching product within cost category of specified product is not available.
 - 8. "Color as Selected by Architect": Unless otherwise noted, where specified product requirements include "Color as Selected by Architect" or words of similar effect, the selection of manufacturer and basic product complying with Contract Documents is Contractor's option and subsequent selection of color is Architect's option.
- B. Inclusion by name, of more than one manufacturer or fabricator, does not necessarily imply acceptability of standard products of those named. All manufacturers, named or proposed, shall conform, with modification as necessary, to criteria established by contract documents for performance, efficiency, materials and special accessories.

1.25 SUBSTITUTIONS

- A. Contractor shall pay Architect/Engineer for time spent reviewing substitution requests. Charges shall be \$120/hour. Submittal of substitution request will be construed as evidence of Contractor's agreement to pay such charges, with no added cost to Owner.
- B. Contractor's request for substitution may be submitted only after award of Contract. Requests shall be in writing on Contractor's letterhead and shall include:
 - 1. Contractor's detailed comparison of significant qualities between specified item and proposed substitution.
 - 2. Statement of effect on construction time, coordination with other affected work, and cost information or proposal.
 - 3. Contractor's statement to the effect that proposed substitution will result in overall work equal to, or better than, work originally intended.
- C. Substitution requests will be considered: If extensive revisions to Contract Documents are not required; if changes are in keeping with general intent of Contract Documents; if submitted in timely and proper manner, fully documented; and if one or more of following conditions is satisfied; all as judged by Architect:
 - 1. Where request is directly related to "acceptable equivalent" clause, "or equal" clause or words of similar effect in Contract Documents.
 - 2. Where specified product, material or method cannot be provided within Contract Time; but not as a result of Contractor's failure to pursue the work promptly or to coordinate various activities properly.
 - 3. Where specified product, material or method cannot be provided in manner which is compatible with other materials of the work and where Contractor certifies that proposed substitution is compatible.
 - 4. Where specified product, material or method cannot be properly coordinated with other materials of the work and where Contractor certifies that proposed substitution can be properly coordinated.
 - 5. Where specified product, material or method cannot be warranted as required and where Contractor certifies that proposed substitution can be so warranted.
 - 6. Where specified product, material or method cannot be used without adversely affecting Owner's insurance coverage on completed work and where Contractor certifies that proposed substitution can be so used.
 - 7. Where specified product, material or method will encounter other substantial non-compliance, which are not possible to otherwise overcome except by using proposed substitution.
 - 8. Where specified product, material or method cannot receive required approval by governing authority and proposed substitution can be so approved.
 - 9. Where substantial advantage is offered to the Owner; in terms of cost, time, energy conservation or other valuable considerations; after deducting offsetting responsibilities that Owner may be required to bear, including additional compensation to Architect for redesign and evaluation services, increased cost of other work by Owner or separate contractors, and similar considerations.
- D. The burden is upon the Contractor, supplier and manufacturer to satisfy Architect that:
 - 1. Proposed substitute is equal to, or superior to, the item specified.
 - 2. Intent of the Contract Documents, including required performance, capacity, efficiency, quality, durability, safety, function, appearance, space clearances and delivery date, will be equaled or bettered.

- E. Submission of shop drawings of unspecified manufacturer or shop drawings at variance with the Contract Documents is not a proper request for substitution.
- F. Changes in work of other trades, such as structural supports, which are required as a result of substitution and the associated costs for such changes, shall be the complete responsibility of Contractor proposing substitution. Except as noted in subparagraph 1.25.C.9 above, there shall be no additional expense to the Owner.

1.26 SAMPLES

- A. Submit samples as requested by Architect.

PART 2 - PRODUCTS

2.1 GENERAL PRODUCT REQUIREMENTS

- A. Products shall be undamaged and unused at time of installation and shall be complete with accessories, trim, finish, safety guards and other devices and details needed for complete installation and for intended use.
- B. Where available, products shall be standard products of types which have been produced and used previously and successfully on other projects and in similar applications.
- C. Where products by their nature and their use are likely to need replacement parts on future date, for maintenance and repair or replacement work, products shall be standard domestically produced products likely to have such parts available to Owner in future.
- D. Labels and stamps which are required for observation after installation shall be located on accessible surfaces which, in occupied spaces, are not conspicuous. Other labels and stamps shall be located on concealed surfaces.

PART 3 - EXECUTION

3.1 COOPERATION AND WORK PROGRESS

- A. The HVAC work shall be carried on under the usual construction conditions, in conjunction with all other work at the site. The HVAC Subcontractor shall cooperate with the Architect, General Contractor, all other Subcontractors and equipment suppliers working at the site. The HVAC Subcontractor shall coordinate the work and proceed in a manner so as not to delay the progress of the project.
- B. The HVAC Subcontractor shall coordinate his work with the progress of the building and other Trades so that he will complete his work as soon as conditions permit and such that interruptions of the building functions will be at a minimum. Any overtime hours worked or additional costs incurred due to lack of or improper coordination with other Trades or the Owner by the HVAC Subcontractor, shall be assumed by him without any additional cost to the Owner.
- C. The HVAC Subcontractor shall furnish information on all equipment that is furnished under this Section but installed under another Section to the installing Subcontractor as specified herein.

- D. The HVAC Subcontractor shall provide all materials, equipment and workmanship to provide for adequate protection of all HVAC equipment during the course of construction of the project. This shall also include protection from moisture and all foreign matter. The HVAC Subcontractor shall also be responsible for damage which he causes to the work of other Trades, and he shall remedy such injury at his own expense.
- E. Waste materials shall be removed promptly from the premises. All material and equipment stored on the premises shall be kept in a neat and orderly fashion. Material or equipment shall not be stored where exposed to the weather. The HVAC Subcontractor shall be responsible for the security, safekeeping and damages, including acts of vandalism, of all material and equipment stored at the job site.
- F. The HVAC Subcontractor shall be responsible for unloading all HVAC equipment and materials delivered to the site. This shall also include all large and heavy items or equipment which require hoisting. Consult with the General Contractor for hoisting/crane requirements. During construction of the building, the HVAC Subcontractor shall provide additional protection against moisture, dust accumulation and physical damage of the main service and distribution equipment. This shall include furnishing and installing temporary heaters within these units, as approved, to evaporate excessive moisture and ventilate it from the room, as may be required.
- G. It shall be the responsibility of the HVAC Subcontractor to coordinate the delivery of the HVAC equipment to the project prior to the time installation of equipment will be required; but he shall also make sure such equipment is not delivered too far in advance of such required installation, to ensure that possible damage and deterioration of such equipment will not occur. Such equipment stored for an excessively long period of time (as determined in the opinion of the Architect) on the project site prior to installation may be subject to rejection by the Architect.
- H. The HVAC Subcontractor shall erect and maintain, at all times, necessary safeguards for the protection of life and property of the Owner, Workmen, Staff and the Public.
- I. Prior to installation, the HVAC Subcontractor has the responsibility to coordinate the exact mounting arrangement and location of HVAC equipment to allow proper space requirements as indicated in the NEC. Particular attention shall be given in the field to group installations. If it is questionable that sufficient space, conflict with the work of other Subcontractors, architectural or structural obstructions will result in an arrangement which will prevent proper access, operation or maintenance of the indicated equipment, the HVAC Subcontractor shall immediately notify the Contractor and not proceed with this part of the Contract work until definite instructions have been given to him by the Architect.
- J. The HVAC Subcontractor shall obtain from the Plumbing and Electrical Subcontractors copies of all shop drawing prints showing the ductwork and piping installation as they will be put in place on the project. These drawings shall be thoroughly checked by the HVAC Subcontractor and coordinated with the work of other trades so as to prevent any installation conflict.

3.2 INSTALLATION

A. General:

- 1. Unless specifically noted or indicated otherwise, all equipment and material specified in Division 23 of this specification or indicated on the drawings shall be installed under this Contract whether or not specifically itemized herein. This Section covers particular installation methods and requirements peculiar to certain items and classes of material and equipment.

2. The HVAC Subcontractor shall obtain detailed information from manufacturers of equipment as to proper methods of installation.
3. The HVAC Subcontractor shall obtain final roughing dimensions and other information as needed for complete installation of items furnished under other Sections or furnished by the Owner.
4. The HVAC Subcontractor shall keep fully informed of size, shape and position of openings required for material and equipment provided under this and other Sections. Ensure that openings required for work of this Section are coordinated with work of other Sections. Provide cutting and patching as necessary.
5. All miscellaneous hardware and support accessories, including support rods, nuts, bolts, screws and other such items, shall be of a galvanized or cadmium plated finish or of another approved rust-inhibiting coating.
6. Throughout this Section where reference is made to steel channel supports, it shall be understood to mean that the minimum size shall be 1 5/8" mild strip steel with minimum wall thickness of 0.105", similar to Unistrut P1000 or equal products manufactured by Kindorf or Husky Products Co.

3.3 MATERIALS AND WORKMANSHIP

- A. All materials and equipment shall be new and unused and shall meet requirements of the latest Standards of NEMA, UL, IPCEA, ANSI and IEEE. Equipment shall have components required or recommended by OSHA, applicable NFPA documents and shall be UL listed and labeled.
- B. Despite references in the specifications or on the drawings to materials or pieces of equipment by name, make or catalog number, such references shall be interpreted as establishing standards of quality for materials and performance.
- C. Finish of materials, components and equipment shall not be less than Industry good practice. When material or equipment is visible or subject to corrosive or atmospheric conditions, the finish shall be as approved by the Architect.
- D. Provide proper access to material or equipment that requires inspection, replacement, repair or service. If proper access cannot be provided, confer with the Architect as to the best method of approach to minimize effects of reduced access.
- E. All work shall be installed in a neat and workmanlike manner and shall be done in accordance with all Local and State Codes.
- F. The Owner will not be responsible for material, equipment or the installation of same before testing and acceptance.

3.4 CLEANING

- A. This Section of the specifications shall include the cleaning of all equipment on a day-to-day basis and final cleaning of all HVAC equipment prior to turning building over to the Owner. All necessary cleaning referred to herein shall be cleaned to the satisfaction of the Architect.

3.5 FINAL INSPECTION

- A. When all HVAC work on the project has been completed and is ready for final inspection, such an inspection shall be made. At this time, and in addition to all other requirements in the Contract

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Documents, the HVAC Subcontractor, for the work under this Contract, shall demonstrate that the requirements of these specifications have been met to the Architect's satisfaction.

END OF SECTION

SECTION 230130 - HVAC AIR-DISTRIBUTION SYSTEM CLEANING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes cleaning HVAC air-distribution equipment, ducts, plenums, and system components.

1.3 DEFINITIONS

- A. ASCS: Air systems cleaning specialist.
- B. NADCA: National Air Duct Cleaners Association.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For an ASCS.
- B. Strategies and procedures plan.
- C. Cleanliness verification report.

1.5 QUALITY ASSURANCE

- A. ASCS Qualifications: A certified member of NADCA.
 - 1. Certification: Employ an ASCS certified by NADCA on a full-time basis.
 - 2. Supervisor Qualifications: Certified as an ASCS by NADCA.
- B. Cleaning Conference: Conduct conference at Project site.
 - 1. Review methods and procedures related to HVAC air-distribution system cleaning including, but not limited to, review of the cleaning strategies and procedures plan.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine HVAC air-distribution equipment, ducts, plenums, and system components to determine appropriate methods, tools, and equipment required for performance of the Work.
- B. Perform "Project Evaluation and Recommendation" according to NADCA ACR 2006.

- C. Prepare written report listing conditions detrimental to performance of the Work.
- D. Proceed with work only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare a written plan that includes strategies and step-by-step procedures. At a minimum, include the following:
 - 1. Supervisor contact information.
 - 2. Work schedule including location, times, and impact on occupied areas.
 - 3. Methods and materials planned for each HVAC component type.
 - 4. Required support from other trades.
 - 5. Equipment and material storage requirements.
 - 6. Exhaust equipment setup locations.
- B. Use the existing service openings wherever possible, as required for proper cleaning, at various points of the HVAC system for physical and mechanical entry and for inspection.
- C. Comply with NADCA ACR 2006, "Guidelines for Constructing Service Openings in HVAC Systems" Section.

3.3 CLEANING

- A. Comply with NADCA ACR 2006.
- B. Remove visible surface contaminants and deposits from within the HVAC system.
- C. Systems and Components to Be Cleaned:
 - 1. Air devices for supply and return air.
 - 2. Air-terminal units.
 - 3. Ductwork:
 - a. Supply-air ducts, including turning vanes and reheat coils, to the air-handling unit.
 - b. Return-air ducts to the air-handling unit.
 - c. Exhaust-air ducts.
 - 4. Air-Handling Units:
 - a. Interior surfaces of the unit casing.
 - b. Coil surfaces compartment.
 - c. Condensate drain pans.
 - d. Fans, fan blades, and fan housings.
 - 5. Filters and filter housings.
- D. Collect debris removed during cleaning. Ensure that debris is not dispersed outside the HVAC system during the cleaning process.
- E. Particulate Collection:
 - 1. For particulate collection equipment, include adequate filtration to contain debris removed. Locate equipment downwind and away from all air intakes and other points of entry into the building.
 - 2. HEPA filtration with 99.97 percent collection efficiency for particles sized 0.3 micrometer or larger shall be used where the particulate collection equipment is exhausting inside the building.
- F. Control odors and mist vapors during the cleaning and restoration process.
- G. Mark the position of manual volume dampers and air-directional mechanical devices inside the system prior to cleaning. Restore them to their marked position on completion of cleaning.

- H. System components shall be cleaned so that all HVAC system components are visibly clean. On completion, all components must be returned to those settings recorded just prior to cleaning operations.
- I. Clean all air-distribution devices, registers, grilles, and diffusers.
- J. Clean visible surface contamination deposits according to NADCA ACR 2006 and the following:
 - 1. Clean air-handling units, airstream surfaces, components, condensate collectors, and drains.
 - 2. Ensure that a suitable operative drainage system is in place prior to beginning wash-down procedures.
 - 3. Clean evaporator coils, reheat coils, and other airstream components.
- K. Duct Systems:
 - 1. Create service openings in the HVAC system as necessary to accommodate cleaning.
 - 2. Mechanically clean duct systems specified to remove all visible contaminants so that the systems are capable of passing the HVAC System Cleanliness Tests (see NADCA ACR 2006).
- L. Debris removed from the HVAC system shall be disposed of according to applicable Federal, state, and local requirements.
- M. Mechanical Cleaning Methodology:
 - 1. Source-Removal Cleaning Methods: The HVAC system shall be cleaned using source-removal mechanical cleaning methods designed to extract contaminants from within the HVAC system and to safely remove these contaminants from the facility. No cleaning method, or combination of methods, shall be used that could potentially damage components of the HVAC system or negatively alter the integrity of the system.
 - a. Use continuously operating vacuum-collection devices to keep each section being cleaned under negative pressure.
 - b. Cleaning methods that require mechanical agitation devices to dislodge debris that is adhered to interior surfaces of HVAC system components shall be equipped to safely remove these devices. Cleaning methods shall not damage the integrity of HVAC system components or damage porous surface materials such as duct and plenum liners.
 - 2. Cleaning Mineral-Fiber Insulation Components:
 - a. Fibrous-glass thermal or acoustical insulation elements present in equipment or ductwork shall be thoroughly cleaned with HEPA vacuuming equipment while the HVAC system is under constant negative pressure and shall not be permitted to get wet according to NADCA ACR 2006.
 - b. Cleaning methods used shall not cause damage to fibrous-glass components and will render the system capable of passing the HVAC System Cleanliness Tests (see NADCA ACR 2006).
 - c. Fibrous materials that become wet shall be discarded and replaced.
- N. Coil Cleaning:
 - 1. Measure static-pressure differential across each coil.
 - 2. See NADCA ACR 2006, "Coil Surface Cleaning" Section. Type 1, or Type 1 and Type 2, cleaning methods shall be used to render the coil visibly clean and capable of passing Coil Cleaning Verification (see applicable NADCA ACR 2006).
 - 3. Coil drain pans shall be subject to NADCA ACR 2006, "Non-Porous Surfaces Cleaning Verification." Ensure that condensate drain pans are operational.
 - 4. Electric-resistance coils shall be de-energized, locked out, and tagged before cleaning.
 - 5. Cleaning methods shall not cause any appreciable damage to, cause displacement of, inhibit heat transfer, or cause erosion of the coil surface or fins, and shall comply with coil manufacturer's written recommendations when available.
 - 6. Rinse thoroughly with clean water to remove any latent residues.
- O. Antimicrobial Agents and Coatings:

1. Apply antimicrobial agents and coatings if active fungal growth is reasonably suspected or where unacceptable levels of fungal contamination have been verified. Apply antimicrobial agents and coatings according to manufacturer's written recommendations and EPA registration listing after the removal of surface deposits and debris.
2. When used, antimicrobial treatments and coatings shall be applied after the system is rendered clean.
3. Apply antimicrobial agents and coatings directly onto surfaces of interior ductwork.
4. Sanitizing agent products shall be registered by the EPA as specifically intended for use in HVAC systems and ductwork.

3.4 CLEANLINESS VERIFICATION

- A. Verify cleanliness according to NADCA ACR 2006, "Verification of HVAC System Cleanliness" Section.
- B. Verify HVAC system cleanliness after mechanical cleaning and before applying any treatment or introducing any treatment-related substance to the HVAC system, including biocidal agents and coatings.
- C. Perform visual inspection for cleanliness. If no contaminants are evident through visual inspection, the HVAC system shall be considered clean. If visible contaminants are evident through visual inspection, those portions of the system where contaminants are visible shall be re-cleaned and subjected to re-inspection for cleanliness.
- D. Additional Verification:
 1. Perform surface comparison testing or NADCA vacuum test.
 2. Conduct NADCA vacuum gravimetric test analysis for nonporous surfaces.
- E. Verification of Coil Cleaning:
 1. Measure static-pressure differential across each coil.
 2. Coil will be considered clean if cleaning restored the coil static-pressure differential within 10 percent of the differential measured when the coil was first installed.
 3. If no information on existing coil initial pressure drop, coil will be considered clean if the coil is free of foreign matter and chemical residue, based on a thorough visual inspection.
- F. Prepare a written cleanliness verification report. At a minimum, include the following:
 1. Written documentation of the success of the cleaning.
 2. Site inspection reports, initialed by supervisor, including notation on areas of inspection, as verified through visual inspection.
 3. Surface comparison test results if required.
 4. Gravimetric analysis (nonporous surfaces only).
 5. System areas found to be damaged.

3.5 RESTORATION

- A. Restore and repair HVAC air-distribution equipment, ducts, plenums, and components according to NADCA ACR 2006, "Restoration and Repair of Mechanical Systems" Section.
- B. Restore service openings capable of future reopening. Comply with requirements in Section 233113 "Metal Ducts." Include location of service openings in Project closeout report.
- C. Replace fibrous-glass materials that cannot be restored by cleaning or resurfacing. Comply with requirements in Section 233113 "Metal Ducts" and Section 233116 "Nonmetal Ducts."
- D. Replace damaged insulation according to Section 230713 "Duct Insulation."

- E. Ensure that closures do not hinder or alter airflow.
- F. New closure materials, including insulation, shall match opened materials and shall have removable closure panels fitted with gaskets and fasteners.

END OF SECTION 230130

SECTION 230400 - GENERAL CONDITIONS FOR MECHANICAL TRADES

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section 01 90 00 -Building Commissioning Requirements.

1.2 DESCRIPTION

- A. The General Conditions and Supplementary General Conditions are a part of this Division and are to be considered a part of this Contract.
- B. Demolition and renovation work shall be performed in accordance with SMACNA IAQ Guidelines for Occupied Buildings under Construction.

1.3 INTENT

- A. It is the intent of the Specifications and Drawings to call for finished work, tested and ready for operation.
- B. Any apparatus, appliance, material or work not shown on drawings but mentioned in the specifications, or vice versa, or any incidental accessories necessary to make the work complete and perfect in all respects and ready for operation as determined by good trade practice even if not particularly specified, shall be furnished, delivered and installed under their respective Divisions without any additional expense to the Owner.
- C. Minor details not usually shown or specified but necessary for proper installation and operation shall be included in the work as though they were hereinafter shown or specified.
- D. Work under each Section shall include giving written notice to the Owner and Engineer of any materials or apparatus believed inadequate or unsuitable; in violation of laws, ordinances, rules or regulations of authorities having jurisdiction; and any necessary items of work omitted. In the absence of such written notice, it is mutually agreed that the work under each Section includes the cost of all required items for the accepted, satisfactory functioning of the entire system without extra compensation.

1.4 DEFINITIONS

- A. "Approve": The term "approve", where used in conjunction with the Engineer's action on the Contractor's submittals, applications, and requests, is limited to the Engineer's duties and responsibilities as stated in General and Supplementary Conditions.
- B. "Approved equal" means any product which in the opinion of the Engineer is equal in quality, arrangement, appearance, and performance to the product specified.
- C. "Directed": Terms such as "directed", "requested", "authorized", "selected", "approved", "required", and "permitted" mean "directed by the Engineer", "requested by the Engineer", and similar phrases.

- D. "Finished" refers to all rooms and areas to be specified to receive architectural treatment as indicated on the drawings. All rooms and areas not covered, including underground tunnels and areas above ceilings shall be considered not finished, unless otherwise noted.
- E. "Furnish" or "supply" shall mean purchase, deliver to, and off-load at the job site, ready to be installed including where appropriate all necessary interim storage and protection.
- F. "Indicated": The term "indicated" refers to graphic representations, notes, or schedules on the Drawings, other paragraphs or schedules in the Specifications, and similar requirements in the Contract Documents. Where terms such as "shown", "noted", "scheduled" and "specified" are used, it is to help the reader locate the reference; no limitation on location is intended.
- G. "Install" shall mean set in place complete with all mounting facilities and connections as necessary ready for normal use or service.
- H. "Product" shall mean any item of equipment, material, fixture, apparatus, appliance or accessory installed under this Division.
- I. "Provide" shall mean furnish (or supply) and install as necessary.
- J. "Regulation": The term "Regulation" includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.
- K. "Remove": The term "remove" means "to disconnect from its present position, remove from the premises and to dispose of in a legal manner".
- L. "Special Warranties": The term "Special Warranties" are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Owner.
- M. "Standard Product Warranties": The term "Standard Product Warranties" are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.
- N. "Subcontractor" means specifically the subcontractor working under this Division. Other Contractors are specifically designated "Mechanical Subcontractor", "General Contractor" and so on. Note: Take care to ascertain limits of responsibility for connecting equipment which requires connections by two or more trades.
- O. "Substitutions": Requests for changes in products, materials, equipment, and methods of construction proposed by the Contractor are considered requests for "substitutions".
- P. "Wiring" shall mean cable assembly, raceway, conductors, fittings and any other necessary accessories to make a complete wiring system.

1.5 DRAWINGS

- A. Drawings are diagrammatic and indicate the general arrangement of systems and work included in the Contract. Consult the Architectural Drawings and Details for exact location of fixtures and equipment; where same are not definitely located, obtain this information from the Architect. (Do not scale the drawings)
- B. Work under each Section shall closely follow Drawings in layout of work; check

Drawings of other Divisions to verify spaces in which work will be installed. Maintain maximum headroom; where space conditions appear inadequate, Owner and Engineer shall be notified before proceeding with installations.

- C. The Owner may, without extra charge, make reasonable modifications in the layout as needed to prevent conflict with work of other trades and/or for proper execution of the work.
- D. Where variances occur between the Drawings and Specifications or within either of the Documents, the item or arrangement of better quality, shall be included in the Contract price. The Owner and Engineer shall decide on the item and the manner in which the work shall be installed.

1.6 SURVEYS AND MEASUREMENTS

- A. Before submitting his Bid, the Contractors shall visit the site and become thoroughly familiar with all existing conditions under which work will be installed. This Contract includes all modifications of existing systems required for the installation of new equipment. This Contract includes all necessary offsets, transitions and modifications required to install all new equipment in existing spaces. All new and existing equipment and systems shall be fully operational under this Contract before the job is considered complete. The Contractors shall be held responsible for any assumptions he makes, any omissions or errors he makes as a result of his failure to become fully familiar with the existing conditions at the site and the Contract Documents.
- B. The Contractor shall base all measurements, both horizontal and vertical, from established bench marks. All work shall agree with these established lines and levels. Verify all measurements at the site and check the correctness of same as related to the work.
- C. Should the Contractor discover any discrepancies between actual measurements and those indicated which prevent following good practice or which interfere with the intent of the Drawings and Specifications, the Engineer will be notified and work will not proceed until instructions from the Engineer are received.

1.7 DEMOLITION

- A. Demolition work shall be performed in a neat and orderly fashion. After piping, ductwork, equipment, etc., has been removed, neatly cap remaining ductwork and piping, and insulate caps in accordance to Section 230700 – HVAC Insulation. In finished areas, all ductwork and piping shall be cut back to a concealed location, i.e., within walls, above ceilings, etc., before capping.
- B. Before submitting his Bid, the Contractor shall visit the site with Architectural and Mechanical Plans in hand, and shall inspect all existing systems to determine the extent of demolition work involved. Particular attention is drawn to the removal of existing walls or portions of existing walls. In those areas, all exposed and concealed piping, ductwork, equipment, etc., running across or through affected areas shall be removed as required. Piping and ductwork shall then be either capped, or, if required for the proper continuing operation of an existing system to remain, piping and ductwork shall be rerouted around the affected areas and reconnected as required.
- C. Cut, remove and legally dispose of selected mechanical equipment, components, and materials as indicated, including but not limited to removal of mechanical piping, heating units, and other mechanical items made obsolete by the new Work.

- D. Location of existing systems and equipment shown on the drawings is based on the best available information. The Contractor shall verify dimensions and locations of existing systems and equipment in the field and adjust as necessary.
- E. Certain items of existing equipment and piping or ductwork may be indicated for removal or relocation. Items noted for removal shall be disconnected and disposed of by the Contractor or turned over to the Owner if requested. If instructed to dispose of items, the Contractor shall remove the items from the premises and dispose of them in a safe, legal and responsible manner and location. Items noted for relocation are intended for reuse in another location as designated on the Drawings. It shall be the responsibility of the Contractor to remove the material from its present location, store the material in a safe place and reinstall the material in its new location. Questions regarding the suitability of the material or equipment shall be brought to the attention of the Owner and Engineer in writing.
- F. Demolition work shall be performed in accordance with SMACNA IAQ Guidelines for Occupied Buildings Under Construction.

1.8 REFRIGERANT RECLAMATION

- A. The Contractor shall provide all required equipment and labor to reclaim all chlorofluorocarbon refrigerant liquids and vapors from all refrigeration equipment being demolished under this Contract, including all existing equipment, freon storage tanks and piping. When work on an existing system would otherwise release refrigerant to the environment, the Contractor shall reclaim all refrigerant before commencing with such work.

1.9 CODES AND STANDARDS

- A. Reference Standard Compliance
 - 1. Where equipment or materials are specified to conform to industry and technical society reference standards of the organizations such as American National Standards Institute (ANSI), American Society for Testing and Materials (ASTM), National Electrical Manufacturers Association (NEMA), and Underwriters Laboratories Inc. (UL), submit proof of such compliance. The label or listing by the specified organization will be acceptable evidence of compliance.
 - 2. Independent Testing Organization Certificate: In lieu of the label or listing indicated above, submit a certificate from an independent testing organization, competent to perform testing, and approved by the Engineer. The certificate shall state that the item has been tested in accordance with the specified organization's test methods and that the item complies with the specified organization's reference standard.
- B. The Following Codes and Standards listed below apply to all mechanical work.
 - 1. Wherever Codes and/or Standards are mentioned in these Specifications, the latest applicable edition or revision shall be followed:
 - 2. New York State Building Code – New York Supplement
 - 3. The International Building Code
 - 4. The International Energy Conservation Code
 - 5. The International Mechanical Code
 - 6. The National Electrical Code
 - 7. NFPA 101 Life Safety
 - 8. ASHRAE 90.1 and International Energy Conservation Code

C. The following Standards shall be used where referenced by the following abbreviations:

AABC	Associated Air Balance Council
ACGIH	American Conference of Governmental Industrial Hygienists
ADC	Air Diffusion Council
AGA	American Gas Association
AIA	American Institute of Architects
AMCA	Air Moving and Conditioning Association
ANSI	American National Standards Institute
ARI	Air Conditioning and Refrigeration Institute
ASHRAE	American Society of Heating Refrigeration and Air Conditioning Engineers.
ASME	American Society of Mechanical Engineers
ASTM	American Society of Testing and Materials
AWS	American Welding Society
EJMA	Expansion Joint Manufacturing Association
EPA	Environmental Protection Agency
FM	Factory Mutual
FSSC	Federal Specification
HIS	Hydraulic Institute Standards
IEEE	Institute of Electrical and Electronic Engineers
IRI	Industrial Risk Insurers
ISO	Insurance Services Office
MCAA	Mechanical Contractors Association of America
NBS	National Bureau of Standards
NEBB	National Environmental Balancing Bureau
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NOFI	National Oil Fuel Institute
NSC	National Safety Council
NSF	National Sanitation Foundation
OSHA	Occupational Safety and Health Administration
SBI	Steel Boiler Industry (Division of Hydraulics Institute
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
STI	Steel Tank Institute
UL	Underwriters Laboratories

- D. All materials furnished and all work installed shall comply with the rules and recommendations of the NFPA, the requirements of the local utility companies, the recommendations of the fire insurance rating organization having jurisdiction and the requirements of all Governmental departments having jurisdiction.
- E. The Contractor shall include in the work, without extra cost to the Owner, any labor, materials, services, apparatus and Drawings in order to comply with all applicable laws, ordinances, rules and regulations, whether shown on Drawings and/or specified or not.

1.10 PERMITS AND FEES

- A. The Contractor shall give all necessary notices, obtain all permits; and pay all Government and State sales taxes and fees where applicable, and other costs, including utility connections or extensions in connection with the work, file all necessary Drawings, prepare all documents and obtain all necessary approvals of all Governmental and State departments having jurisdiction, obtain all required certificates of inspection for his work, and deliver a copy to the Owner and Engineer before request

for acceptance and final payment for the work.

1.11 EQUIPMENT SUBSTITUTIONS

- A. In these Specifications and on the accompanying Drawings, one or more makes of materials, apparatus or appliances may have been specified for use in this installation. This has been done for convenience in fixing the standard of workmanship, finish and design required for installation. The details of workmanship, finish and design, and the guaranteed performance of any material, apparatus or appliance which the Contractor desires to deviate from those mentioned herein shall also conform to these standards.
- B. Where no specific make of material, apparatus or appliance is mentioned any first-class product made by a reputable manufacturer may be submitted for the Engineers review.
- C. Where two or more names are given as equivalents, the Contractor must use the specified item or one of the named equivalents. Where one name only is used and is followed by the words "or approved equal", the Contractor must use the item named or he may apply for a substitution. Where one name only is used, the Contractor must use that item named.
- D. Equipment, material or devices submitted for review as an "equivalent" shall meet the following requirements:
 - 1. The equivalent shall have the same construction features such as, but not limited to:
 - a. Material thickness, gauge, weight, density, etc.
 - b. Welded, riveted, bolted, etc., construction.
 - c. Finish, undercoating, corrosion protection.
 - 2. The equivalent shall perform with the same or better operating efficiency.
 - 3. The equivalent shall be locally represented by the manufacturer for service, parts and technical information.
 - 4. The equivalent shall bear the same labels of performance certification as is applicable to the specified item, such as AMCA or ARI labels.
- E. Where the Contractor proposes to deviate from the equipment or materials as hereinafter specified, he shall do so by making a request in writing. The Contractor shall state in his request the amount of credit or extra cost involved. A copy of said request shall be included in the Mechanical Base Bid with manufacturer's equipment cuts. The Base Bid shall be based on using the materials and equipment as specified with no exceptions.
- F. Where the Contractor proposes to use an item of equipment other than specified or detailed on the Drawings which requires any redesign of the structure, partitions, foundations, piping, wiring or any other part of the mechanical, electrical or architectural layout, all such redesign and all new drawings and detailing required therefore shall be prepared by the Designers of Record at the expense of the Contractor and at no additional cost to the Owner.
- G. Where such accepted substitution requires a different quantity and arrangement of piping, ductwork, valves, pumps, insulation, wiring, conduit and equipment from that specified or indicated on the Drawings, the Contractor shall, with the acceptance by the Engineer, furnish and install any such additional equipment required by the system at no additional cost to the Owner, including any costs added to other trades due to the substitution.

- H. Equipment, material or devices submitted for review as a "substitution" shall meet the following requirements:
1. Substitution Request Submittal: Requests for substitution will be considered if received in writing 14 days before the bid date. Requests received later than 14 days before the bid date may be considered or rejected at the discretion of the Engineer.
 - a. Submit three (3) copies of each request for substitution for consideration.
 - b. Identify the product, or the fabrication or installation method to be replaced in each request. Include related Specification Section and Drawing numbers. Provide complete documentation showing compliance with the requirements for substitutions, and the following information, as appropriate:
 - 1) Product Data, including Drawings and descriptions of products, fabrication and installation procedures.
 - 2) Samples, where applicable or requested.
 - 3) A detailed comparison of significant qualities of the proposed substitution with those of the Work specified. Significant qualities may include elements such as size, weight, durability, performance and visual effect.
 - 4) Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by the Owner and separate Contractors that will become necessary to accommodate the proposed substitution.
 - 5) A statement indicating the substitution's effect on the Contractor's Construction Schedule compared to the schedule without approval of the substitution. Indicate the effect of the proposed substitution on overall Contract Time.
 - 6) Cost information, including a proposal of the net change, if any in the Contract Sum.
 - 7) Certification by the Contractor that the substitution proposed is equal to or better in every significant respect to that required by the Contract Documents, and that it will perform adequately in the application indicated. Include the Contractor's waiver of rights to additional payment or time, that may subsequently become necessary because of the failure of the substitution to perform adequately.
 2. Engineer's Action: Within one week of receipt of the request for substitution, the Engineer will notify the Contractor of acceptance or rejection of the proposed substitution. If a decision on use of a proposed substitute cannot be made or obtained within the time allocated, use the product specified by name. Acceptance of a product substitution will be in the form of an Addendum.
 3. Other Conditions: The Contractor's substitution request will be received and considered by the Engineer when one or more of the following conditions are satisfied, as determined by the Engineer; otherwise requests will be returned without action except to record noncompliance with these requirements.
 - a. The specified product or method of construction cannot be provided within the Contract Time. The request will not be considered if the product or method cannot be provided as a result of failure to pursue the Work promptly or coordinate activities properly.
 - b. A substantial advantage is offered to the Owner, in terms of cost, time, energy conservation or other considerations of merit, after deducting offsetting responsibilities the Owner may be required to bear. Additional responsibilities for the Owner may include additional compensation to the

Engineer for redesign and evaluation services, increased cost of other construction by the Owner or separate Contractors, and similar considerations.

1.12 SUBMITTAL PROCEDURES

- A. Provide Submittals in accordance with the requirements of Division I and as indicated in the following.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.
 - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals and related activities that require sequential activity.
 - 2. Coordinate transmittal of different types of submittals for related elements of the Work so processing will not be delayed by the need to review submittals concurrently for coordination. The Engineer reserves the right to withhold action in a submittal requiring coordination with other submittals until related submittals are received.
- C. Processing: Allow sufficient review time so that installation will not be delayed as a result of the time required to process submittals, including time for resubmittals.
 - 1. Allow two weeks for initial review. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. The Engineer will promptly advise the Contractor when a submittal being processed must be delayed for coordination.
 - 2. If an intermediate submittal is necessary, process the same as the initial submittal.
 - 3. Allow two weeks for reprocessing each submittal.
 - 4. No extension of Contract Time will be authorized because of failure to transmit submittals to the Engineer sufficiently in advance of the Work to permit processing.
- D. Submittal Preparation: Place a permanent label or title block on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block. Submittals shall be arranged in order of specification sections.
 - 1. Include the following information on the label for processing and recording action taken.
 - a. Project name.
 - b. Date.
 - c. Name and address of Engineer.
 - d. Name and address of Contractor.
 - e. Name and address of subcontractor.
 - f. Name and address of supplier.
 - g. Name of manufacturer.
 - h. Number, title and paragraph of appropriate Specification Section.
 - i. Drawing number and detail references, as appropriate.
- E. Submittal Transmittal: Package each submittal appropriately for transmittal and handling. Transmit each submittal from Contractor to Architect or Engineer using a transmittal form. Submittals received from sources other than the Contractor will be returned without action. On the transmittal, record relevant information and requests for data. On the form, or separate sheet, record deviations from Contract Document requirements, including minor

variations and limitations. Include Contractor's certification that information complies with Contract Document requirements.

- F. Except for submittals for record, information or similar purposes, the Engineer will review each submittal, mark to indicate action taken, and return promptly. Compliance with specified characteristics is the Contractor's responsibility.
- G. Action Stamp: The Engineer will stamp each submittal with a uniform, self-explanatory action stamp. The stamp will be appropriately marked, to indicate the action taken.

1.13 SHOP DRAWINGS

- A. Submit neatly prepared information, drawn to accurate scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as a basis for Shop Drawings. Standard information without specific reference to the Project is not considered Shop Drawings.
- B. The Contractor shall submit for review detailed shop drawings of all equipment and material specified in each section and coordinated ductwork layouts. No material or equipment may be delivered to the job site or installed until the Contractor has received shop drawings for the particular material or equipment which have been properly reviewed. Shop drawings shall be submitted within 60 days after award of Contract before any material or equipment is purchased. The Contractor shall submit for review copies of all shop drawings to be incorporated in the Mechanical Contract. Refer to Division 1 for the quantity of copies required for submission. Where quantities are not specified, provide seven (7) copies for review.
- C. Provide shop drawings for all devices specified under equipment specifications for all systems. Shop drawings shall include manufacturers' names, catalog numbers, cuts, diagrams, dimensions, identification of products and materials included, compliance with specified standards, notation of coordination requirements, notation of dimensions established by field measurement and other such descriptive data as may be required to identify and accept the equipment. A complete list in each category (example: all fixtures), of all shop drawings, catalog cuts, material lists, etc., shall be submitted to the Engineer at one time. No consideration will be given to a partial shop drawing submittal.
- D. When a submittal could involve more than one trade, e.g., valves, piping, etc., the submitted shall be separated by traded involved, i.e. HVAC, plumbing, fire protection, etc.
- E. Where multiple quantities or types of equipment are being submitted, provide a cover sheet (with a list of contents) on the submittal identifying the equipment or material being submitted.
- F. The Contractor shall furnish all necessary templates, patterns, etc., for installation work and for the purpose of making adjoining work conform; furnish setting plans and shop details to other trades as required.
- G. "No Exception Taken" rendered on shop drawings shall not be considered as a guarantee of measurements or building conditions. Where drawings are reviewed, review does not mean that drawings have been checked in detail; said approval does not in any way relieve the Contractor from his responsibility or necessity of furnishing material or performing work as required by the Contract Drawings and Specifications. Verify available space prior to submitting shop drawings. Review of shop drawings shall not apply to quantity of material.

- H. After shop drawings have been reviewed, with no exceptions taken, no further changes will be allowed without the written consent of the Engineer.
- I. Shop drawing submittal sheets which may show items that are not being furnished shall have those items crossed off to clearly indicate which items will be furnished.
- J. Bidders shall not rely on any verbal clarification of the Drawings and/or Specifications. Any questions shall be referred to the Engineer in writing at least five (5) working days prior to bidding to allow for issuance of an Addendum.
- K. Do not use Shop Drawings without an appropriate final stamp indicating action taken in connection with construction.
- L. Prepare sheet metal shop drawings drawn in the latest AutoCAD version to a minimum scale of 1/4"=1'-0". Final approved drawings shall be turned over to the Owner on floppy disk or CD Rom.

1.14 COORDINATION DRAWINGS

- A. Prepare coordination drawings drawn in the latest AutoCAD version in accordance with Division 1 to a minimum scale of 1/4" 1'-0" detailing major elements, components, and systems of mechanical equipment and materials in relationship with other systems, installations, and building components. Indicate locations where space is limited for installation and access and where sequencing and coordination of installations are of importance to the efficient flow of the Work, including (but not necessarily limited to) the following:
 - B. The Contractor shall indicate the proposed locations of piping, conduit, ductwork, equipment, and materials. Include the following:
 - a. Clearances for servicing and maintaining equipment, including tube removal, filter removal, and space for equipment disassembly required for periodic maintenance.
 - b. Equipment connections and support.
 - c. Exterior wall and foundation penetrations.
 - d. Fire-rated wall and floor penetrations.
 - e. Sizes and locations of required concrete pads and bases.
- C. Coordination drawings will include all major systems, including but not limited to:
 - i. HVAC ductwork and equipment.
 - ii. HVAC piping.
 - iii. Sprinkler piping and sprinkler head location.
 - iv. Sanitary waste and domestic water piping.
 - v. Fuel oil and gas piping.
- D. Indicate scheduling, sequencing, movement, and positioning of large equipment into the building during construction.
- E. Prepare floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.
- F. Prepare reflected ceiling plans to coordinate and integrate installations, air outlets and inlets, light fixtures, communication systems components, sprinklers, and other ceiling-mounted items.
- G. The Contractor and each major subcontractor (HVAC, Plumbing, Fire Protection and

Electrical) shall sign and date each coordination drawing prior to submission.

- H. Work shall not be performed until coordination drawings have been approved by the architect and engineer.
- I. Electronic copies of the MEP floor plans are available to use as a basis for preparing coordination drawings and can be provided by the Engineer. If the Contractor elects to obtain the Engineers electronic files a CADD File Release Form must be submitted. This form must be signed by the Contractor, Owner, and Architect. Upon receipt of a signed copy of the CADD File Release Form, the Engineer will provide copies of the electronic files for the Contractor's use. A copy of the CADD File Release Form is appended to the end of this specification section.

1.15 COORDINATION WITH OTHER DIVISIONS

- A. All work shall be carried out in conjunction with other trades and full cooperation shall be given in order that all work may proceed with a minimum of delay and interference. Particular emphasis is placed on timely installation of major apparatus and furnishing other Contractors, especially the Contractor or Construction Manager, with information as to openings, chases, sleeves, bases, inserts, equipment locations, panels, etc., required by other trades.
- B. The Contractors are required to examine all of the Project Drawings and mutually arrange work so as to avoid interference with the work of other trades. In general, ductwork, HVAC piping, sprinkler piping and drainage lines take precedence over water, gas and electrical conduits. The Engineer shall make final decisions regarding the arrangement of work which cannot be agreed upon by the Contractors.
- C. Where the work of the Contractor will be installed in close proximity to or will interfere with work of other trades, the Contractors will cooperate in working out space conditions to make a satisfactory adjustment.
- D. If the work under a Section is installed before coordinating with other Divisions or Sections or so as to cause interference with work of other Sections, the necessary changes to correct the condition shall be made by the Contractor causing the interference without extra charge to the Owner.

1.16 WORKMANSHIP

- A. Service Support: The equipment items shall be supported by service organizations which are reasonably convenient to the equipment installation in order to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract. Reasonably convenient, unless specifically approved otherwise shall be considered within a fifty-mile radius of the project site.
- B. Modification of References: In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "shall" had been substituted for "should" wherever it appears.
- C. The Contractor shall furnish the services of an experienced superintendent who shall be constantly in charge of the installation of the work together with all skilled workmen, fitters, metal workers, welders, helpers and laborers required to unload, transfer, erect, connect, adjust, start, operate and test each system.
- D. Unless otherwise specifically indicated on the Drawings or Specifications, all equipment and materials shall be installed with the acceptance of the Engineer and in accordance with

the recommendations of the manufacturer. This includes the performance of such tests as the manufacturer recommends.

- E. All labor for installation of mechanical systems shall be performed by experienced, skilled tradesmen under the supervision of a licensed journeyman foreman. All work shall be of a quality consistent with good trade practice and shall be installed in a neat, workmanlike manner. The Engineer reserves the right to reject any work which, in his opinion, has been installed in a substandard, dangerous or unserviceable manner. The Contractor shall replace said work in a satisfactory manner at no extra cost to the Owner.

1.17 SHUTDOWNS

- A. When installation of a new system requires the temporary shutdown of an existing operating system, the connection of the new system shall be performed at such time as designated by the Owner.
- B. The Engineer and the Owner shall be notified in writing of the estimated duration of the shutdown period at least ten (10) days in advance of the date the work is to be performed.
- C. Work shall be arranged for continuous performance whenever possible. The Contractor shall provide all necessary labor, including overtime if required, to assure that existing operating services will be shut down only during the time actually required to make necessary connections.

1.18 TEMPORARY UTILITIES

- A. General: Provide new materials and equipment; if acceptable to the Engineer, undamaged previously used materials in serviceable condition may be used. Provide materials suitable for the use intended.
- B. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Take necessary fire prevention measures. Do not overload facilities, or permit them to interfere with progress. Do not allow hazardous dangerous or unsanitary conditions, or public nuisances to develop or persist on the site.
- C. First Aid Supplies: Comply with governing regulations.
- D. Fire Extinguishers: Provide hand-carried, portable UL-rated, class "A" fire extinguishers for temporary offices and similar spaces. In other locations provide hand-carried, portable, UL-rated, class "ABC" dry chemical extinguishers, or a combination of extinguishers of NFPA recommended classes for the exposures.
- E. Temporary Heat-Cool-Dehumidification: Provide temporary services required by construction activities, for curing or drying of completed installations or protection of installed construction from adverse effects of low temperatures or high humidity. Select safe equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate temporary services to produce the ambient condition required and minimize consumption of energy. The building's permanent HVAC systems shall not be used for these purposes. When propane is used for temporary heat, contractor shall be trained per state's department of public safety or equivalent requirements in storing, use and emergency planning of propane systems for temporary heat at construction sites. Documentation of trained personnel shall be kept on site.
- F. Environmental Protection: Provide protection, operate temporary facilities and conduct construction in ways and by methods that comply with environmental regulations, and

eliminate the possibility that air, waterways and subsoil might be contaminated or polluted, or that other undesirable effects might result. Avoid use of tools and equipment which produce harmful noise. Restrict use of noise making tools and equipment to hours that will minimize complaints from persons or firms near the site.

- G. Termination and Removal: Unless the Engineer requires that it be maintained longer, remove each temporary facility when the need has ended, or when replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with the temporary facility. Repair damaged Work, clean exposed surfaces and replace construction that cannot be satisfactorily repaired. Materials and facilities that constitute temporary facilities are property of the Contractor. The Owner reserves the right to take possession of Project identification signs.

1.19 BUILDING FLUSH-OUT

- A. Building flush-out shall begin after construction ends and finishes are installed but prior to building occupancy. Prior to building flush-out, HVAC systems shall be balanced per Specification Section 23 05 93. Flush-out shall not occur until contractor receives permission to proceed from the Owner or Owner's representative. Flush-out shall continue during the first weeks of occupancy as scheduled below.
- B. Building flush-out procedures shall include continuously operating all the building's new ventilation systems at maximum design outside air flow rates. For constant volume HVAC systems, ventilation systems shall operate at maximum design supply air flow rates. For VAV systems, supply air flow shall be allowed to vary to maintain space temperatures. HVAC systems shall be set to maintain internal space temperatures at minimum 60°F and maximum 78°F and relative humidity at maximum 60% RH.
- C. Building flush-out prior to occupancy: HVAC systems shall operate continuously, 24 hours per day, for a minimum period of 12 days. Commissioning and testing of the HVAC systems' temperature controls shall be allowed during this time frame.
- D. Building flush-out at start of occupancy: HVAC systems shall operate continuously, 24 hours per day, for a minimum period of 40 days.

1.20 PROJECT PHASING

- A. Work under each Section shall include all necessary temporary connections, equipment, piping, heating, temperature control work, fire stopping, water heaters, labor, and material as necessary to accommodate the phasing of Construction as developed by the General Contractor or Construction Manager and approved by the Owner. All existing systems that pass-thru an area of the building shall remain operational during all phases of construction. No extra compensation shall be granted the Contractor for work required to maintain existing systems operational or to accommodate the construction phasing of the project.

1.21 PROTECTION OF MATERIALS AND EQUIPMENT

- A. Work under each Section shall include protecting the work and material of all other Sections from damage by work or workmen and shall include corrective actions to damage thus caused.
- B. The Contractor shall be responsible for work and equipment until the facility has been accepted by the Owner. Protect work against theft, injury or damage and carefully

store material and equipment received on site which is not immediately installed. Close open ends of work with temporary covers or plugs during construction to prevent entry of foreign material.

- C. Work under each Section includes receiving, unloading, uncrating, storing, protecting, setting in place and completely connecting equipment supplied under each Section. Work under each Section shall also include exercising special care in handling and protecting equipment and fixtures, and shall include the cost of replacing any of the equipment and fixtures which are missing or damaged.
- D. Equipment and material stored on the job site shall be protected from the weather, vehicles, dirt and/or damage by workmen or machinery. Insure that all electrical or absorbent equipment or material is protected from moisture during storage.

1.22 ADJUSTING AND TESTING

- A. After all the equipment and accessories to be furnished are in place, they shall be put in final adjustment and subjected to such operating tests so as to assure the Engineer that they are in proper adjustment and in satisfactory, permanent operating condition.
- B. Where requested by the Engineer, a factory-trained service representative shall inspect the installation and assist in the initial startup and adjustment to the equipment. The period of these services shall be for such time as necessary to secure proper installation and adjustments. After the equipment is placed in permanent operation, the service representative shall supervise the initial operation of the equipment and instruct personnel responsible for operation and maintenance of the equipment. The service representative shall notify the Contractor in writing that the equipment was installed according to manufacturer's recommendations and is operating as intended by the manufacturer.
- C. Contractor is responsible for completing all pre-functional and functional checklist items to the satisfaction of the Commissioning Agent. See Sections 01 90 00 and 23 08 00 for additional requirements.

1.23 CLEANING

- A. The Contractor shall thoroughly clean and flush all piping, ducts and equipment of all foreign substances, oils, burrs, solder, flux, etc., inside and out before being placed in operation.
- B. If any part of a system should be stopped or damaged by any foreign matter after being placed in operation, the system shall be disconnected, cleaned and reconnected wherever necessary to locate and/or remove obstructions. Any work damaged in the course of removing obstructions shall be repaired or replaced when the system is reconnected at no additional cost to the Owner.
- C. During the course of construction, all ducts and pipes shall be capped in an acceptable manner to insure adequate protection against the entrance of foreign matter.
- D. Upon completion of all work under the Contract, the Contractor shall remove from the premises all rubbish, debris and excess materials left over from his work. Any oil or grease stains on floor areas caused by the Contractor shall be removed and floor areas left clean.
- E. Complete the following cleaning operations before requesting inspection for Certification of Substantial Completion.

1. Remove labels that are not permanent labels.
 2. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compound and other substances that are noticeable vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials.
 3. Clean exposed exterior and interior hard-surfaced finishes to a dust-free condition, free of stains, films and similar foreign substances. Restore reflective surfaces to their original reflective condition. Leave concrete floors broom clean. Vacuum carpeted surfaces.
 4. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication and other substances.
- F. Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile, harmful or dangerous materials into drainage systems. Remove and dispose of ALL waste materials, packaging material, skids etc. from the site and dispose of in a lawful manner in accordance with municipal, state and federal regulations.
- G. Where extra materials of value remaining after completion of associated Work have become the Owner's property, arrange for disposition of these materials as directed.

1.24 OPERATING AND MAINTENANCE

- A. Upon completion of all work and tests, the Contractor shall furnish the necessary skilled labor and helpers for operating his system and equipment for a period specified under each applicable Section of this Division. During this period, he shall fully instruct the Owner or the Owner's representative in the operation, adjustment and maintenance of all equipment furnished. The Contractor shall give at least seven (7) days notice to the Owner and the Engineer in advance of this period.
- B. The Contractor shall include the maintenance schedule for the principal items of equipment furnished under this Division.
- C. The Contractor shall physically demonstrate procedures for all routine maintenance of all equipment furnished under each respective Section to assure accessibility to all devices.
- D. An authorized manufacturer's representative shall attest in writing that the equipment has been properly installed prior to startup of any major equipment. The following equipment will require this inspection: pumps; air conditioning equipment, controls, air handling equipment, compressors, boilers etc. These letters shall be bound into the operating and maintenance books.
- E. Refer to individual trade Sections for any other particular requirements related to operating instructions.

1.25 OPERATING AND MAINTENANCE MANUALS

- A. Prepare operating and maintenance manuals in accordance with the requirements of Division I and requirements listed below. The Contractor shall prepare six (6) copies of a complete maintenance and operating instructions manual, bound in booklet form. Organize operating and maintenance data into

suitable sets of manageable size. Bind properly indexed data in individual heavy-duty 3-ring vinyl-covered binders, with pocket folders for folded sheet information and designation partitions with identification tabs. Mark appropriate identification on front and spine of each binder.

B. Manual shall include the following:

1. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of replacement parts.
2. Manufacturer's printed operating procedures to include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions; and summer and winter operating instructions.
3. Maintenance procedures for routine preventative maintenance and trouble-shooting; disassembly, repair, and reassembly; aligning and adjusting instructions.
4. Servicing and operating instructions including lubrication charts and schedules.
5. Emergency and safety instructions.
6. Spare parts list.
7. Copies of warranties.
8. Wiring diagrams.
9. Recommended "turn around" cycles.
10. Inspection procedures.
11. Approved Shop Drawings and Product Data.
12. Equipment Start-up Reports.
13. Temperature control diagrams and written sequences of operations.
14. Balance reports.

C. Include in the manual, a tabulated equipment schedule for all equipment. Schedule shall include pertinent data such as: make, model number, serial number, voltage, normal operating current, belt size, filter quantities and sizes, bearing number, etc. Schedule shall include maintenance to be done and frequency.

D. Maintenance and instruction manuals shall be submitted to the Owner at the same time as the seven (7) day notice is given prior to the instruction period.

1.26 ACCEPTANCES

- A. The equipment, materials, workmanship, design and arrangement of all work installed under the Mechanical Sections shall be subject to the review of the Engineer.
- B. Within 30 days after the awarding of a Contract, the Mechanical Contractor shall submit to the Engineer, for review, a list of manufacturers of equipment proposed for the work under the Mechanical Sections. The intent to use the exact manufacturers and models specified does not relieve the Contractor of the responsibility of submitting such a list.
- C. If extensive or unacceptable delivery time is expected on a particular item of equipment specified, the Contractor shall notify the Owner and Engineer, in writing, within 30 days of award of the Contract. In such instances, equipment substitutions may be made pending acceptance by the Engineer or the Owner's representative.
- D. Where any specific material, process or method of construction or manufactured article is specified by reference to the catalog number of a manufacturer, the Specifications are to be used as a guide and are not intended to take precedence over the basic duty and performance specified or noted on the Drawings. In all cases, the Mechanical Contractor shall verify the duty specified with the specific characteristics of the equipment offered for review. Equipment characteristics are to be used as mandatory requirements where the Contractor proposes to use an acceptable equivalent.

- E. If material or equipment is installed before it is reviewed and/or approved, the Contractor shall be liable for its removal and replacement at no extra charge to the Owner if, in the opinion of the Engineer, the material or equipment does not meet the intent of, or standard of quality implied by, the Drawings and Specifications.
- F. Failure on the part of the Engineer to reject shop drawings or to reject work in progress shall not be interpreted as acceptance of work not in conformance with the Drawings and/or Specifications. Work not in conformance with the Drawings and/or Specifications shall be corrected whenever it is discovered.

1.27 RECORD DRAWINGS

- A. General: Do not use record documents for construction purposes; protect from deterioration and loss in a secure, fire-resistive location; provide access to record documents for the Engineer's reference during normal working hours.
- B. Maintain a clean, undamaged set of blue or black line white-prints of Contract Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies from the Work as originally shown. Mark whichever drawing is most capable of showing conditions fully and accurately. Give particular attention to concealed elements that would be difficult to measure and record at a later date. Items to be indicated include but are not limited to:
 - 1. Dimensional change
 - 2. Revision to drawing detail
 - 3. Location and depth of underground utility
 - 4. Revision to pipe routing
 - 5. Revision to electrical circuitry
 - 6. Actual equipment location
 - 7. Duct size and routing
 - 8. Location of concealed internal utility
 - 9. Changes made by Change Order
 - 10. Details not on original Contract Drawing
 - 11. Information on concealed elements which would be difficult to identify or measure later
- C. Mark record sets with red erasable pencil; use other colors to distinguish between variations in separate categories of the Work.
- D. Mark new information that is important to the Owner, but was not shown on Contract Drawings or Shop Drawings.
- E. Note related Change Order numbers where applicable.
- F. Organize record drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates and other identification on the cover of each set.
- G. Final record documents shall be prepared in the latest AutoCAD version and CD Rom of all drawings and a clean set of reproducible drawings shall be turned over to the Owner at the completion of the work.

1.28 WARRANTIES AND BONDS

- A. The following general administrative and procedural requirements for warranties and

bonds required by the Contract Documents, including manufacturer's standard warranties on products and special warranties are to be included:

1. General close-out requirements included in Division 1 .
 2. Specific requirements for warranties for the Work and products and installation that are specified to be warranted are included in the individual Sections of Divisions-23.
 3. Certifications and other commitments and agreements for continuing services to Owner are specified elsewhere in the Contract Documents.
- B. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products, nor does it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.
- C. Separate Prime Contracts: Each prime Contractor is responsible for warranties related to its own Contract.

1.29 WARRANTY REQUIREMENTS

- A. Related Damages and Losses: When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.
- B. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
- C. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.
- D. Owner's Recourse: Written warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, right and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights, or remedies.
- E. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.
- F. The Owner reserves the right to refuse to accept Work for the Project where a special warranty, certification, or similar commitment is required on such Work or part of the Work, until evidence is presented that entities required to countersign such commitments are willing to do so.
- G. Submit written warranties to the Engineer prior to the date certified for Substantial Completion. If the Engineer's Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, or a designated portion of the Work, submit written warranties upon request of the Engineer.
- H. When a designated portion of the Work is completed and occupied or used by the Owner,

by separate agreement with the Contractor during the construction period, submit properly executed warranties to the Engineer within fifteen days of completion of that designated portion of the Work.

- I. When a special warranty is required to be executed by the Contractor, or the Contractor and a subcontractor, supplier or manufacturer, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner through the Engineer for approval prior to final execution.
 - 1. Refer to individual Sections of Divisions-23 for specific content requirements, and particular requirements for submittal of special warranties.
- J. Form of Submittal: At Final Completion compile two copies of each required warranty and bond properly executed by the Contractor, or by the Contractor, subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the table of contents of the Project Manual.
- K. Bind warranties and bonds in heavy-duty, commercial quality, durable 3-ring vinyl covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2" by 11" paper.
 - 1. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address and telephone number of the installer.
 - 2. Identify each binder on the front and the spine with the typed or printed title "WARRANTIES AND BONDS," the Project title or name, and the name of the Contractor.
 - 3. When operating and maintenance manuals are required for warranted construction, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

1.30 GUARANTEES

- A. The Contractor shall guarantee all material and workmanship under these Specifications and the Contract for a period of one (1) year from the date of final acceptance by Owner. During this guarantee period, all defects developing through faulty equipment, materials or workmanship shall be corrected or replaced immediately by this Contractor without expense to the Owner. Such repairs or replacements shall be made to the Engineer's satisfaction.
- B. Contractor shall provide name, address, and phone number of all contractors and subcontractors and associated equipment they provided.

1.31 PROJECT CLOSE-OUT

- A. Submit specific warranties, workmanship bonds, maintenance agreements, final certifications and similar documents in accordance with Division 1.
- B. Deliver tools, spare parts, extra stock, and similar items.
- C. Complete start-up testing of systems, and instruction of the Owner's operating and maintenance personnel. Discontinue or change over and remove temporary facilities from the site, along with construction tools, mock-ups, and similar elements.
- D. Complete final clean up requirements, including touch-up painting. Touch-up and

otherwise repair and restore marred exposed finishes.

- E. Field Observation Procedures: On receipt of a request for an Engineers Field Observation, the Engineer will advise the Contractor of unfulfilled requirements. The Engineer will advise the Contractor of construction that must be completed or corrected before the certificate will be issued.
1. The Engineer will repeat the Field Observation when requested and assured that the Work has been substantially completed.
 2. Results of the completed list of unfulfilled items will form the basis of requirements for final acceptance.

END OF SECTION 230400

SECTION 230513 - COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.3 COORDINATION

- A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:
 - 1. Motor controllers.
 - 2. Torque, speed, and horsepower requirements of the load.
 - 3. Ratings and characteristics of supply circuit and required control sequence.
 - 4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

- A. Comply with NEMA MG 1 unless otherwise indicated.
- B. Comply with IEEE 841 for severe-duty motors.

2.2 MOTOR CHARACTERISTICS

- A. Duty: Continuous duty at ambient temperature of 40 degrees C and at altitude of 3300 feet above sea level.
- B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 POLYPHASE MOTORS

- A. Description: NEMA MG 1, Design B, medium induction motor.
- B. Efficiency: Premium efficient, as defined in NEMA MG 1.
- C. Service Factor: 1.15.

- D. Multispeed Motors: Variable torque.
 - 1. For motors with 2:1 speed ratio, consequent pole, single winding.
 - 2. For motors with other than 2:1 speed ratio, separate winding for each speed.
- E. Multispeed Motors: Separate winding for each speed.
- F. Rotor: Random-wound, squirrel cage.
- G. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.
- H. Temperature Rise: Match insulation rating.
- I. Insulation: Class F.
- J. Code Letter Designation:
 - 1. Motors 15 HP and Larger: NEMA starting Code F or Code G.
 - 2. Motors Smaller than HP: Manufacturer's standard starting characteristic.
- K. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T

2.4 POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS

- A. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.
- B. Motors Used with Variable Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.
 - 1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.
 - 2. Premium-Efficient Motors: Class B temperature rise; Class F insulation.
 - 3. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
 - 4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.
- C. Severe-Duty Motors: Comply with IEEE 841, with 1.15 minimum service factor.

2.5 SINGLE-PHASE MOTORS

- A. Motors larger than 1/20 HP shall be one of the following, to suit starting torque and requirements of specific motor application:
 - 1. Permanent-split capacitor.
 - 2. Split phase.
 - 3. Capacitor start, inductor run.
 - 4. Capacitor start, capacitor run.
- B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.
- C. Bearings: Pre-lubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.

- D. Motors 1/20 HP and Smaller: Shaded-pole type.
- E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 230513

SECTION 230516 - EXPANSION FITTINGS AND LOOPS FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Flexible, ball-joint packed expansion joints.
 - 2. Slip-joint, packed expansion joints.
 - 3. Metal, compensator pack-less expansion joints.
 - 4. Flexible-hose pack-less expansion joints.
 - 5. Metal-bellows pack-less expansion joints.
 - 6. Externally pressurized metal-bellows pack-less expansion joints.
 - 7. Grooved-joint expansion joints.
 - 8. Alignment guides and anchors.
 - 9. Pipe loops and swing connections.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Delegated-Design Submittal: For each anchor and alignment guide, including analysis data, signed and sealed by the qualified professional engineer responsible for their preparation.
 - 1. Design Calculations: Calculate requirements for thermal expansion of piping systems and for selecting and designing expansion joints, loops, and swing connections.
 - 2. Anchor Details: Detail fabrication of each anchor indicated. Show dimensions and methods of assembly and attachment to building structure.
 - 3. Alignment Guide Details: Detail field assembly and attachment to building structure.
 - 4. Schedule: Indicate type, manufacturer's number, size, material, pressure rating, end connections, and location for each expansion joint.

1.4 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For expansion joints to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

- B. Pipe and Pressure-Vessel Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Compatibility: Products shall be suitable for piping service fluids, materials, working pressures, and temperatures.
- B. Capability: Products to absorb 200 percent of maximum axial movement between anchors.

2.2 PACKED EXPANSION JOINTS

- A. Flexible, Ball-Joint Packed Expansion Joints:
 - 1. Acceptable Manufacturers:
 - a. Advanced Thermal Systems
 - b. Hyspan Precision Products
 - c. Mason Industries
 - 2. Standards: ASME Boiler and Pressure Vessel Code: Section II, "Materials"; ASME B31.9, "Building Services Piping," for materials and design of pressure-containing parts and bolting.
 - 3. Material: Carbon-steel assembly with asbestos-free composition packing.
 - 4. Design: Provide 360-degree rotation and angular deflection.
 - 5. Minimum Pressure Rating: 250 psig at 400 degrees F.
 - 6. Angular Deflection for NPS 6 and Smaller: 30 degree minimum.
 - 7. Angular Deflection for NPS 8 and Larger: 15 degree minimum.
 - 8. Seal Type: Two carbon steel and graphite seals suitable for continuous operation at temperature up to 650 degrees F.
 - 9. Internal Ball: Plated with minimum 1-mil chrome cover.
 - 10. Ball Socket: One- or two-piece design with integral socket/retainer.
 - a. Stuffing Box: Incorporates containment seals and compression seals for containment of injectable packing.
 - b. Packing Cylinders: Provides packing under full line pressure with check valves to prevent blow-back.
 - 11. End Connections for NPS 2 and Smaller: Threaded.
 - 12. End Connections for NPS 2-1/2 and Larger: Flanged.
- B. Slip-Joint Packed Expansion Joints:
 - 1. Acceptable Manufacturers:
 - a. Advanced Thermal Systems
 - b. Hyspan Precision Products
 - c. Mason Industries
 - 2. Standard: ASTM F 1007.
 - 3. Material: Carbon steel with asbestos-free PTFE packing.
 - 4. Design: With internal guide and injection ports for repacking under full system pressure. Housing shall be furnished with drain ports and lifting ring. Include drip connection if used for steam piping.
 - 5. Configuration: Single joint with base and double joint with base classes unless otherwise indicated.
 - 6. Slip Tube for sizes NPS 1-1/2 through NPS 16: Schedule 80.
 - 7. Sliding Surface: 2 mil thick chrome finish.
 - 8. End Connections: Flanged or welded ends to match piping system.

2.3 PACKLESS EXPANSION JOINTS

A. Metal, Compensator Pack-less Expansion Joints

1. Acceptable Manufacturers:
 - a. Flex-Hose
 - b. Flexicraft
 - c. Flex-Weld
 - d. Metraflex
 - e. Hyspan Precision Products
 - f. Mason Industries
2. Minimum Pressure Rating: 175 psig, unless otherwise indicated.
3. Description: Totally enclosed, externally pressurized, multi-ply bellows isolated from fluid flow by an internal pipe sleeve and external housing.
4. Joint Axial Movement: 2 inches of compression and 1/2 inch of extension.
5. Configuration for Copper Tubing: Multi-ply, phosphor-bronze bellows with copper pipe ends.
 - a. End Connections for Copper Tubing NPS 2 and Smaller: Solder joint or threaded.
 - b. End Connections for Copper Tubing NPS 2-1/2 to NPS 4: Threaded.
6. Configuration for Steel Piping: Multi-ply, stainless-steel bellows; steel-pipe end connections; and carbon-steel shroud.
 - a. End Connections for Steel Pipe NPS 2 and Smaller: Threaded.
 - b. End Connections for Steel Pipe NPS 2-1/2 to NPS 4: Flanged or Welded.

B. Flexible-Hose Pack-less Expansion Joints:

- a. Flex-Hose
- b. Flexicraft
- c. Flex-Weld
- d. Metraflex
- e. Hyspan Precision Products
- f. Mason Industries
2. Description: Manufactured assembly with inlet and outlet elbow fittings and two flexible-metal-hose legs joined by long-radius, 180-degree return bend or center section of flexible hose.
3. Flexible Hose: Corrugated-metal inner hoses and braided outer sheaths.
4. Expansion Joints for Copper Tubing NPS 2 and Smaller: Copper-alloy fittings with soldered joint end connections: Bronze hoses and single-braid bronze sheaths with 340 psig at 450 degree F rating.
5. Expansion Joints for Copper Tubing NPS 2-1/2 to NPS 4: Copper-alloy fittings with threaded end connections: Stainless-steel hoses and single-braid, stainless-steel sheaths with 225 psig at 450 degree F ratings.
6. Expansion Joints for Steel Piping NPS 2 and Smaller: Carbon-steel fittings with threaded end connections: Stainless-steel hoses and single-braid, stainless-steel sheaths with 325 psig at 600 degree F ratings.
7. Expansion Joints for Steel Piping NPS 2-1/2 to NPS 6: Carbon-steel fittings with flanged or welded end connections: Stainless-steel hoses and single-braid, stainless-steel sheaths with 145 psig at 600 degree F rating.

C. Metal-Bellows Pack-less Expansion Joints:

- a. Flex-Hose
- b. Flexicraft
- c. Flex-Weld
- d. Metraflex
- e. Hyspan Precision Products
- f. Mason Industries
2. Standards: ASTM F 1120 and EJMA's "Standards of the Expansion Joint Manufacturers Association, Inc."
3. Type: Circular, corrugated bellows with external tie rods.

4. Minimum Pressure Rating: 175 psig unless otherwise indicated.
5. Configuration: Single joint with base and double joint with base classes, unless otherwise indicated.
6. Expansion Joints for Copper Tubing: Single- or multi-ply phosphor-bronze bellows, copper pipe ends, and brass shrouds.
 - a. End Connections for Copper Tubing NPS 2 and Smaller: Solder joint or threaded.
 - b. End Connections for Copper Tubing NPS 2 ½ and Larger: Flanged.
7. Expansion Joints for Steel Piping: Single- or multi-ply stainless-steel bellows, steel pipe ends, and carbon-steel shroud.
 - a. End Connections for Steel Pipe NPS 2 and Smaller: Threaded.
 - b. End Connections for Steel Pipe NPS 2-1/2 and Larger: Flanged.

D. Externally Pressurized Metal-Bellows Pack-less Expansion

1. Acceptable manufacturers:
 - a. Flex-Hose
 - b. Flexicraft
 - c. Flex-Weld
 - d. Metraflex
 - e. Hyspan Precision Products
 - f. Mason Industries
2. Minimum Pressure Rating: 150 psig, unless otherwise indicated.
3. Description:
 - a. Totally enclosed, externally pressurized, multi-ply, stainless-steel bellows isolated from fluid flow by an internal pipe sleeve.
 - b. Carbon-steel housing.
 - c. Drain plugs and lifting lug for the NPS 3 and larger.
 - d. Bellows shall have operating clearance between the internal pipe sleeves and the external shrouds.
 - e. Joints shall be supplied with a built-in scale to confirm the starting position and operating movement.
 - f. Joint Axial Movement: 6 inches of compression and 0.75 inch of extension.
4. Permanent Locking Bolts: Set locking bolts to maintain joint lengths during installation. Temporary welding tabs that are removed after installation in lieu of locking bolts are not acceptable.
5. End Connection Configuration: Flanged; one raised, fixed and one floating flange.

2.4 GROOVED-JOINT EXPANSION JOINTS

- A. Acceptable Manufacturers:
 1. Victaulic Company
 2. Anvil International
 3. Shurjoint Piping Products.
- B. Description: Factory-assembled expansion joint made of several grooved-end pipe nipples, couplings, and grooved joints.
- C. Standard: AWWA C606, for grooved joints.
- D. Nipples: ASTM A 53/A 53M, Schedule 40, Type E or S, steel pipe with grooved ends.
- E. Couplings: Five flexible type for steel-pipe dimensions. Include ferrous housing sections, Buna-N gasket or ethylene-propylene-diene terpolymer rubber gasket suitable for cold and hot water, and bolts and nuts.

2.5 ALIGNMENT GUIDES AND ANCHORS

A. Alignment Guides:

1. Acceptable manufacturers:
 - a. Flex-Hose
 - b. Flexicraft
 - c. Flex-Weld
 - d. Metraflex
 - e. Hyspan Precision Products
 - f. Mason Industries
2. Description: Steel, factory-fabricated alignment guide, with bolted two-section outer cylinder and base for attaching to structure; with two-section guiding slider for bolting to pipe.

B. Anchor Materials:

1. Steel Shapes and Plates: ASTM A 36/A 36M.
2. Bolts and Nuts: ASME B18.10 or ASTM A 183, steel hex head.
3. Washers: ASTM F 844, steel, plain, flat washers.
4. Mechanical Fasteners: Insert-wedge-type stud with expansion plug anchor for use in hardened Portland cement concrete, with tension and shear capacities appropriate for application.
 - a. Stud: Threaded, zinc-coated carbon steel.
 - b. Expansion Plug: Zinc-coated steel.
 - c. Washer and Nut: Zinc-coated steel.
5. Chemical Fasteners: Insert-type stud, bonding-system anchor for use with hardened Portland cement concrete, with tension and shear capacities appropriate for application.
 - a. Bonding Material: ASTM C 881/C 881M, Type IV, Grade 3, two-component epoxy resin suitable for surface temperature of hardened concrete where fastener is to be installed.
 - b. Stud: ASTM A 307, zinc-coated carbon steel with continuous thread on stud, unless otherwise indicated.
 - c. Washer and Nut: Zinc-coated steel.

PART 3 - EXECUTION

3.1 EXPANSION JOINT INSTALLATION

- A. Install expansion joints of sizes matching sizes of piping in which they are installed.
- B. Install packed-type expansion joints with packing suitable for fluid service.
- C. Install metal-bellows expansion joints according to EJMA's "Standards of the Expansion Joint Manufacturers Association, Inc."
- D. Install grooved-joint expansion joints to grooved-end steel piping.

3.2 PIPE LOOP AND SWING CONNECTION INSTALLATION

- A. Install pipe loops cold-sprung in tension or compression as required to partly absorb tension or compression produced during anticipated change in temperature.
- B. Connect risers and branch connections to mains with at least five pipe fittings, including tee in main.
- C. Connect risers and branch connections to terminal units with at least four pipe fittings, including tee in riser.
- D. Connect mains and branch connections to terminal units with at least four pipe fittings, including tee in main.

3.3 ALIGNMENT-GUIDE AND ANCHOR INSTALLATION

- A. Install alignment guides to guide expansion and to avoid end-loading and torsional stress.
- B. Install one guide on each side of pipe expansion fittings and loops. Install guides nearest to expansion joint not more than four pipe diameters from expansion joint.
- C. Attach guides to pipe, and secure guides to building structure.
- D. Install anchors at locations to prevent stresses from exceeding those permitted by ASME B31.9 and to prevent transfer of loading and stresses to connected equipment.
- E. Anchor Attachments:
 - 1. Anchor Attachment to Steel Pipe: Attach by welding. Comply with ASME B31.9 and ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
 - 2. Anchor Attachment to Copper Tubing: Attach with pipe hangers. Use MSS SP-69, Type 24; U bolts bolted to anchor.
- F. Fabricate and install steel anchors by welding steel shapes, plates, and bars. Comply with ASME B31.9 and AWS D1.1/D1.1M.
 - 1. Anchor Attachment to Steel Structural Members: Attach by welding.
 - 2. Anchor Attachment to Concrete Structural Members: Attach by fasteners. Follow fastener manufacturer's written instructions.
- G. Use grout to form flat bearing surfaces for guides and anchors attached to concrete.

END OF SECTION 230516

SECTION 230517 – SLEEVES, SLEEVE SEALS AND ESCUTCHEONS FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Sleeves.
 - 2. Grout.
 - 3. Escutcheons
 - 4. Floor Plates

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 SLEEVES

- A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral water-stop unless otherwise indicated.
- B. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.
- C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.
- D. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

2.2 GROUT

- A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- B. Characteristics: Non-shrink; recommended for interior and exterior applications.
- C. Design Mix: 5000-psi, 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

2.3 ESCUTCHEONS

- A. One-Piece, Cast-Brass Type: With polished, chrome-plated and rough-brass finish and setscrew fastener.
- B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.
- C. Split-Casting Brass Type: With polished, chrome-plated and rough-brass finish and with concealed hinge and setscrew.

2.4 FLOOR PLATES

- A. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.
- B. Split-Casting Floor Plates: Cast brass with concealed hinge.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

- A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.
- B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.
 - 1. Sleeves are not required for core-drilled holes.
- C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.
 - 1. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.
 - 2. Cut sleeves to length for mounting flush with both surfaces.
 - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.
 - 3. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.
- D. Install sleeves for pipes passing through interior partitions.
 - 1. Cut sleeves to length for mounting flush with both surfaces.
 - 2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
 - 3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Division 07 Section "Joint Sealants."
- E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with fire-stop materials. Comply with requirements for fire-stopping specified in Division 07 Section "Penetration Fire-stopping."

3.2 SLEEVE SCHEDULE

- A. Use sleeves for the following piping-penetration applications:
 - 1. Interior Partitions:
 - a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves.

3.3 ESCUTCHEON INSTALLATION

- A. Install escutcheons with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.
 - 1. Escutcheons for New Piping:
 - a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
 - b. Chrome-Plated Piping: One-piece, cast-brass or split-casting brass type with polished, chrome-plated finish.
 - c. Insulated Piping: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge or split-plate, stamped-steel type with exposed-rivet hinge.
 - d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass or split-casting brass type with polished, chrome-plated
 - e. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass or split-casting brass type with polished, chrome-plated finish.
 - f. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass or split-casting brass type with polished, chrome-plated or rough-brass finish.
 - g. Bare Piping in Equipment Rooms: One-piece, cast-brass or split-casting brass type with polished, chrome-plated or rough-brass finish.
 - 2. Escutcheons for Existing Piping:
 - a. Chrome-Plated Piping: Split-casting brass type with polished, chrome-plated finish.
 - b. Insulated Piping: Split-plate, stamped-steel type with concealed or exposed-rivet hinge.
 - c. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-casting brass type with polished, chrome-plated finish.
 - d. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-casting brass type with polished, chrome-plated finish.
 - e. Bare Piping in Unfinished Service Spaces: Split-casting brass type with polished, chrome-plated or rough-brass finish.
 - f. Bare Piping in Equipment Rooms: Split-casting brass type with polished, chrome-plated or rough-brass finish.
- B. Install floor plates for piping penetrations of equipment-room floors.
- C. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.
 - 1. New Piping: One-piece, floor-plate type.
 - 2. Existing Piping: Split-casting, floor-plate type.

3.4 FIELD QUALITY CONTROL

- A. Replace broken and damaged escutcheons and floor plates using new materials.

CHARTWELLS
735 ANDERSON HILL RD, PURCHASE, NY

SUNY PURCHASE HUB - CAFE RENOVATION
PHASE ZERO DESIGN PROJECT #1518416

END OF SECTION 230517

SECTION 230519 - METERS AND GAGES FOR HVAC PIPING

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Bimetallic-actuated thermometers.
 - 2. Thermo-wells.
 - 3. Dial-type pressure gages.
 - 4. Gage attachments.
 - 5. Test plugs.
 - 6. Test-plug kits.
 - 7. Sight flow indicators.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of meter and gage, from manufacturer.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For meters and gages to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 BIMETALLIC-ACTUATED THERMOMETERS

- A. Acceptable manufacturers:
 - 1. Ashcroft Inc.
 - 2. Terice, H.O. Company
 - 3. Weiss Instruments
- B. Standard: ASME B40.200.
- C. Case: Liquid-filled and sealed type; stainless steel with 3-inch nominal diameter.
- D. Dial: Non-reflective aluminum with permanently etched scale markings and scales in degrees F.
- E. Connector Type: Union joint, adjustable angle, with unified-inch screw threads.
- F. Connector Size: 1/2 inch, with ASME B1.1 screw threads.

- G. Stem: 0.25 or 0.375 inch in diameter; stainless steel.
- H. Window: Plastic.
- I. Ring: Stainless steel.
- J. Element: Bimetal coil.
- K. Pointer: Dark-colored metal.
- L. Accuracy: Plus or minus 1 percent of scale range.

2.2 DUCT-THERMOMETER MOUNTING BRACKETS

- A. Description: Flanged bracket with screw holes, for attachment to air duct and made to hold thermometer stem.

2.3 THERMOWELLS

- A. Standard: ASME B40.200.
- B. Description: Pressure-tight, socket-type fitting made for insertion into piping tee fitting.
- C. Material for Use with Copper Tubing: CNR or CUNI.
- D. Material for Use with Steel Piping: CRES or CSA.
- E. Type: Stepped shank unless straight or tapered shank is indicated.
- F. External Threads: NPS 1/2, NPS 3/4, or NPS 1, ASME B1.20.1 pipe threads.
- G. Internal Threads: 1/2, 3/4, and 1 inch, with ASME B1.1 screw threads.
- H. Bore: Diameter required to match thermometer bulb or stem.
- I. Insertion Length: Length required to match thermometer bulb or stem.
- J. Lagging Extension: Include on thermos-wells for insulated piping and tubing.
- K. Bushings: For converting size of thermos-well's internal screw thread to size of thermometer connection.
- L. Heat-Transfer Medium: Mixture of graphite and glycerin.

2.4 PRESSURE GAGES

- A. Acceptable manufacturers:
 - 1. Ashcroft Inc.
 - 2. Trerice, H.O. Company
 - 3. Weiss Instruments.
- B. Standard: ASME B40.100.
- C. Case: Liquid-filled type; cast aluminum or drawn steel; 4-1/2-inch nominal diameter.

- D. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
- E. Pressure Connection: Brass, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
- F. Movement: Mechanical, with link to pressure element and connection to pointer.
- G. Dial: Non-reflective aluminum with permanently etched scale markings graduated in psi.
- H. Pointer: Dark-colored metal.
- I. Window: Plastic.
- J. Ring: Metal.
- K. Accuracy: Grade B, plus or minus 2 percent of middle half of scale range.

2.5 GAGE ATTACHMENTS

- A. Snubbers: ASME B40.100, brass; with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and piston or porous-metal-type surge-dampening device. Include extension for use on insulated piping.
- B. Valves: Brass or stainless-steel needle, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads.

2.6 TEST PLUGS

- A. Acceptable manufacturers:
 - 1. Trerice, H.O. Company
 - 2. Weiss Instruments
- B. Description: Test-station fitting made for insertion into piping tee fitting.
- C. Body: Brass or stainless steel with core inserts and gasketed threaded cap. Include extended stem on units to be installed in insulated piping.
- D. Thread Size: NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe thread.
- E. Minimum Pressure and Temperature Rating: 500 psig at 200 degrees F.
- F. Core Inserts: Chlorosulfonated polyethylene synthetic and EPDM self-sealing rubber.

2.7 TEST-PLUG KITS

- A. Acceptable manufacturers:
 - 1. Trerice, H.O. Company
 - 2. Weiss Instruments
- B. Furnish one test-plug kit containing two thermometer(s), one pressure gage and adapter, and carrying case. Thermometer sensing elements, pressure gage, and adapter probes shall be of diameter to fit test plugs and of length to project into piping.
- C. Low-Range Thermometer: Small, bimetallic insertion type with 1- to 2-inch- diameter dial and tapered-end sensing element. Dial range shall be at least 25 to 125 degrees F.

- D. High-Range Thermometer: Small, bimetallic insertion type with 1- to 2-inch- diameter dial and tapered-end sensing element. Dial range shall be at least 0 to 220 degrees F.
- E. Pressure Gage: Small, Bourdon-tube insertion type with 2- to 3-inch- diameter dial and probe. Dial range shall be at least 0 to 200 psig.
- F. Carrying Case: Metal or plastic, with formed instrument padding.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install thermos-wells with socket extending to center of pipe and in vertical position in piping tees.
- B. Install thermos-wells of sizes required to match thermometer connectors. Include bushings if required to match sizes.
- C. Install thermos-wells with extension on insulated piping.
- D. Fill thermos-wells with heat-transfer medium.
- E. Install direct-mounted thermometers in thermos-wells and adjust vertical and tilted positions.
- F. Install duct-thermometer mounting brackets in walls of ducts. Attach to duct with screws.
- G. Install direct-mounted pressure gages in piping tees with pressure gage located on pipe at the most readable position.
- H. Install valve and snubber in piping for each pressure gage for fluids (except steam).
- I. Install test plugs in piping tees.
- J. Install thermometers in the following locations:
 - 1. Inlet and outlet of each hydronic zone.
 - 2. Outside-, return-, supply-, and mixed-air ducts.
- K. Install pressure gages in the following locations:
 - 1. Inlet and outlet of each chiller chilled-water and condenser-water connection.
 - 2. Suction and discharge of each pump.

3.2 CONNECTIONS

- A. Install thermometers and gages adjacent to machines and equipment to allow service and maintenance of meters, gages, machines, and equipment.

3.3 ADJUSTING

- A. After installation, calibrate thermometers according to manufacturer's written instructions.
- B. Adjust faces of thermometers and gages to proper angle for best visibility.

3.4 THERMOMETER SCALE-RANGE SCHEDULE

- A. Scale Range for Chilled-Water Piping: Minus 40 to plus 160 degrees F
- B. Scale Range for Heating, Hot-Water Piping: 0 to 250 degrees F.

3.5 PRESSURE-GAGE SCALE-RANGE SCHEDULE

- A. Scale Range for Chilled-Water Piping: 0 to 100 psi.
- B. Scale Range for Heating, Hot-Water Piping: 0 to 100 psi

END OF SECTION 230519

SECTION 230523 - GENERAL DUTY VALVES FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Globe valves
 - 2. Ball valves
 - 3. Butterfly valves
 - 4. Check valves

1.3 DEFINITIONS

- A. CWP: Cold working pressure.
- B. EPDM: Ethylene propylene copolymer rubber.
- C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.
- D. PTFE: Poly-tetra-flouro-ethylene (Teflon)

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of valve.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
 - 1. Protect internal parts against rust and corrosion.
 - 2. Protect threads, flange faces, grooves, and weld ends.
 - 3. Set globe valves closed to prevent rattling.
 - 4. Set ball valves open to minimize exposure of functional surfaces.
 - 5. Set butterfly valves closed or slightly open.
 - 6. Block check valves in either the closed or open position.
- B. Use the following precautions during storage:
 - 1. Maintain valve end protection.
 - 2. Store valves indoors and maintain at higher-than-ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.
- C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use operating handles, hand-wheels or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

- A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.
- B. ASME Compliance:
 - 1. ASME B1.20.1 for threads for threaded-end valves.
 - 2. ASME B16.1 for flanges on iron valves.
 - 3. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
 - 4. ASME B16.18 for solder joint.
 - 5. ASME B31.9 for building services piping valves.
- C. Refer to HVAC valve schedule articles for applications of valves.
- D. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- E. Valve Sizes: Same as upstream piping unless otherwise indicated.
- F. Valves in Insulated Piping:
 - 1. With 2-inch stem extensions.
 - 2. Extended necks for butterfly valves.
 - 3. Extended operating handle of non-thermal conductive material, and protective sleeves that allow operation of valves without breaking the vapor seals or disturbing insulation.
 - 4. Memory stops that are fully adjustable after insulation is applied.

2.2 BRONZE GLOBE VALVES

- A. Acceptable manufacturers for bronze globe valves:
 - 1. Hammond
 - 2. Milwaukee
 - 3. Nibco.
 - 4. Stockham
- B. Class 125 Bronze Globe Valves:
 - 1. Description:
 - a. Standard: MSS SP-80, Type 1.
 - b. CWP Rating: 200 psig.
 - c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
 - d. Ends: Threaded or solder joint.
 - e. Stem and Disc: Bronze or PTFE.
 - f. Packing: Asbestos free.
 - g. Hand-wheel: Malleable iron, bronze, or aluminum.

2.3 IRON GLOBE VALVES

- A. Acceptable manufacturers for iron globe valves:
 - 1. Hammond
 - 2. Milwaukee
 - 3. Nibco.
 - 4. Stockham

- B. Class 125 Iron Globe Valves:
 - 1. Description:
 - a. Standard: MSS SP-85, Type I.
 - b. CWP Rating: 200 psig.
 - c. Body Material: ASTM A 126, gray iron with bolted bonnet.
 - d. Ends: Flanged.
 - e. Trim: Bronze.
 - f. Packing and Gasket: Asbestos free.
 - g. Operator: Hand-wheel or chain-wheel.

2.4 BRONZE BALL VALVES

- A. Acceptable manufacturers for bronze ball valves:
 - 1. Hammond
 - 2. Milwaukee
 - 3. Nibco
 - 4. Stockham.
- B. Two-Piece Bronze Ball Valves with Full Port and Bronze Trim:
 - 1. Description:
 - a. Standard: MSS SP-110.
 - b. CWP Rating: 600 psig.
 - c. Body Design: Two piece.
 - d. Body Material: Bronze.
 - e. Ends: Threaded.
 - f. Seats: PTFE.
 - g. Stem: Bronze.
 - h. Ball: Chrome-plated brass.
 - i. Port: Full.

2.5 IRON, SINGLE-FLANGE BUTTERFLY VALVES

- A. Acceptable manufacturers for iron single flange butterfly valves:
 - 1. Hammond
 - 2. Milwaukee
 - 3. Nibco
 - 4. Stockham
- B. Iron, Single-Flange Butterfly Valves with Aluminum-Bronze Disc:
 - 1. Description:
 - a. Standard: MSS SP-67, Type I.
 - b. CWP Rating: 150 psig.
 - c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
 - d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
 - e. Seat: EPDM or NBR.
 - f. Stem: One- or two-piece stainless steel.
 - g. Disc: Aluminum bronze.

2.6 DUCTILE-IRON, GROOVED-END BUTTERFLY VALVES

- A. Acceptable Manufacturers for ductile iron grooved-end butterfly valves:
 - 1. Grinnell
 - 2. Kennedy
 - 3. Victaulic

- B. 175 CWP, Iron, Grooved-End Butterfly Valves:
 - 1. Description:
 - a. Standard: MSS SP-67, Type I.
 - b. CWP Rating: 175 psig.
 - c. Body Material: Coated, ductile iron.
 - d. Stem: Two-piece stainless steel.
 - e. Disc: Coated, ductile iron.
 - f. Seal: EPDM.

2.7 BRONZE SWING CHECK VALVES

- A. Acceptable manufacturers for bronze swing check valves:
 - 1. Hammond
 - 2. Milwaukee
 - 3. Nibco
 - 4. Stockham
- B. Class 125, Bronze Swing Check Valves with Nonmetallic Disc:
 - 1. Description:
 - a. Standard: MSS SP-80, Type 4.
 - b. CWP Rating: 200 psig.
 - c. Body Design: Horizontal flow.
 - d. Body Material: ASTM B 62, bronze.
 - e. Ends: Threaded.
 - f. Disc: PTFE.

2.8 IRON SWING CHECK VALVES

- A. Acceptable manufacturers for iron swing check valves:
 - 1. Hammond
 - 2. Milwaukee
 - 3. Nibco
 - 4. Stockham
- B. Class 125, Iron Swing Check Valves with Nonmetallic-to-Metal Seats:
 - 1. Description:
 - a. Standard: MSS SP-71, Type I.
 - b. NPS 2-1/2 to NPS 12, CWP Rating: 200 psig.
 - c. Body Material: ASTM A 126, gray iron with bolted bonnet.
 - d. Ends: Flanged.
 - e. Trim: Composition.
 - f. Seat Ring: Bronze.
 - g. Disc Holder: Bronze.
 - h. Disc: PTFE.
 - i. Gasket: Asbestos free.

2.9 IRON, GROOVED-END SWING CHECK VALVES

- A. Acceptable Manufacturers for ductile iron grooved-end swing check valves:
 - 1. Grinnell
 - 2. Kennedy
 - 3. Victaulic
- B. 300 CWP, Iron, Grooved-End Swing Check Valves:
 - 1. Description:

- a. CWP Rating: 300 psig.
- b. Body Material: ASTM A 536, ductile iron.
- c. Seal: EPDM.
- d. Disc: Spring operated, ductile iron or stainless steel.

2.10 IRON, CENTER-GUIDED CHECK VALVES

- A. Acceptable manufacturers for iron center-guided check valves:
 1. Hammond
 2. Milwaukee
 3. Nibco
 4. Stockham
- B. Class 125, Iron, Compact-Wafer, Center-Guided Check Valves with Resilient Seat:
 1. Description:
 - a. Standard: MSS SP-125.
 - b. NPS 2-1/2 to NPS 12, CWP Rating: 200 psig.
 - c. Body Material: ASTM A 126, gray iron.
 - d. Style: Compact wafer.
 - e. Seat: EPDM or NBR.

2.11 CHAINWHEELS

- A. Description: Valve actuation assembly with sprocket rim, chain guides, chain, and attachment brackets for mounting chain-wheels directly to hand-wheels.
 1. Sprocket Rim with Chain Guides: Ductile or cast iron, of type and size required for valve. Include zinc or epoxy coating.
 2. Chain: Hot-dip-galvanized steel, of size required to fit sprocket rim.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- B. Operate valves in positions from fully open to fully close. Examine guides and seats made accessible by such operations.
- C. Examine threads on valve and mating pipe for form and cleanliness.
- D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.
- E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

- A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves in horizontal piping with stem at or above center of pipe.
- D. Install valves in position to allow full stem movement.
- E. Install check valves for proper direction of flow and as follows:
 - 1. Swing Check Valves: In horizontal position with hinge pin level.
 - 2. Center-Guided Check Valves: In horizontal or vertical position, between flanges.
- F. Install chain-wheels on operators for valves NPS 4 and larger and more than 84 inches above floor. Extend chains to 60 inches above finished floor.
- G. Install valve tags. Comply with requirements in Section 230553 "Identification for HVAC Piping and Equipment" for valve tags and schedules.

3.3 ADJUSTING

- A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. If valve applications are not indicated, use the following:
 - 1. Throttling Service: Globe valves.
 - 2. Shut-off service: Ball or butterfly
- B. If valves with specified CWP ratings are unavailable, the same types of valves with higher CWP ratings may be substituted.
- C. Select valves with the following end connections:
 - 1. For Copper Tubing, NPS 2 and Smaller: Threaded ends or solder-joint valve-end as indicated in valve schedules.
 - 2. For Steel Piping, NPS 2-1/2 to NPS 4: Flanged ends or threaded valve-end as indicated in valve schedules.
 - 3. For Steel Piping, NPS 5 and Larger: Flanged ends.
 - 4. For grooved end piping, all sizes, grooved end valves are acceptable.

3.5 CHILLED-WATER VALVE SCHEDULE

- A. Pipe NPS 2-1/2 and Larger:
 - 1. Iron globe valves, Class 125 with flanged ends.
 - 2. Iron, Single-Flange Butterfly Valves, NPS 2-1/2 to NPS 12: 200 CWP, EPDM or NBR seat, aluminum-bronze disc.
 - 3. Iron, Grooved-End Butterfly Valves, NPS 2-1/2 to NPS 12: 175 CWP.
 - 4. Iron Swing Check Valves: Class 125, nonmetallic-to-metal seats.
 - 5. Iron, Grooved-End Check Valves, NPS 3 to NPS 12: 300 CWP.
 - 6. Iron, Center-Guided Check Valves: Class 125, compact-wafer, resilient seat.

3.6 HEATING-WATER VALVE SCHEDULE

- A. Pipe NPS 2 and Smaller:
 - 1. Bronze globe valves, Class 125, bronze or nonmetallic disc, with soldered or threaded ends.

2. Ball valves, two piece, full port, bronze with bronze trim, with solder-joint or threaded ends.
3. Bronze Swing Check Valves: Class 125, nonmetallic disc, with soldered-joint or threaded ends.

B. Pipe NPS 2-1/2 and Larger:

1. Iron globe valves, Class 125 with flanged ends.
2. Iron, Single-Flange Butterfly Valves, NPS 2-1/2 to NPS 12: 200 CWP, EPDM or NBR seat, aluminum-bronze disc.
3. Iron, Grooved-End Butterfly Valves, NPS 2-1/2 to NPS 12: 175 CWP.
4. Iron Swing Check Valves: Class 125, nonmetallic-to-metal seats.
5. Iron, Grooved-End Check Valves, NPS 3 to NPS 12: 300 CWP.
6. Iron, Center-Guided Check Valves: Class 125, compact-wafer, resilient seat.

END OF SECTION 230523

SECTION 230529 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Thermal-hanger shield inserts.
4. Fastener systems.
5. Equipment supports.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
2. Section 230516 "Expansion Fittings and Loops for HVAC Piping" for pipe guides and anchors.
3. Section 230548 "Vibration and Seismic Controls for HVAC" or Section 230548.13 "Vibration Controls for HVAC" for vibration isolation devices.
4. Section 233113 "Metal Ducts" for duct hangers and supports.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
2. Product Certificates: For materials manufactured within 100 miles of Project, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each raw material.

C. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following; include Product Data for components:

1. Trapeze pipe hangers.
2. Equipment supports.

D. Delegated-Design Submittal: For trapeze hangers indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Detail fabrication and assembly of trapeze hangers.
2. Include design calculations for designing trapeze hangers.

1.3 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

1.4 QUALITY ASSURANCE

- A. Structural-Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code, Section IX.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design trapeze pipe hangers and equipment supports.
- B. Structural Performance: Hangers and supports for HVAC piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.
 - 1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
 - 2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
 - 3. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.

2.2 METAL PIPE HANGERS AND SUPPORTS

- A. Carbon-Steel Pipe Hangers and Supports:
 - 1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
 - 2. Galvanized Metallic Coatings: Pregalvanized, hot-dip galvanized, or electro-galvanized.
 - 3. Nonmetallic Coatings: Plastic coated, or epoxy powder-coated.
 - 4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
 - 5. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.
- B. Copper Pipe and Tube Hangers:
 - 1. Description: MSS SP-58, Types 1 through 58, copper-plated steel, factory-fabricated components.
 - 2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-plated steel.

2.3 TRAPEZE PIPE HANGERS

- A. Description: MSS SP-58, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.4 THERMAL-HANGER SHIELD INSERTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Pipe Shields Inc.
 - 2. Rilco Manufacturing Co., Inc.
 - 3. Value Engineered Products, Inc.
- B. Insulation-Insert Material for Hot Piping: Water-repellent-treated, ASTM C 533, Type I calcium silicate with 100-psi minimum compressive strength.
- C. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
- D. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.
- E. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.5 FASTENER SYSTEMS

- A. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. B-line, an Eaton business.
 - b. Hilti, Inc.
 - c. MKT Fastening, LLC.

2.6 EQUIPMENT SUPPORTS

- A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.7 MATERIALS

- A. Aluminum: ASTM B 221.
- B. Carbon Steel: ASTM A 1011/A 1011M.
- C. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.
- D. Stainless Steel: ASTM A 240/A 240M.

- E. Grout: ASTM C 1107/C 1107M, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
 - 1. Properties: Nonstaining, noncorrosive, and nongaseous.
 - 2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.
- B. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

3.2 HANGER AND SUPPORT INSTALLATION

- A. Metal Pipe-Hanger Installation: Comply with MSS SP-58. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.
- B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-58. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.
 - 1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
 - 2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.
- C. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- D. Fastener System Installation:
 - 1. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- E. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.
- F. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- G. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- H. Install lateral bracing with pipe hangers and supports to prevent swaying.
- I. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

- J. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- K. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.
- L. Insulated Piping:
 - 1. Attach clamps and spacers to piping.
 - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
 - b. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
 - 2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
 - 3. Shield Dimensions for Pipe: Not less than the following:
 - a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
 - 4. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.3 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
- B. Grouting: Place grout under supports for equipment and make bearing surface smooth.
- C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.4 METAL FABRICATIONS

- A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.
- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.5 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.6 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - 1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.
- B. Touchup: Comply with requirements for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780/A 780M.

3.7 HANGER AND SUPPORT SCHEDULE

- A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-58 for pipe-hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use carbon-steel pipe hangers and supports and metal trapeze pipe hangers and attachments for general service applications.
- F. Use copper-plated pipe hangers and copper attachments for copper piping and tubing.
- G. Use padded hangers for piping that is subject to scratching.
- H. Use thermal-hanger shield inserts for insulated piping and tubing.
- I. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
 - 2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F, pipes NPS 4 to NPS 24, requiring up to 4 inches of insulation.
 - 3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.

4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 if little or no insulation is required.
 5. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
 6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes NPS 3/4 to NPS 8.
 7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
 8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
 9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
 10. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8.
 11. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 3.
 12. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
 13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
 14. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction might occur.
 15. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is unnecessary.
 16. Pipe Roll and Plate Units (MSS Type 45): For support of pipes NPS 2 to NPS 24 if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is unnecessary.
 17. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes NPS 2 to NPS 30 if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.
- J. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
 2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.
- K. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
 2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
 3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
 4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
 5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.
- L. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
 2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.

3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
 4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
 5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
 6. C-Clamps (MSS Type 23): For structural shapes.
 7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
 8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
 9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
 10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
 11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
 12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:
 - a. Light (MSS Type 31): 750 lb.
 - b. Medium (MSS Type 32): 1500 lb.
 - c. Heavy (MSS Type 33): 3000 lb.
 13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
 14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
 15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.
- M. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
 2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
 3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.
- N. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
 2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
 3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
 4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
 5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from hanger.
 6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.
 7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from trapeze support.
 8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:

- a. Horizontal (MSS Type 54): Mounted horizontally.
 - b. Vertical (MSS Type 55): Mounted vertically.
 - c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.
- O. Comply with MSS SP-58 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.
- P. Use mechanical-expansion anchors instead of building attachments where required in concrete construction.

END OF SECTION 230529

SECTION 230548 - VIBRATION AND SEISMIC CONTROLS FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Elastomeric isolation pads.
2. Elastomeric isolation mounts.
3. Restrained elastomeric isolation mounts.
4. Open-spring isolators.
5. Housed-spring isolators.
6. Restrained-spring isolators.
7. Housed-restrained-spring isolators.
8. Pipe-riser resilient supports.
9. Resilient pipe guides.
10. Elastomeric hangers.
11. Spring hangers.
12. Snubbers.
13. Restraint channel bracings.
14. Restraint cables.
15. Seismic-restraint accessories.
16. Mechanical anchor bolts.
17. Adhesive anchor bolts.
18. Vibration isolation equipment bases.
19. Restrained isolation roof-curb rails.

B. Related Requirements:

1. Section 210548 "Vibration and Seismic Controls for Fire Suppression" for devices for fire-suppression equipment and systems.
2. Section 220548 "Vibration and Seismic Controls for Plumbing" for devices for plumbing equipment and systems.

1.3 DEFINITIONS

- A. IBC: International Building Code.
- B. ICC-ES: ICC-Evaluation Service.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.

2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of vibration isolation device and seismic-restraint component required.
 - a. Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear as evaluated by an agency acceptable to authorities having jurisdiction.
 - b. Annotate to indicate application of each product submitted and compliance with requirements.
 3. Interlocking Snubbers: Include ratings for horizontal, vertical, and combined loads.
- B. Shop Drawings:
1. Detail fabrication and assembly of equipment bases. Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.
 2. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.
- C. Delegated-Design Submittal: For each vibration isolation and seismic-restraint device.
1. Include design calculations and details for selecting vibration isolators, seismic restraints, and vibration isolation bases complying with performance requirements, design criteria, and analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 2. Design Calculations: Calculate static and dynamic loading due to equipment weight, operation, and seismic and wind forces required to select vibration isolators and seismic and wind restraints and for designing vibration isolation bases.
 - a. Coordinate design calculations with wind load calculations required for equipment mounted outdoors. Comply with requirements in other Sections for equipment mounted outdoors.
 3. Riser Supports: Include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on building structure, spring deflection changes, and seismic loads. Include certification that riser system was examined for excessive stress and that none exists.
 4. Seismic and Wind-Restraint Details:
 - a. Design Analysis: To support selection and arrangement of seismic and wind restraints. Include calculations of combined tensile and shear loads.
 - b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to the restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events. Indicate association with vibration isolation devices.
 - c. Coordinate seismic-restraint and vibration isolation details with wind-restraint details required for equipment mounted outdoors. Comply with requirements in other Sections for equipment mounted outdoors.
 - d. Preapproval and Evaluation Documentation: By an agency acceptable to authorities having jurisdiction, showing maximum ratings of restraint items and the basis for approval (tests or calculations).

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Show coordination of vibration isolation device installation and seismic bracing for HVAC piping and equipment with other systems and equipment in the vicinity, including other supports and restraints, if any.
- B. Qualification Data: For professional engineer and testing agency.

- C. Welding certificates.
- D. Air-Mounting System Performance Certification: Include natural frequency, load, and damping test data performed by an independent agency.
- E. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For air-spring mounts and restrained-air-spring mounts to include in operation and maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7 and that is acceptable to authorities having jurisdiction.
- B. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.
- C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- D. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval OPA number from OSHPD, preapproval by ICC-ES, or preapproval by another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are unavailable, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Wind-Restraint Loading:
 - 1. Basic Wind Speed: 130 mph
 - 2. Building Classification Category: III.
 - 3. Minimum 10 lb/sq. ft. multiplied by maximum area of HVAC component projected on vertical plane normal to wind direction, and 45 degrees either side of normal.
- B. Seismic-Restraint Loading:
 - 1. Site Class as Defined in the IBC: Site Class C
 - 2. Assigned Seismic Use Group or Building Category as Defined in the IBC: III
 - a. Component Importance Factor: 1.0.
 - b. Component Response Modification Factor: 2.5.
 - c. Component Amplification Factor:
 - 1) For stacks (including discharge from laboratory exhaust fans), pressure vessels (i.e. expansion tanks), and HVAC equipment that is externally vibration isolated = 2.5
 - 2) For all other HVAC equipment = 1.0.
 - 3. Design Spectral Response Acceleration at Short Periods (0.2 Second): $S_s = 0.267$

4. Design Spectral Response Acceleration at 1.0-Second Period: $S_1 = 0.071$
 5. Rated strengths, features, and applications shall be as defined in reports by an agency acceptable to authorities having jurisdiction.
 - a. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they are subjected.
- C. All vibration isolation supports will be designed and selected in accordance with Table 47 "Selection Guide for Vibration Isolation" in the ASHRAE Handbook-HVAC Applications. Isolators shall also meet the requirements of Paragraph 2.2 through 2.21.

2.2 MANUFACTURERS

- A. All vibration isolation components shall be manufactured by one of the following manufacturers:
1. Ace Mountings Co., Inc.
 2. Amber/Booth Company, Inc.
 3. Isolation Technology, Inc.
 4. Kinetics Noise Control.
 5. Mason Industries.
 6. Vibration Eliminator Co., Inc.
 7. Vibration Isolation.
 8. Vibration Mountings & Controls, Inc.

2.3 ELASTOMERIC ISOLATION PADS

- A. Elastomeric Isolation Pad.
1. Fabrication: Single or multiple layers of sufficient durometer stiffness for uniform loading over pad area.
 2. Size: Factory or field cut to match requirements of supported equipment.
 3. Pad Material: Oil and water resistant with elastomeric properties.
 4. Surface Pattern: Smooth, Ribbed or Waffle pattern.
 5. Infused nonwoven cotton or synthetic fibers.
 6. Load-bearing metal plates adhered to pads.
 7. Sandwich-Core Material: Resilient and elastomeric.
 - a. Surface Pattern: Smooth, Ribbed or Waffle pattern.
 - b. Infused nonwoven cotton or synthetic fibers.

2.4 ELASTOMERIC ISOLATION MOUNTS

- A. Double-Deflection, Elastomeric Isolation Mounts:
1. Mounting Plates:
 - a. Top Plate: Encapsulated steel load transfer top plates, factory drilled and threaded with threaded studs or bolts.
 - b. Baseplate: Encapsulated steel bottom plates with holes provided for anchoring to support structure.
 2. Elastomeric Material: Molded, oil-resistant rubber, neoprene, or other elastomeric material.

2.5 RESTRAINED ELASTOMERIC ISOLATION MOUNTS

- A. Restrained Elastomeric Isolation Mounts:
1. Description: All-directional isolator with seismic restraints containing two separate and opposing elastomeric elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.
 - a. Housing: Cast-ductile iron or welded steel.

- b. Elastomeric Material: Molded, oil-resistant rubber, neoprene, or other elastomeric material.

2.6 OPEN-SPRING ISOLATORS

- A. Freestanding, Laterally Stable, Open-Spring Isolators:
 - 1. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
 - 2. Minimum Additional Travel: 50 percent of the required deflection at rated load.
 - 3. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
 - 4. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
 - 5. Baseplates: Factory-drilled steel plate for bolting to structure with an elastomeric isolator pad attached to the underside. Baseplates shall limit floor load to 500 psig.
 - 6. Top Plate and Adjustment Bolt: Threaded top plate with adjustment bolt and cap screw to fasten and level equipment.

2.7 HOUSED-SPRING ISOLATORS

- A. Freestanding, Laterally Stable, Open-Spring Isolators in Two-Part Telescoping Housing:
 - 1. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
 - 2. Minimum Additional Travel: 50 percent of the required deflection at rated load.
 - 3. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
 - 4. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
 - 5. Two-Part Telescoping Housing: A steel top and bottom frame separated by an elastomeric material and enclosing the spring isolators.
 - a. Drilled base housing for bolting to structure with an elastomeric isolator pad attached to the underside. Bases shall limit floor load to 500 psig.
 - b. Top housing with attachment and leveling bolt, threaded mounting holes and internal leveling device or elastomeric pad.

2.8 RESTRAINED-SPRING ISOLATORS

- A. Freestanding, Laterally Stable, Open-Spring Isolators with Vertical-Limit Stop Restraint:
 - 1. Housing: Steel housing with vertical-limit stops to prevent spring extension due to weight being removed.
 - a. Base with holes for bolting to structure with an elastomeric isolator pad attached to the underside. Bases shall limit floor load to 500 psig.
 - b. Top plate with threaded mounting holes or elastomeric pad.
 - c. Internal leveling bolt that acts as blocking during installation.
 - 2. Restraint: Limit stop as required for equipment and authorities having jurisdiction.
 - 3. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
 - 4. Minimum Additional Travel: 50 percent of the required deflection at rated load.
 - 5. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
 - 6. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

2.9 HOUSED-RESTRAINED-SPRING ISOLATORS

- A. Freestanding, Steel, Open-Spring Isolators with Vertical-Limit Stop Restraint in Two-Part Telescoping Housing:

1. Two-Part Telescoping Housing: A steel top and bottom frame separated by an elastomeric material and enclosing the spring isolators. Housings are equipped with adjustable or non-adjustable snubbers to limit vertical movement.
 - a. Drilled base housing for bolting to structure with an elastomeric isolator pad attached to the underside. Bases shall limit floor load to 500 psig.
 - b. Threaded top housing with adjustment bolt and cap screw to fasten and level equipment.
2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

2.10 PIPE-RISER RESILIENT SUPPORT

- A. Description: All-directional, acoustical pipe anchor consisting of two steel tubes separated by a minimum 1/2-inch-thick neoprene.
 1. Vertical-Limit Stops: Steel and neoprene vertical-limit stops arranged to prevent vertical travel in both directions.
 2. Maximum Load Per Support: 500 psig on isolation material providing equal isolation in all directions.

2.11 RESILIENT PIPE GUIDES

- A. Description: Telescopic arrangement of two steel tubes or post and sleeve arrangement separated by a minimum 1/2-inch-thick neoprene.
 1. Factory-Set Height Guide with Shear Pin: Shear pin shall be removable and reinsertable to allow for selection of pipe movement. Guides shall be capable of motion to meet location requirements.

2.12 ELASTOMERIC HANGERS

- A. Elastomeric Mount in a Steel Frame with Upper and Lower Steel Hanger Rods:
 1. Frame: Steel, fabricated with a connection for an upper threaded hanger rod and an opening on the underside to allow for a maximum of 30 degrees of angular lower hanger-rod misalignment without binding or reducing isolation efficiency.
 2. Dampening Element: Molded, oil-resistant rubber, neoprene, or other elastomeric material with a projecting bushing for the underside opening preventing steel to steel contact.

2.13 SPRING HANGERS

- A. Combination Coil-Spring and Elastomeric-Insert Hanger with Spring and Insert in Compression:
 1. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
 2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
 3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
 4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
 5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
 6. Elastomeric Element: Molded, oil-resistant rubber or neoprene. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.
 7. Adjustable Vertical Stop: Steel washer with neoprene washer "up-stop" on lower threaded rod.
 8. Self-centering hanger-rod cap to ensure concentricity between hanger rod and support spring coil.

2.14 SNUBBERS

- A. Description: Factory fabricated using welded structural-steel shapes and plates, anchor bolts, and replaceable resilient isolation washers and bushings.
 - 1. Anchor bolts for attaching to concrete shall be seismic-rated, drill-in, and stud-wedge or female-wedge type.
 - 2. Resilient Isolation Washers and Bushings: Oil- and water-resistant neoprene.
 - 3. Maximum 1/4-inch air gap, and minimum 1/4-inch- thick resilient cushion.

2.15 RESTRAINT CHANNEL BRACINGS

- A. Description: MFMA-4, shop- or field-fabricated bracing assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; rated in tension, compression, and torsion forces.

2.16 RESTRAINT CABLES

- A. Restraint Cables: ASTM A 492 stainless-steel cables. End connections made of steel assemblies with thimbles, brackets, swivel, and bolts designed for restraining cable service; with a minimum of two clamping bolts for cable engagement.

2.17 SEISMIC-RESTRAINT ACCESSORIES

- A. Hanger-Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections or reinforcing steel angle clamped to hanger rod.
- B. Hinged and Swivel Brace Attachments: Multifunctional steel connectors for attaching hangers to rigid channel bracings and restraint cables.
- C. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchor bolts and studs.
- D. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings, and matched to type and size of attachment devices used.
- E. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

2.18 MECHANICAL ANCHOR BOLTS

- A. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

2.19 ADHESIVE ANCHOR BOLTS

- A. Adhesive Anchor Bolts: Drilled-in and capsule anchor system containing PVC or urethane methacrylate-based resin and accelerator, or injected polymer or hybrid mortar adhesive. Provide anchor bolts and hardware with zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

2.20 VIBRATION ISOLATION EQUIPMENT BASES

- A. Steel Rails: Factory-fabricated, welded, structural-steel rails.
 - 1. Design Requirements: Lowest possible mounting height with not less than 1-inch clearance above the floor. Include equipment anchor bolts and auxiliary motor slide rails.
 - a. Include supports for suction and discharge elbows for pumps.
 - 2. Structural Steel: Steel shapes, plates, and bars complying with ASTM A 36/A 36M. Rails shall have shape to accommodate supported equipment.
 - 3. Support Brackets: Factory-welded steel brackets on frame for outrigger isolation mountings and to provide for anchor bolts and equipment support.
- B. Steel Bases: Factory-fabricated, welded, structural-steel bases and rails.
 - 1. Design Requirements: Lowest possible mounting height with not less than 1-inch clearance above the floor. Include equipment anchor bolts and auxiliary motor slide bases or rails.
 - a. Include supports for suction and discharge elbows for pumps.
 - 2. Structural Steel: Steel shapes, plates, and bars complying with ASTM A 36/A 36M. Bases shall have shape to accommodate supported equipment.
 - 3. Support Brackets: Factory-welded steel brackets on frame for outrigger isolation mountings and to provide for anchor bolts and equipment support.
- C. Concrete Inertia Base: Field-fabricated, welded, structural-steel bases and rails ready for placement of cast-in-place concrete.
 - 1. Design Requirements: Lowest possible mounting height with not less than 1-inch clearance above the floor. Include equipment anchor bolts and auxiliary motor slide bases or rails.
 - a. Include supports for suction and discharge elbows for pumps.
 - 2. Structural Steel: Steel shapes, plates, and bars complying with ASTM A 36/A 36M. Bases shall have shape to accommodate supported equipment.
 - 3. Support Brackets: Factory-welded steel brackets on frame for outrigger isolation mountings and to provide for anchor bolts and equipment support.
 - 4. Fabrication: Fabricate steel templates to hold equipment anchor-bolt sleeves and anchors in place during placement of concrete. Obtain anchor-bolt templates from supported equipment manufacturer.

2.21 RESTRAINED ISOLATION ROOF-CURB RAILS

- A. Description: Factory-assembled, fully enclosed, insulated, air- and watertight curb rail designed to resiliently support equipment and to withstand seismic and wind forces.
- B. Upper Frame: The upper frame shall provide continuous support for equipment and shall be captive to resiliently resist seismic and wind forces.
- C. Lower Support Assembly: The lower support assembly shall be formed sheet metal section containing adjustable and removable steel springs that support the upper frame. The lower support assembly shall have a means for attaching to building structure and a wood nailer for attaching roof materials, and shall be insulated with a minimum of 2 inches of rigid, glass-fiber insulation on inside of assembly. Adjustable, restrained-spring isolators shall be mounted on elastomeric vibration isolation pads and shall have access ports, for level adjustment, with removable waterproof covers at all isolator locations. Isolators shall be located so they are accessible for adjustment at any time during the life of the installation without interfering with the integrity of the roof.
- D. Snubber Bushings: All-directional, elastomeric snubber bushings at least 1/4 inch thick.

- E. Water Seal: Galvanized sheet metal with EPDM seals at corners, attached to upper support frame, extending down past wood nailer of lower support assembly, and counter-flashed over roof materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and equipment to receive vibration isolation and seismic and wind-control devices for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

- A. Multiple Pipe Supports: Secure pipes to trapeze member with clamps approved for application by an agency acceptable to authorities having jurisdiction.
- B. Hanger-Rod Stiffeners: Install hanger-rod stiffeners where required to prevent buckling of hanger rods due to seismic forces.
- C. Strength of Support and Seismic-Restraint Assemblies: Select sizes of components so strength is adequate to carry present and future static and seismic loads within specified loading limits.

3.3 VIBRATION CONTROL AND SEISMIC-RESTRAINT DEVICE INSTALLATION

- A. Coordinate the location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in Section 033000 "Cast-in-Place Concrete."
- B. Installation of vibration isolators must not cause any change of position of equipment, piping, or ductwork resulting in stresses or misalignment.
- C. Comply with requirements in Section 077200 "Roof Accessories" for installation of roof curbs, equipment supports, and roof penetrations.
- D. Equipment Restraints:
 - 1. Install seismic snubbers on HVAC equipment mounted on vibration isolators. Locate snubbers as close as possible to vibration isolators and bolt to equipment base and supporting structure.
 - 2. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.
 - 3. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction that provides required submittals for component.
- E. Piping Restraints:
 - 1. Comply with requirements in MSS SP-127.
 - 2. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c.
 - 3. Brace a change of direction longer than 12 feet.

- F. Install cables so they do not bend across edges of adjacent equipment or building structure.
- G. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction that provides required submittals for component.
- H. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.
- I. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.
- J. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.
- K. Drilled-in Anchors:
 - 1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid pre-stressed tendons, electrical and telecommunications conduit, and gas lines.
 - 2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
 - 3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
 - 4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
 - 5. Set anchors to manufacturer's recommended torque, using a torque wrench.
 - 6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.4 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

- A. Install flexible connections in piping where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where the connections terminate with connection to equipment that is anchored to a different structural element from the one supporting the connections as they approach equipment. Comply with requirements in Section 232113 "Hydronic Piping" for piping flexible connections.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Perform tests and inspections.
- C. Tests and Inspections:
 - 1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
 - 2. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless post-connection testing has been approved), and with at least seven days' advance notice.
 - 3. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
 - 4. Test at least four of each type and size of installed anchors and fasteners selected by Architect.

5. Test to 90 percent of rated proof load of device.
6. Measure isolator restraint clearance.
7. Measure isolator deflection.
8. Verify snubber minimum clearances.
9. Test and adjust restrained-air-spring isolator controls and safeties.

D. Remove and replace malfunctioning units and retest as specified above.

E. Prepare test and inspection reports.

3.6 ADJUSTING

A. Adjust isolators after piping system is at operating weight.

B. Adjust limit stops on restrained-spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.

3.7 VIBRATION ISOLATION EQUIPMENT BASES INSTALLATION

A. Coordinate the location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in Section 033000 "Cast-in-Place Concrete."

END OF SECTION 230548

SECTION 230553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Equipment labels.
 - 2. Warning signs and labels.
 - 3. Pipe labels.
 - 4. Duct labels.
 - 5. Valve tags.
 - 6. Warning tags.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For color, letter style, and graphic representation required for each identification material and device.
- C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.
- D. Valve numbering scheme.
- E. Valve Schedules: For each piping system to include in maintenance manuals.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Acceptable manufacturers for all labels and tags:
 - 1. Seton
 - 2. Brady
 - 3. Kolbi Pipe Markers
 - 4. Craftmart

2.2 EQUIPMENT LABELS

- A. Metal Labels for Equipment:
 - 1. Material and Thickness: Brass, 0.032-inch, stainless steel, 0.025-inch, aluminum, 0.032-inch or anodized aluminum, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
 - 2. Letter Color: White.

3. Background Color: Black.
 4. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
 5. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
 6. Fasteners: Stainless-steel rivets or self-tapping screws.
 7. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- B. Plastic Labels for Equipment:
1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
 2. Letter Color: White.
 3. Background Color: Black.
 4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
 5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
 6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
 7. Fasteners: Stainless-steel rivets or self-tapping screws.
 8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- C. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), and the Specification Section number and title where equipment is specified.
- D. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number, and identify Drawing numbers where equipment is indicated (plans, details, and schedules) and the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.3 WARNING SIGNS AND LABELS

- A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
- B. Letter Color: Black
- C. Background Color: Yellow.
- D. Maximum Temperature: Able to withstand temperatures up to 160 degrees F.
- E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
- F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
- G. Fasteners: Stainless-steel rivets or self-tapping screws.
- H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

- I. Label Content: Include caution and warning information plus emergency notification instructions.

2.4 PIPE LABELS

- A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction according to ASME A13.1.
- B. Pre-tensioned Pipe Labels: Pre-coiled, semi-rigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.
- C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.
- D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings; also include pipe size and an arrow indicating flow direction.
 - 1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
 - 2. Lettering Size: Size letters according to ASME A13.1 for piping.

2.5 DUCT LABELS

- A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
- B. Letter Color: White.
- C. Background Color: Black.
- D. Maximum Temperature: Able to withstand temperatures up to 160 degrees F.
- E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
- F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 in, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
- G. Fasteners: Stainless-steel rivets or self-tapping screws.
- H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- I. Duct Label Contents: Include identification of duct service using same designations or abbreviations as used on Drawings; also include duct size and an arrow indicating flow direction.
 - 1. Flow-Direction Arrows: Integral with duct system service lettering to accommodate both directions or as separate unit on each duct label to indicate flow direction.

2.6 VALVE TAGS

- A. Description: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.
 - 1. Tag Material: Brass, 0.032-inch, stainless steel, 0.025-inch, aluminum, 0.032-inch or anodized aluminum, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.

2. Fasteners: Brass wire-link chain, beaded chain or S-hook.

- B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve-tag schedule shall be included in operation and maintenance data.

2.7 WARNING TAGS

- A. Description: Preprinted or partially preprinted accident-prevention tags of plasticized card stock with matte finish suitable for writing.
 1. Size: Approximately 4 by 7 inches.
 2. Fasteners: Reinforced grommet and wire or string.
 3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
 4. Color: Safety-yellow background with black lettering.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 GENERAL INSTALLATION REQUIREMENTS

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- B. Coordinate installation of identifying devices with locations of access panels and doors.
- C. Install identifying devices before installing acoustical ceilings and similar concealment.

3.3 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.

3.4 PIPE LABEL INSTALLATION

- A. Piping Color Coding: Painting of piping is specified in Section 099123 "Interior Painting."
- B. Pipe Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
 1. Near each valve and control device.

2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
 3. Near penetrations and on both sides of through walls, floors, ceilings, and inaccessible enclosures.
 4. At access doors, manholes, and similar access points that permit view of concealed piping.
 5. Near major equipment items and other points of origination and termination.
 6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
 7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.
- C. Directional Flow Arrows: Arrows shall be used to indicate direction of flow in pipes, including pipes where flow is allowed in both directions.
- D. Pipe Label Color Schedule:
1. Heating Water Piping: White letters on a safety-green background.

3.5 DUCT LABEL INSTALLATION

- A. Install plastic-laminated or self-adhesive duct labels with permanent adhesive on air ducts in the following color codes:
1. Blue: For cold-air supply ducts.
 2. Yellow: For hot-air supply ducts.
 3. Green: For exhaust-, outside-, relief-, return-, and mixed-air ducts.
- B. Locate labels near points where ducts enter into and exit from concealed spaces and at maximum intervals of 50 feet in each space where ducts are exposed or concealed by removable ceiling system.

3.6 VALVE-TAG INSTALLATION

- A. Install tags on valves and control devices in piping systems, except check valves, valves within factory-fabricated equipment units, shutoff valves, faucets, convenience and lawn-watering hose connections, and HVAC terminal devices and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.
- B. Valve-Tag Application Schedule:
1. Valve-Tag Size and Shape: 2" round for all valves.
 2. Valve-Tag Colors:
 - a. Potable and Other Water: White letters on a safety-green background.

3.7 WARNING-TAG INSTALLATION

- A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION 230553

SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Balancing Air Systems:
 - a. Constant-volume air systems.
 - 2. Balancing Hydronic Piping Systems:
 - a. Constant-flow hydronic systems.
 - 3. Testing, Adjusting, and Balancing Equipment:
 - a. Motors.
 - b. Heat-transfer coils.
 - 4. Testing, adjusting, and balancing existing systems and equipment.
 - 5. Sound tests.
 - 6. Vibration tests.
 - 7. Control system verification.

1.3 DEFINITIONS

- A. AABC: Associated Air Balance Council.
- B. BAS: Building automation systems.
- C. NEBB: National Environmental Balancing Bureau.
- D. TAB: Testing, adjusting, and balancing.
- E. TABB: Testing, Adjusting, and Balancing Bureau.
- F. TAB Specialist: An independent entity meeting qualifications to perform TAB work.
- G. TDH: Total dynamic head.

1.4 PREINSTALLATION MEETINGS

- A. TAB Conference: If requested by the Owner, conduct a TAB conference at project site after approval of the TAB strategies and procedures plan to develop a mutual understanding of the details. Provide a minimum of 14 days advance notice of scheduled meeting time and location.
 - 1. Minimum Agenda Items:
 - a. The Contract Documents examination report.
 - b. The TAB plan.
 - c. Needs for coordination and cooperation of trades and subcontractors.
 - d. Proposed procedures for documentation and communication flow.

1.5 ACTION SUBMITTALS

A. LEED Submittals:

1. Air-Balance Report for Prerequisite IEQ 1: Documentation indicating that work complies with ASHRAE 62.1, Section 7.2.2 - "Air Balancing."
2. TAB Report for Prerequisite EA 2: Documentation indicating that work complies with ASHRAE/IESNA 90.1, Section 6.7.2.3 - "System Balancing."

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: Within 30 days of Contractor's Notice to Proceed, submit documentation that the TAB specialist and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.
- B. Contract Documents Examination Report: Within 30 days of Contractor's Notice to Proceed, submit the Contract Documents review report as specified in Part 3.
- C. Strategies and Procedures Plan: Within 30 days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.
- D. System Readiness Checklists: Within 60 days of Contractor's Notice to Proceed, submit system readiness checklists as specified in "Preparation" Article.
- E. Examination Report: Submit a summary report of the examination review required in "Examination" Article.
- F. Certified TAB reports.
- G. Sample report forms.
- H. Instrument calibration reports, to include the following:
 1. Instrument type and make.
 2. Serial number.
 3. Application.
 4. Dates of use.
 5. Dates of calibration.

1.7 QUALITY ASSURANCE

- A. TAB Specialists Qualifications: Certified by AABC, NEBB or TABB.
 1. TAB Field Supervisor: Employee of the TAB specialist and certified by AABC, NEBB or TABB.
 2. TAB Technician: Employee of the TAB specialist and certified by AABC, NEBB or TABB as a TAB technician.
- B. Instrumentation Type, Quantity, Accuracy, and Calibration: Comply with requirements in ASHRAE 111, Section 4, "Instrumentation."
- C. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."
- D. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.7.2.3 - "System Balancing."

1.8 FIELD CONDITIONS

- A. Full Owner Occupancy: Owner will occupy the site and existing building during entire TAB period. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.
- B. Partial Owner Occupancy: Owner may occupy completed areas of building before Substantial Completion. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems designs that may preclude proper TAB of systems and equipment.
- B. Examine installed systems for balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are applicable for intended purpose and are accessible.
- C. Examine the approved submittals for HVAC systems and equipment.
- D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems output, and statements of philosophies and assumptions about HVAC system and equipment controls.
- E. Examine ceiling plenums and underfloor air plenums used for supply, return, or relief air to verify that they are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.
- F. Examine equipment performance data including fan and pump curves.
 - 1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
 - 2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.
- G. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.
- H. Examine test reports specified in individual system and equipment Sections.
- I. Examine HVAC equipment and verify that bearings are greased, belts are aligned and tight, filters are clean, and equipment with functioning controls is ready for operation.

- J. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible and their controls are connected and functioning.
- K. Examine strainers. Verify that startup screens have been replaced by permanent screens with indicated perforations.
- L. Examine control valves for proper installation for their intended function of throttling, diverting, or mixing fluid flows.
- M. Examine heat-transfer coils for correct piping connections and for clean and straight fins.
- N. Examine system pumps to ensure absence of entrained air in the suction piping.
- O. Examine operating safety interlocks and controls on HVAC equipment.
- P. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

- A. Prepare a TAB plan that includes the following:
 - 1. Equipment and systems to be tested.
 - 2. Strategies and step-by-step procedures for balancing the systems.
 - 3. Instrumentation to be used.
 - 4. Sample forms with specific identification for all equipment.
- B. Perform system-readiness checks of HVAC systems and equipment to verify system readiness for TAB work. Include, at a minimum, the following:
 - 1. Airside:
 - a. Verify that leakage and pressure tests on air distribution systems have been satisfactorily completed.
 - b. Duct systems are complete with terminals installed.
 - c. Volume, smoke, and fire dampers are open and functional.
 - d. Clean filters are installed.
 - e. Fans are operating, free of vibration, and rotating in correct direction.
 - f. Variable-frequency controllers' startup is complete and safeties are verified.
 - g. Automatic temperature-control systems are operational.
 - h. Ceilings are installed.
 - i. Windows and doors are installed.
 - j. Suitable access to balancing devices and equipment is provided.
 - 2. Hydronics:
 - a. Verify leakage and pressure tests on water distribution systems have been satisfactorily completed.
 - b. Piping is complete with terminals installed.
 - c. Water treatment is complete.
 - d. Systems are flushed, filled, and air purged.
 - e. Strainers are pulled and cleaned.
 - f. Control valves are functioning per the sequence of operation.
 - g. Shutoff and balance valves have been verified to be 100 percent open.
 - h. Pumps are started and proper rotation is verified.
 - i. Pump gage connections are installed directly at pump inlet and outlet flanges or in discharge and suction pipe prior to valves or strainers.
 - j. Variable-frequency controllers' startup is complete and safeties are verified.
 - k. Suitable access to balancing devices and equipment is provided.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

- A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance", ASHRAE 111, NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" or SMACNA's "HVAC Systems - Testing, Adjusting, and Balancing" and in this Section.
- B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures
 - 1. After testing and balancing, install test ports and duct access doors that comply with requirements in Section 233300 "Air Duct Accessories."
 - 2. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Section 230713 "Duct Insulation," Section 230716 "HVAC Equipment Insulation," and Section 230719 "HVAC Piping Insulation."
- C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.
- D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

- A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Cross-check the summation of required outlet volumes with required fan volumes.
- B. Prepare schematic diagrams of systems' "as-built" duct layouts.
- C. For variable-air-volume systems, develop a plan to simulate diversity.
- D. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.
- E. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.
- F. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- G. Verify that motor starters are equipped with properly sized thermal protection.
- H. Check dampers for proper position to achieve desired airflow path.
- I. Check for airflow blockages.
- J. Check condensate drains for proper connections and functioning.
- K. Check for proper sealing of air-handling-unit components.
- L. Verify that air duct system is sealed as specified in Section 233113 "Metal Ducts."

3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

- A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.

1. Measure total airflow.
 - a. Set outside-air, return-air, and relief-air dampers for proper position that simulates minimum outdoor-air conditions.
 - b. Where duct conditions allow, measure airflow by Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses to obtain total airflow.
 - c. Where duct conditions are not suitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.
 2. Measure fan static pressures as follows:
 - a. Measure static pressure directly at the fan outlet or through the flexible connection.
 - b. Measure static pressure directly at the fan inlet or through the flexible connection.
 - c. Measure static pressure across each component that makes up the air-handling system.
 - d. Report artificial loading of filters at the time static pressures are measured
 3. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
 4. Obtain approval from the project engineer or from the commissioning authority for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in HVAC Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
 5. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload occurs. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.
- B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows.
1. Measure airflow of submain and branch ducts.
 2. Adjust submain and branch duct volume dampers for specified airflow.
 3. Re-measure each submain and branch duct after all have been adjusted.
- C. Adjust air inlets and outlets for each space to indicated airflows.
1. Set airflow patterns of adjustable outlets for proper distribution without drafts.
 2. Measure inlets and outlets airflow.
 3. Adjust each inlet and outlet for specified airflow.
 4. Re-measure each inlet and outlet after they have been adjusted.
- D. Verify final system conditions.
1. Re-measure and confirm that minimum outdoor, return, and relief airflows are within design. Readjust to design if necessary.
 2. Re-measure and confirm that total airflow is within design.
 3. Re-measure all final fan operating data, rpms, volts, amps, and static profile.
 4. Mark all final settings.
 5. Test system in economizer mode. Verify proper operation and adjust if necessary.
 6. Measure and record all operating data.
 7. Record final fan-performance data.
- 3.6 GENERAL PROCEDURES FOR HYDRONIC SYSTEMS
- A. Prepare test reports for pumps, coils, and heat exchangers. Obtain approved submittals and manufacturer-recommended testing procedures. Crosscheck the summation of required coil and heat exchanger flow rates with pump design flow rate.
- B. Prepare schematic diagrams of systems' "as-built" piping layouts.

- C. In addition to requirements in "Preparation" Article, prepare hydronic systems for testing and balancing as follows:
1. Check liquid level in expansion tank.
 2. Check highest vent for adequate pressure.
 3. Check flow-control valves for proper position.
 4. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
 5. Verify that motor starters are equipped with properly sized thermal protection.
 6. Check that air has been purged from the system.

3.7 PROCEDURES FOR CONSTANT-FLOW HYDRONIC SYSTEMS

- A. Adjust pumps to deliver total design gpm.
1. Measure total water flow.
 - a. Position valves for full flow through coils.
 - b. Measure flow by main flow meter, if installed.
 - c. If main flow meter is not installed, determine flow by pump TDH or exchanger pressure drop.
 2. Measure pump TDH as follows:
 - a. Measure discharge pressure directly at the pump outlet flange or in discharge pipe prior to any valves.
 - b. Measure inlet pressure directly at the pump inlet flange or in suction pipe prior to any valves or strainers.
 - c. Convert pressure to head and correct for differences in gage heights.
 - d. Verify pump impeller size by measuring the TDH with the discharge valve closed. Note the point on manufacturer's pump curve at zero flow, and verify that the pump has the intended impeller size.
 - e. With valves open, read pump TDH. Adjust pump discharge valve until design water flow is achieved.
 3. Monitor motor performance during procedures and do not operate motor in an overloaded condition.
- B. Adjust flow-measuring devices installed in mains and branches to design water flows.
1. Measure flow in main and branch pipes.
 2. Adjust main and branch balance valves for design flow.
 3. Re-measure each main and branch after all have been adjusted.
- C. Adjust flow-measuring devices installed at terminals for each space to design water flows.
1. Measure flow at terminals.
 2. Adjust each terminal to design flow.
 3. Re-measure each terminal after it is adjusted.
 4. Position three-way control valves to bypass the coil, and adjust the bypass valve to maintain design flow.
 5. Perform temperature tests after flows have been balanced.
- D. For systems with pressure-independent flow control valves at terminals:
1. Measure differential pressure and verify that it is within manufacturer's specified range.
 2. Perform temperature tests after flows have been verified.
- E. For systems without pressure-independent valves or flow-measuring devices at terminals:
1. Measure and balance coils by either coil pressure drop or temperature method.
 2. If balanced by coil pressure drop, perform temperature tests after flows have been verified.
- F. Verify final system conditions as follows:
1. Re-measure and confirm that total water flow is within design.

2. Re-measure final pumps' operating data, TDH, volts, amps, and static profile.
 3. Mark final settings.
- G. Verify that memory stops have been set.

3.8 PROCEDURES FOR MOTORS

- A. Motors 1/2 HP and Larger: Test at final balanced conditions and record the following data:
1. Manufacturer's name, model number, and serial number.
 2. Motor horsepower rating.
 3. Motor rpm.
 4. Phase and hertz.
 5. Nameplate and measured voltage, each phase.
 6. Nameplate and measured amperage, each phase.
 7. Starter size and thermal-protection-element rating.
 8. Service factor and frame size.
- B. Motors Driven by Variable-Frequency Controllers: Test manual bypass of controller to prove proper operation.

3.9 PROCEDURES FOR HEAT-TRANSFER COILS

- A. Measure, adjust, and record the following data for each water coil:
1. Entering- and leaving-water temperature.
 2. Water flow rate.
 3. Water pressure drop for equipment coils.
 4. Dry-bulb temperature of entering and leaving air.
 5. Wet-bulb temperature of entering and leaving air for cooling coils.
 6. Airflow.

3.10 SOUND TESTS

- A. After the systems are balanced and construction is Substantially Complete, measure and record sound levels at 5 locations as designated by the Architect.
- B. Instrumentation:
1. The sound-testing meter shall be a portable, general-purpose testing meter consisting of a microphone, processing unit, and readout.
 2. The sound-testing meter shall be capable of showing fluctuations at minimum and maximum levels, and measuring the equivalent continuous sound pressure level (LEQ).
 3. The sound-testing meter must be capable of using 1/3 octave band filters to measure mid-frequencies from 31.5 Hz to 8000 Hz.
 4. The accuracy of the sound-testing meter shall be plus or minus one decibel.
- C. Test Procedures:
1. Perform test at quietest background noise period. Note cause of unpreventable sound that affects test outcome.

2. Equipment should be operating at design values.
3. Calibrate the sound-testing meter prior to taking measurements.
4. Use a microphone suitable for the type of noise levels measured that is compatible with meter. Provide a windshield for outside or in-duct measurements.
5. Record a set of background measurements in dBA and sound pressure levels in the eight un-weighted octave bands 63 Hz to 8000 Hz (NC) with the equipment off.
6. Take sound readings in dBA and sound pressure levels in the eight un-weighted octave bands 63 Hz to 8000 Hz (NC) with the equipment operating.
7. Take readings no closer than 36 inches from a wall or from the operating equipment and approximately 60 inches from the floor, with the meter held or mounted on a tripod.
8. For outdoor measurements, move sound-testing meter slowly and scan area that has the most exposure to noise source being tested. Use A-weighted scale for this type of reading.

D. Reporting:

1. Report shall record the following:
 - a. Location.
 - b. System tested.
 - c. dBA reading.
 - d. Sound pressure level in each octave band with equipment on and off.
2. Plot sound pressure levels on NC worksheet with equipment on and off.

3.11 VIBRATION TESTS

- A. After systems are balanced and construction is Substantially Complete, measure and record vibration levels on equipment having motor horsepower equal to or greater than 10.
- B. Instrumentation:
1. Use portable, battery-operated, and microprocessor-controlled vibration meter with or without a built-in printer.
 2. The meter shall automatically identify engineering units, filter bandwidth, amplitude, and frequency scale values.
 3. The meter shall be able to measure machine vibration displacement in mils of deflection, velocity in inches per second, and acceleration in inches per second squared.
 4. Verify calibration date is current for vibration meter before taking readings.
- C. Test Procedures:
1. To ensure accurate readings, verify that accelerometer has a clean, flat surface and is mounted properly.
 2. With the unit running, set up vibration meter in a safe, secure location. Connect transducer to meter with proper cables. Hold magnetic tip of transducer on top of the bearing, and measure unit in mils of deflection. Record measurement, then move transducer to the side of the bearing and record in mils of deflection. Record an axial reading in mils of deflection by holding nonmagnetic, pointed transducer tip on end of shaft.
 3. Change vibration meter to velocity (inches per second) measurements. Repeat and record above measurements.
 4. Record CPM or rpm.
 5. Read each bearing on motor, fan, and pump as required. Track and record vibration levels from rotating component through casing to base.
- D. Reporting:
1. Report shall record location and the system tested.
 2. Include horizontal-vertical-axial measurements for tests.

3. Verify that vibration limits follow Specifications, or, if not specified, follow the General Machinery Vibration Severity Chart or Vibration Acceleration General Severity Chart from the AABC National Standards. Acceptable levels of vibration are normally "smooth" to "good."
4. Include in report General Machinery Vibration Severity Chart, with conditions plotted.

3.12 CONTROLS VERIFICATION

- A. In conjunction with system balancing, perform the following:
 1. Verify temperature control system is operating within the design limitations.
 2. Confirm that the sequences of operation are in compliance with Contract Documents.
 3. Verify that controllers are calibrated and function as intended.
 4. Verify that controller set points are as indicated.
 5. Verify the operation of lockout or interlock systems.
 6. Verify the operation of valve and damper actuators.
 7. Verify that controlled devices are properly installed and connected to correct controller.
 8. Verify that controlled devices travel freely and are in position indicated by controller: open, closed, or modulating.
 9. Verify location and installation of sensors to ensure that they sense only intended temperature, humidity, or pressure.
- B. Reporting: Include a summary of verifications performed, remaining deficiencies, and variations from indicated conditions.

3.13 PROCEDURES FOR TESTING, ADJUSTING, AND BALANCING EXISTING SYSTEMS

- A. Perform a preconstruction inspection of existing equipment that is to remain and be reused.
 1. Measure and record the operating speed, airflow, and static pressure of each fan.
 2. Measure motor voltage and amperage. Compare the values to motor nameplate information.
 3. Check the condition of filters.
 4. Check the condition of coils.
 5. Check the operation of the drain pan and condensate-drain trap.
 6. Check bearings and other lubricated parts for proper lubrication.
 7. Report on the operating condition of the equipment and the results of the measurements taken. Report deficiencies.
- B. Before performing testing and balancing of existing systems, inspect existing equipment that is to remain and be reused to verify that existing equipment has been cleaned and refurbished. Verify the following:
 1. New filters are installed.
 2. Coils are clean and fins combed.
 3. Drain pans are clean.
 4. Fans are clean.
 5. Bearings and other parts are properly lubricated.
 6. Deficiencies noted in the preconstruction report are corrected.
- C. Perform testing and balancing of existing systems to the extent that existing systems are affected by the renovation work.
 1. Compare the indicated airflow of the renovated work to the measured fan airflows, and determine the new fan speed and the face velocity of filters and coils.
 2. Verify that the indicated airflows of the renovated work result in filter and coil face velocities and fan speeds that are within the acceptable limits defined by equipment manufacturer.
 3. If calculations increase or decrease the airflow rates and water flow rates by more than 5 percent, make equipment adjustments to achieve the calculated rates. If increase or decrease is 5 percent or less, equipment adjustments are not required.

4. Balance each air outlet.

3.14 TOLERANCES

- A. Set HVAC system's airflow rates and water flow rates within the following tolerances:
 1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10 percent.
 2. Air Outlets and Inlets: Plus or minus 10 percent.
 3. Heating-Water Flow Rate: Plus or minus 10 percent.
 4. Cooling-Water Flow Rate: Plus or minus 10 percent.
- B. Maintaining pressure relationships as designed shall have priority over the tolerances specified above.

3.15 PROGRESS REPORTING

- A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems balancing devices. Recommend changes and additions to systems balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.
- B. Status Reports: Prepare monthly progress reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.16 FINAL REPORT

- A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.
 1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
 2. Include a list of instruments used for procedures, along with proof of calibration.
 3. Certify validity and accuracy of field data.
- B. Final Report Contents: In addition to certified field-report data, include the following:
 1. Pump curves.
 2. Fan curves.
 3. Manufacturers' test data.
 4. Field test reports prepared by system and equipment installers.
 5. Other information relative to equipment performance; do not include Shop Drawings and Product Data.
- C. General Report Data: In addition to form titles and entries, include the following data:
 1. Title page.
 2. Name and address of the TAB specialist.
 3. Project name.
 4. Project location.
 5. Architect's name and address.
 6. Engineer's name and address.
 7. Contractor's name and address.
 8. Report date.
 9. Signature of TAB supervisor who certifies the report.
 10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
 11. Summary of contents including the following:

- a. Indicated versus final performance.
 - b. Notable characteristics of systems.
 - c. Description of system operation sequence if it varies from the Contract Documents.
 12. Nomenclature sheets for each item of equipment.
 13. Data for terminal units, including manufacturer's name, type, size, and fittings.
 14. Notes to explain why certain final data in the body of reports vary from indicated values.
 15. Test conditions for fans and pump performance forms including the following:
 - a. Settings for outdoor-, return-, and exhaust-air dampers.
 - b. Conditions of filters.
 - c. Cooling coil, wet- and dry-bulb conditions.
 - d. Face and bypass damper settings at coils.
 - e. Fan drive settings including settings and percentage of maximum pitch diameter.
 - f. Settings for supply-air, static-pressure controller.
 - g. Other system operating conditions that affect performance.
- D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:
 1. Quantities of outdoor, supply, return, and exhaust airflows.
 2. Water flow rates.
 3. Duct, outlet, and inlet sizes.
 4. Pipe and valve sizes and locations.
 5. Terminal units.
 6. Balancing stations.
 7. Position of balancing devices.
- E. Air-Handling-Unit Test Reports: For air-handling units with coils, include the following:
 1. Unit Data:
 - a. Unit identification.
 - b. Location.
 - c. Make and type.
 - d. Model number and unit size.
 - e. Manufacturer's serial number.
 - f. Unit arrangement and class.
 - g. Discharge arrangement.
 - h. Sheave make, size in inches and bore.
 - i. Center-to-center dimensions of sheave and amount of adjustments in inches.
 - j. Number, make, and size of belts.
 - k. Number, type, and size of filters.
 2. Motor Data:
 - a. Motor make, and frame type and size.
 - b. Horsepower and rpm.
 - c. Volts, phase, and hertz.
 - d. Full-load amperage and service factor.
 - e. Sheave make, size in inches, and bore.
 - f. Center-to-center dimensions of sheave and amount of adjustments in inches.
 3. Test Data (Indicated and Actual Values):
 - a. Total airflow rate in cfm.
 - b. Total system static pressure in inches wg.
 - c. Fan rpm.
 - d. Discharge static pressure in inches wg.
 - e. Filter static-pressure differential in inches wg.
 - f. Preheat-coil static-pressure differential in inches wg.
 - g. Cooling-coil static-pressure differential in inches wg.
 - h. Heating-coil static-pressure differential in inches wg.
 - i. Outdoor airflow in cfm.

- j. Return airflow in cfm.
 - k. Outdoor-air damper position.
 - l. Return-air damper position.
- F. Fan Test Reports: For supply, return, and exhaust fans, include the following:
- 1. Fan Data:
 - a. System identification.
 - b. Location.
 - c. Make and type.
 - d. Model number and size.
 - e. Manufacturer's serial number.
 - f. Arrangement and class.
 - g. Sheave make, size in inches and bore.
 - h. Center-to-center dimensions of sheave and amount of adjustments in inches.
 - 2. Motor Data:
 - a. Motor make, and frame type and size.
 - b. Horsepower and rpm.
 - c. Volts, phase, and hertz.
 - d. Full-load amperage and service factor.
 - e. Sheave make, size in inches, and bore.
 - f. Center-to-center dimensions of sheave, and amount of adjustments in inches.
 - g. Number, make, and size of belts.
 - 3. Test Data (Indicated and Actual Values):
 - a. Total airflow rate in cfm.
 - b. Total system static pressure in inches wg.
 - c. Fan rpm.
 - d. Discharge static pressure in inches wg.
 - e. Suction static pressure in inches wg.
- G. Round, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:
- 1. Report Data:
 - a. System and air-handling-unit number.
 - b. Location and zone.
 - c. Traverse air temperature in deg F.
 - d. Duct static pressure in inches wg.
 - e. Duct size in inches.
 - f. Duct area in sq. ft.
 - g. Indicated airflow rate in cfm.
 - h. Indicated velocity in fpm.
 - i. Actual airflow rate in cfm.
 - j. Actual average velocity in fpm.
 - k. Barometric pressure in psig.
- H. Air-Terminal-Device Reports:
- 1. Unit Data:
 - a. System and air-handling unit identification.
 - b. Location and zone.
 - c. Apparatus used for test.
 - d. Area served.
 - e. Make.
 - f. Number from system diagram.
 - g. Type and model number.
 - h. Size.
 - i. Effective area in sq. ft.

2. Test Data (Indicated and Actual Values):
 - a. Airflow rate in cfm.
 - b. Air velocity in fpm.
 - c. Preliminary airflow rate as needed in cfm.
 - d. Preliminary velocity as needed in fpm.
 - e. Final airflow rate in cfm.
 - f. Final velocity in fpm.
 - g. Space temperature in deg F.
- I. System-Coil Reports: For reheat coils and water coils, include the following:
 1. Unit Data:
 - a. System and air-handling-unit identification.
 - b. Location and zone.
 - c. Room or riser served.
 - d. Coil make and size.
 - e. Flowmeter type.
 2. Test Data (Indicated and Actual Values):
 - a. Airflow rate in cfm.
 - b. Entering-water temperature in deg F.
 - c. Leaving-water temperature in deg F.
 - d. Water pressure drop in feet of head or psig.
 - e. Entering-air temperature in deg F.
 - f. Leaving-air temperature in deg F.
- J. Pump Test Reports: Calculate impeller size by plotting the shutoff head on pump curves and include the following:
 1. Unit Data:
 - a. Unit identification.
 - b. Location.
 - c. Service.
 - d. Make and size.
 - e. Model number and serial number.
 - f. Water flow rate in gpm.
 - g. Water pressure differential in feet of head or psig.
 - h. Required net positive suction head in feet of head or psig.
 - i. Pump rpm.
 - j. Impeller diameter in inches.
 - k. Motor make and frame size.
 - l. Motor horsepower and rpm.
 - m. Voltage at each connection.
 - n. Amperage for each phase.
 - o. Full-load amperage and service factor.
 - p. Seal type.
 2. Test Data (Indicated and Actual Values):
 - a. Static head in feet of head or psig.
 - b. Pump shutoff pressure in feet of head or psig.
 - c. Actual impeller size in inches.
 - d. Full-open flow rate in gpm.
 - e. Full-open pressure in feet of head or psig.
 - f. Final discharge pressure in feet of head or psig.
 - g. Final suction pressure in feet of head or psig.
 - h. Final total pressure in feet of head or psig.
 - i. Final water flow rate in gpm.
 - j. Voltage at each connection.
 - k. Amperage for each phase.

- K. Instrument Calibration Reports:
 - 1. Report Data:
 - a. Instrument type and make.
 - b. Serial number.
 - c. Application.
 - d. Dates of use.
 - e. Dates of calibration.

3.17 VERIFICATION OF TAB REPORT

- A. Engineer or Commissioning authority shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.
- B. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."
- C. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.
- D. If TAB work fails, proceed as follows:
 - 1. TAB specialists shall recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.
 - 2. If the second final inspection also fails, Owner may contract the services of another TAB specialist to complete TAB work according to the Contract Documents and deduct the cost of the services from the original TAB specialist's final payment.
 - 3. If the second verification also fails, design professional may contact AABC Headquarters regarding the AABC National Performance Guaranty.
- E. Prepare test and inspection reports.

3.18 ADDITIONAL TESTS

- A. Within 90 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.
- B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

END OF SECTION 230593

SECTION 230713 - DUCT INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes insulating the following duct services:
 - 1. Indoor, concealed and exposed supply and outdoor air.
 - 2. Indoor, concealed and exposed return located in unconditioned space.
 - 3. Indoor, concealed and exposed, Type I, commercial, kitchen hood exhaust.
- B. Related Sections:
 - 1. Section 230716 "HVAC Equipment Insulation."
 - 2. Section 230719 "HVAC Piping Insulation."
 - 3. Section 233113 "Metal Ducts" for duct liners.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance, thickness and jackets (both factory- and field-applied if any).
- B. Sustainable Design Submittals:
 - 1. Product Data: For adhesives, indicating VOC content.
 - 2. Sustainable Design Submittals.
 - 3. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
 - 4. Laboratory Test Reports: For coatings, indicating compliance with requirements for low-emitting materials.
 - 5. Product Data: For sealants, indicating VOC content.
 - 6. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.
- C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
 - 2. Detail insulation application at elbows, fittings, dampers, specialties and flanges for each type of insulation.
 - 3. Detail application of field-applied jackets.
 - 4. Detail application at linkages of control devices.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers,

attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

- C. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.
- B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
 - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
 - 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.
- C. Mockups: Before installing insulation, build mockups for each type of insulation and finish listed below to demonstrate quality of insulation application and finishes. Build mockups in the location indicated or, if not indicated, as directed by Architect. Use materials indicated for the completed Work.
 - 1. Ductwork Mockups:
 - a. One six (6) foot section each of rectangular and round straight duct.
 - b. One each of a 90-degree mitered round and rectangular elbow, and one each of a 90-degree radius round and rectangular elbow.
 - c. One rectangular branch takeoff and one round branch takeoff from a rectangular duct. One round tee fitting.
 - d. One rectangular and round transition fitting.
 - e. Four support hangers for round and rectangular ductwork.
 - f. Each type of damper and specialty.
 - 2. For each mockup, fabricate cutaway sections to allow observation of application details for insulation materials, adhesives, mastics, attachments, and jackets.
 - 3. Notify Architect seven days in advance of dates and times when mockups will be constructed.
 - 4. Obtain Architect's approval of mockups before starting insulation application.
 - 5. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 - 7. Demolish and remove mockups when directed.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.7 COORDINATION

- A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."
- B. Coordinate clearance requirements with duct Installer for duct insulation application. Before preparing ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Comply with requirements in "Indoor and Outdoor Above Ground Duct Insulation Schedule, General " articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- E. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
 - 1. Acceptable manufacturers for mineral fiber blanket insulation are:
 - a. Certain Teed Corporation
 - b. Johns Manville
 - c. Knauf Insulation
 - d. Owens Corning
- F. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For duct and plenum applications, provide insulation with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
 - 1. Acceptable manufacturers for mineral fiber board insulation are:
 - a. Certain Teed Corporation
 - b. Johns Manville
 - c. Knauf Insulation
 - d. Owens Corning

2.2 FIRE-RATED INSULATION SYSTEMS

- A. Fire-Rated Blanket: High-temperature, flexible, blanket insulation with FSK jacket that is tested and certified to provide a 2-hour fire rating by an NRTL acceptable to authorities having jurisdiction.
 - 1. Acceptable manufacturers of fire rated blanket insulation are:
 - a. 3M
 - b. Certain Teed Corporation
 - c. Johns Manville
 - d. Nelson Firestop

2.3 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.
- B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
 - 1. Acceptable manufacturers for mineral fiber adhesive are:
 - a. Childers Brand
 - b. Eagle Bridges

- c. Foster Brand
 2. Fiberglass adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 3. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- C. FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
1. Acceptable manufacturers FSK jacket adhesive adhesive are:
 - a. Childers Brand
 - b. Eagle Bridges
 - c. Foster Brand
 2. Adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 3. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.4 MASTICS

- A. The following are acceptable manufacturers for mastics:
1. Childers Brand
 2. Eagle Bridges
 3. Foster Brand
 4. Vimasco
- B. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II."
1. VOC Content: 300g/L or less.
 2. Low-Emitting Materials: Mastic coatings shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- C. Vapor-Barrier Mastic: Water based; suitable for indoor use on below ambient services.
1. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
 2. Service Temperature Range: Minus 20 to plus 180 deg F.
 3. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
 4. Color: White.
- D. Vapor-Barrier Mastic: Solvent based; suitable for outdoor use on below ambient services.
1. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 30-mil dry film thickness.
 2. Service Temperature Range: Minus 50 to plus 220 deg F.
 3. Solids Content: ASTM D 1644, 33 percent by volume and 46 percent by weight.
 4. Color: White.
- E. Breather Mastic: Water based; suitable for indoor and outdoor use on above ambient services.
1. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
 2. Service Temperature Range: Minus 20 to plus 180 deg F.
 3. Solids Content: 60 percent by volume and 66 percent by weight.
 4. Color: White.

2.5 LAGGING ADHESIVES

- A. Description: Comply with MIL-A-3316C, Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.
 - 1. Acceptable manufacturers for lagging adhesive are:
 - a. Childers Brand
 - b. Foster Brand
 - c. Vimasco
 - 2. Adhesives shall have a VOC content of 50 g/L or less.
 - 3. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 - 4. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over duct insulation.
 - 5. Service Temperature Range: 0 to plus 180 deg F.
 - 6. Color: White.

2.6 SEALANTS

- A. FSK and Metal Jacket Flashing Sealants:
 - 1. Acceptable manufacturers for flashing sealants are:
 - a. Childers Brand
 - b. Eagle Bridges
 - c. Foster Brand
 - 2. Materials shall be compatible with insulation materials, jackets, and substrates.
 - 3. Fire- and water-resistant, flexible, elastomeric sealant.
 - 4. Service Temperature Range: Minus 40 to plus 250 deg F
 - 5. Color: Aluminum.
 - 6. Sealant shall have a VOC content of 420 g/L or less.
 - 7. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.7 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
 - 1. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

2.8 FIELD-APPLIED JACKETS

- A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.
- B. Metal Jacket:
 - 1. Acceptable manufacturers for metal jackets are:
 - a. Childers Brand
 - b. ITW Insulation Systems
 - c. RPR Products, Inc.
 - 2. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105, or 5005, Temper H-14.
 - a. Sheet and roll stock ready for shop or field sizing.
 - b. Finish and thickness are indicated in field-applied jacket schedules.
 - c. Moisture Barrier for Outdoor Applications: 3-mil-thick, heat-bonded polyethylene and kraft paper.

3. Stainless-Steel Jacket: ASTM A 167 or ASTM A 240/A 240M.
 - a. Sheet and roll stock ready for shop or field sizing.
 - b. Material, finish, and thickness are indicated in field-applied jacket schedules.
 - c. Moisture Barrier for Outdoor Applications: 3-mil-thick, heat-bonded polyethylene and kraft paper.
- C. Self-Adhesive Outdoor Jacket: 60-mil thick, laminated vapor barrier and waterproofing membrane for installation over insulation located aboveground outdoors; consisting of a rubberized bituminous resin on a cross-laminated polyethylene film covered with white aluminum-foil facing.
 1. Acceptable manufacturer of self-adhesive outdoor jacket is Polyguard Alumaguard All Weather with Cool Wrap finish of approved equal.

2.9 TAPES

- A. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.
 1. Acceptable manufacturers for FSK tape are:
 - a. Compac Corporation
 - b. Ideal Tape Co
 - c. Venture Tape
 2. Width: 3 inches.
 3. Thickness: 6.5 mils.
 4. Adhesion: 90 ounces force/inch in width.
 5. Elongation: 2 percent.
 6. Tensile Strength: 40 lbf/inch in width.
 7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

2.10 SECUREMENTS

- A. Bands:
 1. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304 or Type 316; 0.015 inch thick, 3/4 inch wide with wing seal or closed seal.
 2. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 3/4 inch wide with wing seal or closed seal.
 3. Springs: Twin spring set constructed of stainless steel with ends flat and slotted to accept metal bands. Spring size determined by manufacturer for application.
- B. Insulation Pins and Hangers:
 1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.135-inch- diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.
- C. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.
- D. Wire: 0.080-inch nickel-copper alloy, 0.062-inch soft-annealed, stainless steel or 0.062-inch soft-annealed, galvanized steel.

2.11 CORNER ANGLES

- A. PVC Corner Angles: 30 mils thick, minimum 1 by 1 inch, PVC according to ASTM D 1784, Class 16354-C. White or color-coded to match adjacent surface.
- B. Aluminum Corner Angles: 0.040 inch thick, minimum 1 by 1 inch, aluminum according to ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005; Temper H-14.

- C. Stainless-Steel Corner Angles: 0.024 inch thick, minimum 1 by 1 inch, stainless steel according to ASTM A 167 or ASTM A 240/A 240M, Type 304 or Type 316.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
 - 1. Verify that systems to be insulated have been tested and are free of defects.
 - 2. Verify that surfaces to be insulated are clean and dry.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings.
- B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Keep insulation materials dry during application and finishing.
- G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- H. Install insulation with least number of joints practical.
- I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.
 - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
 - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
- J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

- K. Install insulation with factory-applied jackets as follows:
 - Draw jacket tight and smooth.
 - 1. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
 - 2. Overlap jacket longitudinal seams at least 1-1/2 inches. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches o.c.
 - a. For below ambient services, apply vapor-barrier mastic over staples.
 - 3. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
 - 4. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct flanges and fittings.
- L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.4 PENETRATIONS

- A. Insulation Installation at Roof and Aboveground Exterior Wall Penetrations: Install insulation continuously through roof penetrations.
 - 1. Seal penetrations with flashing sealant.
 - 2. For applications requiring only indoor insulation, terminate insulation above roof surface or inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 - 3. Extend jacket of outdoor insulation outside roof flashing or outside wall flashing at least 2 inches below top of roof flashing.
 - 4. Seal jacket to roof or wall flashing with flashing sealant.
- B. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- C. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.
 - 1. Comply with requirements in Section 078413 "Penetration Fire-stopping."
- D. Insulation Installation at Floor Penetrations:
 - 1. Duct: For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches.
 - 2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Fire-stopping."

3.5 INSTALLATION OF MINERAL-FIBER INSULATION

- A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins. Verify application coverage recommendations with insulation manufacturer.
 - 1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
 - 2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.

3. Install cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
 - a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
 - b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
 - c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
 - d. Do not over-compress insulation during installation.
 - e. Impale insulation over pins and attach speed washers.
 - f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
 4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
 - a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
 - b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.
 5. Overlap un-faced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
 6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
 7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch-wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.
- B. Board Insulation Installation on Ducts and Plenums:
1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
 2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
 3. Install cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
 - a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
 - b. On duct sides with dimensions larger than 18 inches, space pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
 - c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
 - d. Do not over-compress insulation during installation.
 - e. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
 4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
 - a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.

- b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.
- 5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
- 6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch-wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

3.6 FIELD-APPLIED JACKET INSTALLATION

- A. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.7 FIRE-RATED INSULATION SYSTEM INSTALLATION

- A. Where fire-rated insulation system is indicated, secure system to ducts and duct hangers and supports to maintain a continuous fire rating.
- B. Insulate duct access panels and doors to achieve same fire rating as duct.
- C. Install fire-stopping at penetrations through fire-rated assemblies. Fire-stop systems are specified in Section 078413 "Penetration Fire-stopping."

3.8 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Perform tests and inspections.
- C. Tests and Inspections:
 - 1. Inspect ductwork, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location(s) for each duct system defined in the "Duct Insulation Schedule, General" Article.
- D. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements

3.9 DUCT INSULATION SCHEDULE, GENERAL

- A. Plenums and Ducts Requiring Insulation:
 - 1. Indoor, concealed supply and indoor, concealed or exposed outdoor air.
 - 2. Indoor, concealed return located in unconditioned space.
 - 3. Indoor, concealed and exposed, Type I, commercial, kitchen hood exhaust.
- B. Items Not Insulated:
 - 1. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.

2. Exhaust ductwork, except as noted above.
3. Return air ductwork in conditioned spaces.
4. Factory-insulated flexible ducts.
5. Factory-insulated plenums and casings.
6. Flexible connectors.
7. Vibration-control devices.
8. Factory-insulated access panels and doors. Consider the exposure of installed insulation to damage. Concealed applications have less risk than exposed.

3.10 INDOOR DUCT INSULATION SCHEDULE

- A. Concealed, round and flat-oval and rectangular, supply-air duct insulation shall be the following:
 1. Mineral-Fiber Blanket: 1-1/2 inches thick and minimum R value of 3.5.
- B. Concealed, round and flat-oval and rectangular, return-air duct insulation shall be the following:
 1. Mineral-Fiber Blanket: 1-1/2 inches thick and minimum R value of 3.5.
- C. Concealed or exposed, round and flat-oval and rectangular, outdoor-air duct insulation shall be the following:
 1. Mineral-Fiber Board: 2 inches thick and minimum R value of 6.0
 2. Provide exterior exposed ductwork with aluminum jacket.
- D. Concealed or exposed, Type I, Commercial, Kitchen Hood Exhaust Duct and Plenum Insulation: Fire-rated blanket or board; thickness as required to achieve 2-hour fire rating.

END OF SECTION 230713

SECTION 230719 - HVAC PIPING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes insulating the following HVAC piping systems:
 - 1. Heating hot-water piping, indoors.
- B. Related Sections:
 - 1. Section 230713 "Duct Insulation."
 - 2. Section 230716 "HVAC Equipment Insulation."

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory and field applied if any).
- B. Sustainable Design Submittals:
 - 1. Product Data: For adhesives, indicating VOC content.
 - 2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
 - 3. Product Data: For coatings, indicating VOC content.
 - 4. Laboratory Test Reports: For coatings, indicating compliance with requirements for low-emitting materials.
 - 5. Product Data: For sealants, indicating VOC content.
 - 6. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.
- C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
 - 2. Detail attachment and covering of heat tracing inside insulation.
 - 3. Detail insulation application at pipe expansion joints for each type of insulation.
 - 4. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
 - 5. Detail removable insulation at piping specialties.
 - 6. Detail application of field-applied jackets.
 - 7. Detail application at linkages of control devices.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers,

attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

- C. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.
- B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
 - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
 - 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.
- C. Mockups: Before installing insulation, build mockups for each type of insulation and finish listed below to demonstrate quality of insulation application and finishes. Build mockups in the location indicated or, if not indicated, as directed by Architect. Use materials indicated for the completed Work.
 - 1. Piping Mockups:
 - a. One 10-foot section of NPS 2 straight pipe.
 - b. One each of a 90-degree threaded, welded, and flanged elbow.
 - c. One each of a threaded, welded, and flanged tee fitting.
 - d. One NPS 2 or smaller valve, and one NPS 2-1/2 or larger valve.
 - e. Four support hangers including hanger shield and insert.
 - f. One threaded strainer and one flanged strainer with removable portion of insulation.
 - g. One threaded reducer and one welded reducer.
 - h. One pressure temperature tap.
 - i. One mechanical coupling.
 - 2. For each mockup, fabricate cutaway sections to allow observation of application details for insulation materials, adhesives, mastics, attachments, and jackets.
 - 3. Notify Architect seven days in advance of dates and times when mockups will be constructed.
 - 4. Obtain Architect's approval of mockups before starting insulation application.
 - 5. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 - 7. Demolish and remove mockups when directed.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.7 COORDINATION

- A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

- B. Coordinate clearance requirements with piping installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.
- C. Coordinate installation and testing of heat tracing.

1.8 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," and "Outdoor, Aboveground Piping Insulation Schedule," articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- F. Calcium Silicate:
 - 1. Acceptable manufacturer for this product is Johns Manville Industrial Insulation Group, LLC or approved equal.
 - 2. Preformed Pipe Sections: Flat-, curved-, and grooved-block sections of noncombustible, inorganic, hydrous calcium silicate with a non-asbestos fibrous reinforcement. Comply with ASTM C 533, Type I.
 - 3. Prefabricated Fitting Covers: Comply with ASTM C 450 and ASTM C 585 for dimensions used in preforming insulation to cover valves, elbows, tees, and flanges.
- G. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.
 - 1. Acceptable manufacturers for this product are:
 - a. Aeroflex USA
 - b. Armacell LLC
 - c. K-Flex USA
- H. Mineral-Fiber, Preformed Pipe Insulation:
 - 1. Acceptable manufacturers of this product are:
 - a. Johns Manville
 - b. Knauf

- c. Owens Corning
2. Type I, 850 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.2 INSULATING CEMENTS

- A. Acceptable manufacturer of this product is Ramco or approved equal.
- B. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.
- C. Expanded or Exfoliated Vermiculite Insulating Cement: Comply with ASTM C 196.
- D. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449.

2.3 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.
- B. Calcium Silicate Adhesive: Fibrous, sodium-silicate-based adhesive with a service temperature range of 50 to 800 deg F.
 1. Acceptable manufacturers of this product are:
 - a. Childers Brand
 - b. Eagle Bridges
 - c. Foster Brand
 - d. Vimasco Corporation
 2. Adhesives shall have a VOC content of 50 g/L or less.
 3. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- C. Flexible Elastomeric Adhesive: Comply with MIL-A-24179A, Type II, Class I.
 1. Acceptable manufacturers for this product are:
 - a. Aeroflex USA
 - b. Armacell LLC
 - c. Foster Brand
 - d. K-Flex USA
 2. Adhesives shall have a VOC content of 50 g/L or less.
 3. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- D. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
 1. Acceptable manufacturers of this product are:
 - a. Childers Brand
 - b. Eagle Bridges
 - c. Foster Brand
 - d. Mon-Eco Industries
 2. Adhesives shall have a VOC content of 50 g/L or less.

3. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- E. ASJ Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
 1. Acceptable manufacturers of this product are:
 - a. Childers Brand
 - b. Eagle Bridges
 - c. Foster Brand
 - d. Mon-Eco Industries
 2. Adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 3. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.4 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.
 1. VOC Content: 300 g/L or less.
 2. Low-Emitting Materials: Mastic coatings shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- B. Acceptable manufacturers for mastics are:
 1. Childers Brand
 2. Eagle Bridges
 3. Foster Brand
 4. Knauf
 5. Mon-Eco Industries
 6. Vimasco Corporation
- C. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.
 1. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
 2. Service Temperature Range: Minus 20 to plus 180 deg F.
 3. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
 4. Color: White.
- D. Vapor-Barrier Mastic: Solvent based; suitable for outdoor use on below-ambient services.
 1. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 30-mil dry film thickness.
 2. Service Temperature Range: Minus 50 to plus 220 deg F.
 3. Solids Content: ASTM D 1644, 33 percent by volume and 46 percent by weight.
 4. Color: White.
- E. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.
 1. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
 2. Service Temperature Range: Minus 20 to plus 180 deg F.
 3. Solids Content: 60 percent by volume and 66 percent by weight.
 4. Color: White.

2.5 LAGGING ADHESIVES

- A. Description: Comply with MIL-A-3316C, Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.
 - 1. Acceptable manufacturers of this product are:
 - a. Childers Brand
 - b. Foster Brand
 - c. Vimasco Corporation
 - 2. Adhesives shall have a VOC content of 50 g/L or less.
 - 3. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 - 4. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over pipe insulation.
 - 5. Service Temperature Range: 0 to plus 180 deg F.
 - 6. Color: White.

2.6 SEALANTS

- A. Acceptable manufacturers for sealants are:
 - 1. Childers Brand
 - 2. Eagle Bridges
 - 3. Foster Brand
 - 4. Mon-Eco Industries
- B. FSK and Metal Jacket Flashing Sealants:
 - 1. Materials shall be compatible with insulation materials, jackets, and substrates.
 - 2. Fire- and water-resistant, flexible, elastomeric sealant.
 - 3. Service Temperature Range: Minus 40 to plus 250 deg F.
 - 4. Color: Aluminum.
 - 5. Sealant shall have a VOC content of 420 g/L or less.
 - 6. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- C. ASJ Flashing Sealants:
 - 1. Materials shall be compatible with insulation materials, jackets, and substrates.
 - 2. Fire- and water-resistant, flexible, elastomeric sealant.
 - 3. Service Temperature Range: Minus 40 to plus 250 deg F.
 - 4. Color: White.
 - 5. Sealant shall have a VOC content of 420 g/L or less.
 - 6. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.7 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
 - 1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.

2.8 FIELD-APPLIED JACKETS

- A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.
- B. Metal Jacket:
 - 1. Acceptable manufacturers for metal jackets are:
 - a. Childers Brand
 - b. ITW Insulation
 - c. RPR Products
 - 2. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105, or 5005, Temper H-14.
 - a. Factory cut and rolled to size.
 - b. Finish and thickness are indicated in field-applied jacket schedules.
 - c. Moisture Barrier for Outdoor Applications: 3-mil-thick, heat-bonded polyethylene and kraft paper
 - d. Factory-Fabricated Fitting Covers:
 - 1) Same material, finish, and thickness as jacket.
 - 2) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
 - 3) Tee covers.
 - 4) Flange and union covers.
 - 5) End caps.
 - 6) Beveled collars.
 - 7) Valve covers.
 - 8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.
 - 3. Stainless-Steel Jacket: ASTM A 167 or ASTM A 240/A 240M.
 - a. Factory cut and rolled to size.
 - b. Material, finish, and thickness are indicated in field-applied jacket schedules.
 - c. Moisture Barrier for Outdoor Applications: 3-mil-thick, heat-bonded polyethylene and kraft paper.
 - d. Factory-Fabricated Fitting Covers:
 - 1) Same material, finish, and thickness as jacket.
 - 2) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
 - 3) Tee covers.
 - 4) Flange and union covers.
 - 5) End caps.
 - 6) Beveled collars.
 - 7) Valve covers.
 - 8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.
- C. Self-Adhesive Outdoor Jacket: 60-mil- thick, laminated vapor barrier and waterproofing membrane for installation over insulation located aboveground outdoors; consisting of a rubberized bituminous resin on a cross-laminated polyethylene film covered with white aluminum-foil facing.
 - 1. Acceptable manufacturer for this product is Polyguard Alumaguard All Weather with Cool Wrap finish or approved equal

2.9 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
 - 1. Acceptable manufacturers for this product are:
 - a. Compac
 - b. Ideal Tape
 - c. Venture Tape

2. Width: 3 inches.
3. Thickness: 11.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

2.10 SECUREMENTS

- A. Bands:
1. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304 or [Type 316]; 0.015 inch thick, 3/4 inch wide with wing seal or closed seal.
 2. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 3/4 inch wide with wing seal or closed seal.
 3. Springs: Twin spring set constructed of stainless steel with ends flat and slotted to accept metal bands. Spring size determined by manufacturer for application.
- B. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.
- C. Wire: 0.080-inch nickel-copper alloy, 0.062-inch soft-annealed, stainless steel or 0.062-inch soft-annealed, galvanized steel.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
1. Verify that systems to be insulated have been tested and are free of defects.
 2. Verify that surfaces to be insulated are clean and dry.
 3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:
1. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
- C. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.
- D. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Keep insulation materials dry during application and finishing.
- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.
- J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.
 - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
 - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
 - 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- L. Install insulation with factory-applied jackets as follows:
 - 1. Draw jacket tight and smooth.
 - 2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
 - 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches o.c.
 - a. For below-ambient services, apply vapor-barrier mastic over staples.
 - 4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
 - 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.
- M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

- N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- P. For above-ambient services, do not install insulation to the following:
 - 1. Vibration-control devices.
 - 2. Testing agency labels and stamps.
 - 3. Nameplates and data plates.
 - 4. Manholes.
 - 5. Hand-holes.
 - 6. Cleanouts.

3.4 PENETRATIONS

- A. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- B. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
 - 1. Comply with requirements in Section 078413 "Penetration Fire-stopping" for fire-stopping and fire-resistive joint sealers.
- C. Insulation Installation at Floor Penetrations:
 - 1. Pipe: Install insulation continuously through floor penetrations.
 - 2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Fire-stopping."

3.5 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
 - 1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
 - 2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
 - 3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
 - 4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
 - 5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints,

- seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
 7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
 8. For services not specified to receive a field-applied jacket except for flexible elastomeric, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
 9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.
- C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.
- D. Install removable insulation covers at locations indicated. Installation shall conform to the following:
1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
 2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
 3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
 4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
 5. Finish outdoor exposed surfaces with a metal jacket.
- 3.6 INSTALLATION OF CALCIUM SILICATE INSULATION
- A. Insulation Installation on Straight Pipes and Tubes:
1. Secure single-layer insulation with stainless-steel bands at 12-inch intervals and tighten bands without deforming insulation materials.
 2. Install two-layer insulation with joints tightly butted and staggered at least 3 inches. Secure inner layer with wire spaced at 12-inch intervals. Secure outer layer with stainless-steel bands at 12-inch intervals.
 3. Apply a skim coat of mineral-fiber, hydraulic-setting cement to insulation surface. When cement is dry, apply flood coat of lagging adhesive and press on one layer of glass cloth or tape. Overlap edges at least 1 inch. Apply finish coat of lagging adhesive over glass cloth or tape. Thin finish coat to achieve smooth, uniform finish.
- B. Insulation Installation on Pipe Flanges:
1. Install preformed pipe insulation to outer diameter of pipe flange.

2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of block insulation of same material and thickness as pipe insulation.
4. Finish flange insulation same as pipe insulation.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When preformed insulation sections of insulation are not available, install mitered sections of calcium silicate insulation. Secure insulation materials with wire or bands.
3. Finish fittings insulation same as pipe insulation.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install mitered segments of calcium silicate insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
2. Install insulation to flanges as specified for flange insulation application.
3. Finish valve and specialty insulation same as pipe insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.7 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

A. Seal longitudinal seams and end joints with manufacturers recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturers recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.
2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.8 INSTALLATION OF MINERAL-FIBER INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.

2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
 3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward-clinched staples at 6 inches o.c.
 4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.
- B. Insulation Installation on Pipe Flanges:
1. Install preformed pipe insulation to outer diameter of pipe flange.
 2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
 3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
 4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch and seal joints with flashing sealant.
- C. Insulation Installation on Pipe Fittings and Elbows:
1. Install preformed sections of same material as straight segments of pipe insulation when available.
 2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.
- D. Insulation Installation on Valves and Pipe Specialties:
1. Install preformed sections of same material as straight segments of pipe insulation when available.
 2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
 3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
 4. Install insulation to flanges as specified for flange insulation application.

3.9 FIELD-APPLIED JACKET INSTALLATION

- A. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.10 FINISHES

- A. Pipe Insulation with ASJ Material: Paint jacket with paint system identified below and as specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
 - a. Finish Coat Material: Interior, flat, latex-emulsion size.
- B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.
- C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.
- D. Do not field paint aluminum or stainless-steel jackets.

3.11 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Perform tests and inspections.
- C. Tests and Inspections:
 - 1. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.
- D. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements

3.12 PIPING INSULATION SCHEDULE, GENERAL

- A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.
- B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
 - 1. Drainage piping located in crawl spaces.
 - 2. Underground piping.
 - 3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.13 INDOOR PIPING INSULATION SCHEDULE

- A. Heating-Hot-Water Supply and Return, 200 Deg F and Below:
 - 1. NPS 3 and Smaller: Insulation shall be the following:
 - a. Mineral-Fiber, Preformed Pipe, Type I: 1 inch thick.

END OF SECTION 230719

SECTION 232113 - HYDRONIC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes pipe and fitting materials and joining methods for the following:
 - 1. Hot-water heating piping.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of the following:
 - 1. Pressure-seal fittings.
- B. Sustainable Design Submittals:
 - 1. Product Data: For adhesives, indicating VOC content.
 - 2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
- C. Delegated-Design Submittal:
 - 1. Design calculations and detailed fabrication and assembly of pipe anchors and alignment guides, hangers and supports for multiple pipes, expansion joints and loops, and attachments of the same to the building structure.
 - 2. Locations of pipe anchors and alignment guides and expansion joints and loops.
 - 3. Locations of and details for penetrations, including sleeves and sleeve seals for exterior walls, floors, basement, and foundation walls.
 - 4. Locations of and details for penetration and fire-stopping for fire- and smoke-rated wall and floor and ceiling assemblies.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Piping layout, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Suspended ceiling components.
 - 2. Other building services.
 - 3. Structural members.
- B. Qualification Data: For Installer.
- C. Welding certificates.
- D. Field quality-control reports.
- E. Water Analysis: Submit a copy of the water analysis to illustrate water quality available at Project site.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Installers of Pressure-Sealed Joints: Installers shall be certified by pressure-seal joint manufacturer as having been trained and qualified to join piping with pressure-seal pipe couplings and fittings.
- B. Steel Support Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- C. Pipe Welding: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code: Section IX.
 - 1. Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation.
 - 2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature unless otherwise indicated:
 - 1. Hot-Water Heating Piping: 100 psig at 250 degrees F.

2.2 COPPER TUBE AND FITTINGS

- A. Drawn-Temper Copper Tubing: ASTM B 88, Type L.
- B. Annealed-Temper Copper Tubing: ASTM B 88, Type K.
- C. DWV Copper Tubing: ASTM B 306, Type DWV.
- D. Grooved, Mechanical-Joint, Wrought-Copper Fittings:
 - 1. Grooved-End Copper Fittings: ASTM B 75, copper tube or ASTM B 584, bronze casting.
 - 2. Grooved-End-Tube Couplings: Rigid pattern unless otherwise indicated; gasketed fitting. Ductile-iron housing with keys matching pipe and fitting grooves, pre-lubricated EPDM gasket rated for minimum 230 degrees F for use with housing, and steel bolts and nuts.
- E. Copper or Bronze Pressure-Seal Fittings:
 - 1. Housing: Copper.
 - 2. O-Rings and Pipe Stops: EPDM.
 - 3. Tools: Manufacturer's special tools.
 - 4. Minimum 200-psig working-pressure rating at 250 degrees F.
- F. Wrought-Copper Unions: ASME B16.22.

2.3 STEEL PIPE AND FITTINGS

- A. Steel Pipe: ASTM A 53/A 53M, black steel with plain ends; welded and seamless, Grade B, and wall thickness as indicated in "Piping Applications" Article.

- B. Cast-Iron Threaded Fittings: ASME B16.4; Classes 125 and 250 as indicated in "Piping Applications" Article.
- C. Malleable-Iron Threaded Fittings: ASME B16.3, Classes 150 and 300 as indicated in "Piping Applications" Article.
- D. Malleable-Iron Unions: ASME B16.39; Classes 150, 250, and 300 as indicated in "Piping Applications" Article.
- E. Cast-Iron Pipe Flanges and Flanged Fittings: ASME B16.1, Classes 25, 125, and 250; raised ground face, and bolt holes spot faced as indicated in "Piping Applications" Article.
- F. Wrought-Steel Fittings: ASTM A 234/A 234M, wall thickness to match adjoining pipe.
- G. Wrought Cast- and Forged-Steel Flanges and Flanged Fittings: ASME B16.5, including bolts, nuts, and gaskets of the following material group, end connections, and facings:
 - 1. Material Group: 1.1.
 - 2. End Connections: Butt welding.
 - 3. Facings: Raised face.
- H. Grooved Mechanical-Joint Fittings and Couplings:
 - 1. Joint Fittings: ASTM A 536, Grade 65-45-12 ductile iron; ASTM A 47/A 47M, Grade 32510 malleable iron; ASTM A 53/A 53M, Type F, E, or S, Grade B fabricated steel; or ASTM A 106/A 106M, Grade B steel fittings with grooves or shoulders constructed to accept grooved-end couplings; with nuts, bolts, locking pin, locking toggle, or lugs to secure grooved pipe and fittings.
 - 2. Couplings: Ductile- or malleable-iron housing and EPDM or nitrile gasket of central cavity pressure-responsive design; with nuts, bolts, locking pin, locking toggle, or lugs to secure grooved pipe and fittings.
- I. Steel Pipe Nipples: ASTM A 733, made of same materials and wall thicknesses as pipe in which they are installed.

2.4 JOINING MATERIALS

- A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
 - 1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch maximum thickness unless otherwise indicated.
 - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
 - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
- B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- C. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- D. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.5 DIELECTRIC FITTINGS

- A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

- B. Dielectric Unions:
 - 1. Description:
 - a. Standard: ASSE 1079.
 - b. Pressure Rating: 125 psig minimum at 180 degrees F.
 - c. End Connections: Solder-joint copper alloy and threaded ferrous.
- C. Dielectric Flanges:
 - 1. Description:
 - a. Standard: ASSE 1079.
 - b. Factory-fabricated, bolted, companion-flange assembly.
 - c. Pressure Rating: 125 psig minimum at 180 degrees F.
 - d. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.
- D. Dielectric-Flange Insulating Kits:
 - 1. Description:
 - a. Non-conducting materials for field assembly of companion flanges.
 - b. Pressure Rating: 150 psig.
 - c. Gasket: Neoprene or phenolic.
 - d. Bolt Sleeves: Phenolic or polyethylene.
 - e. Washers: Phenolic with steel backing washers.
- E. Dielectric Nipples:
 - 1. Description:
 - a. Standard: IAPMO PS 66.
 - b. Electroplated steel nipple, complying with ASTM F 1545.
 - c. Pressure Rating: 300 psig at 225 degrees F
 - d. End Connections: Male threaded or grooved.
 - e. Lining: Inert and noncorrosive, propylene.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

- A. Hot-water heating piping, aboveground, NPS 2 and smaller, shall be any of the following:
 - 1. Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered or pressure-seal joints.
 - 2. Schedule 40, Grade B, Type 96 steel pipe; Class 125, cast-iron fittings; cast-iron flanges and flange fittings; and threaded joints.
- B. Hot-water heating piping, aboveground, NPS 2-1/2, shall be any of the following:
 - 1. Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered joints.
 - 2. Schedule 40 steel pipe, wrought-steel fittings and wrought-cast or forged-steel flanges and flange fittings, and welded and flanged joints.
 - 3. Schedule 40 steel pipe; grooved, mechanical joint coupling and fittings; and grooved, mechanical joints.

3.2 PIPING INSTALLATIONS

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

- B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Install piping to permit valve servicing.
- F. Install piping at indicated slopes.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Install piping to allow application of insulation.
- J. Select system components with pressure rating equal to or greater than system operating pressure.
- K. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.
- L. Install drains, consisting of a tee fitting, NPS 3/4 ball valve, and short NPS 3/4 threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.
- M. Install piping at a uniform grade of 0.2 percent upward in direction of flow.
- N. Reduce pipe sizes using eccentric reducer fitting installed with level side up.
- O. Install branch connections to mains using tee fittings in main pipe, with the branch connected to the bottom of the main pipe. For up-feed risers, connect the branch to the top of the main pipe.
- P. Install valves according to Section 230523 "General Valves for HVAC Piping,"
- Q. Install unions in piping, NPS 2 and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.
- R. Install flanges in piping, NPS 2-1/2 and larger, at final connections of equipment and elsewhere as indicated.
- S. Install shutoff valve immediately upstream of each dielectric fitting.
- T. Comply with requirements in Section 230516 "Expansion Fittings and Loops for HVAC Piping" for installation of expansion loops, expansion joints, anchors, and pipe alignment guides.
- U. Comply with requirements in Section 230553 "Identification for HVAC Piping and Equipment" for identifying piping.
- V. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 230517 "Sleeves, Sleeve Seals and Escutcheons for HVAC Piping."
- W. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 230517 "Sleeves, Sleeve Seals and Escutcheons for HVAC Piping."

- X. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 230518 "Sleeves, Sleeve Seals and Escutcheons for HVAC Piping."

3.3 DIELECTRIC FITTING INSTALLATION

- A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
- B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric nipples or unions.
- C. Dielectric Fittings for NPS 2-1/2 and larger: Use dielectric flanges.

3.4 HANGERS AND SUPPORTS

- A. Comply with requirements in Section 230529 "Hangers and Supports for HVAC Piping and Equipment" for hanger, support, and anchor devices. Comply with the following requirements for maximum spacing of supports.
- B. Comply with requirements in Section 230548 "Vibration and Seismic Controls for HVAC" for seismic restraints.
- C. Install the following pipe attachments:
 - 1. Adjustable steel clevis hangers for individual horizontal piping less than 20 feet long.
 - 2. Adjustable roller hangers and spring hangers for individual horizontal piping 20 feet or longer.
 - 3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
 - 4. Spring hangers to support vertical runs.
 - 5. Provide copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
- D. Install hangers for steel piping with the following maximum spacing and minimum rod sizes:
 - 1. NPS 3/4: Maximum span, 7 feet; minimum rod size, 1/4 inch.
 - 2. NPS 1: Maximum span, 7 feet; minimum rod size, 1/4 inch
 - 3. NPS 1-1/2: Maximum span, 9 feet; minimum rod size 3/8"
 - 4. NPS 2: Maximum span, 10 feet; minimum rod size 3/8"
 - 5. NPS 2-1/2: Maximum span, 11 feet; minimum rod size 3/8"
- E. Install hangers for drawn-temper copper piping with the following maximum spacing and minimum rod sizes:
 - 1. NPS 3/4: Maximum span, 5 feet; minimum rod size, 1/4 inch.
 - 2. NPS 1: Maximum span, 6 feet; minimum rod size, 1/4 inch.
 - 3. NPS 1-1/4: Maximum span, 7 feet; minimum rod size, 3/8 inch.
 - 4. NPS 1-1/2: Maximum span, 8 feet; minimum rod size, 3/8 inch.
 - 5. NPS 2: Maximum span, 8 feet; minimum rod size, 3/8 inch.
 - 6. NPS 2-1/2: Maximum span, 9 feet; minimum rod size, 3/8 inch.
- F. Support vertical runs at roof, at each floor, and at 10-foot intervals between floors.

3.5 PIPE JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

- C. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
- D. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- E. Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators according to "Quality Assurance" Article.
- F. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
- G. Grooved Joints: Assemble joints with coupling and gasket, lubricant, and bolts. Cut or roll grooves in ends of pipe based on pipe and coupling manufacturer's written instructions for pipe wall thickness. Use grooved-end fittings and rigid, grooved-end-pipe couplings.
- H. Pressure-Sealed Joints: Use manufacturer-recommended tool and procedure. Leave insertion marks on pipe after assembly.

3.6 TERMINAL EQUIPMENT CONNECTIONS

- A. Sizes for supply and return piping connections shall be the same as or larger than equipment connections.
- B. Install control valves in accessible locations close to connected equipment.
- C. Install bypass piping with globe valve around control valve. If parallel control valves are installed, only one bypass is required.
- D. Install ports for pressure gages and thermometers at coil inlet and outlet connections. Comply with requirements in Section 230519 "Meters and Gages for HVAC Piping."

3.7 FIELD QUALITY CONTROL

- A. Prepare hydronic piping according to ASME B31.9 and as follows:
 - 1. Leave joints, including welds, uninsulated and exposed for examination during test.
 - 2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
 - 3. Flush hydronic piping systems with clean water; then remove and clean or replace strainer screens.
 - 4. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.
 - 5. Install safety valve, set at a pressure no more than one-third higher than test pressure, to protect against damage by expanding liquid or other source of overpressure during test.
- B. Perform the following tests on hydronic piping:
 - 1. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.

2. While filling system, use vents installed at high points of system to release air. Use drains installed at low points for complete draining of test liquid.
 3. Isolate expansion tanks and determine that hydronic system is full of water.
 4. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the system's working pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed 90 percent of specified minimum yield strength or 1.7 times the "SE" value in Appendix A in ASME B31.9, "Building Services Piping."
 5. After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.
 6. Prepare written report of testing.
- C. Perform the following before operating the system:
1. Open manual valves fully.
 2. Inspect pumps for proper rotation.
 3. Set makeup pressure-reducing valves for required system pressure.
 4. Inspect air vents at high points of system and determine if all are installed and operating freely (automatic type), or bleed air completely (manual type).
 5. Set temperature controls so all coils are calling for full flow.
 6. Inspect and set operating temperatures of hydronic equipment, such as boilers, chillers, cooling towers, to specified values.
 7. Verify lubrication of motors and bearings.

END OF SECTION 232113

SECTION 232116 - HYDRONIC PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes special-duty valves and specialties for the following:
 - 1. Hot-water heating piping.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of the following:
 - 1. Valves: Include flow and pressure drop curves based on manufacturer's testing for calibrated-orifice balancing valves and automatic flow-control valves.
 - 2. Air-control devices.
 - 3. Hydronic specialties.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For air-control devices, hydronic specialties, and special-duty valves to include in emergency, operation, and maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Differential Pressure Meter: For each type of balancing valve and automatic flow control valve, include flowmeter, probes, hoses, flow charts, and carrying case.

1.6 QUALITY ASSURANCE

- A. Pipe Welding: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code: Section IX.
 - 1. Safety valves and pressure vessels shall bear the appropriate ASME label. Fabricate and stamp air separators and expansion tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature unless otherwise indicated:
 - 1. Hot-Water Heating Piping: 100 psig at 200 degrees F

2.2 VALVES

- A. Valves: Comply with requirements specified in Section 23052 "General Valves for HVAC Piping,"
- B. Automatic Temperature-Control Valves, Actuators, and Sensors: Comply with requirements specified in Section 230923 "Direct Digital Controls for HVAC"
- C. Cast-Iron or Steel, Calibrated-Orifice, Balancing Valves:
 - 1. Acceptable manufacturers:
 - a. Armstrong Pump
 - b. Bell & Gossett
 - c. Taco
 - 2. Body: Cast-iron or steel body, ball, plug, or globe pattern with calibrated orifice or venturi.
 - 3. Ball: Brass or stainless steel.
 - 4. Stem Seals: EPDM O-rings.
 - 5. Disc: Glass and carbon-filled PTFE.
 - 6. Seat: PTFE.
 - 7. End Connections: Flanged or grooved.
 - 8. Pressure Gage Connections: Integral seals for portable differential pressure meter.
 - 9. Handle Style: Lever, with memory stop to retain set position.
 - 10. CWP Rating: Minimum 125 psig.
 - 11. Maximum Operating Temperature: 250 degrees F.
- D. Automatic Flow-Control Valves:
 - 1. Acceptable manufacturers:
 - a. Flow Design, Inc.
 - b. Flowcon Americas LLC
 - c. Griswold
 - 2. Body: Brass or ferrous metal.
 - 3. Piston and Spring Assembly: Corrosion resistant, tamper proof, self-cleaning, and removable.
 - 4. Combination Assemblies: Include bronze or brass-alloy ball valve.
 - 5. Identification Tag: Marked with zone identification, valve number, and flow rate.
 - 6. Size: Same as pipe in which installed.
 - 7. Performance: Maintain constant flow, plus or minus 5 percent over system pressure fluctuations.
 - 8. Minimum CWP Rating: 175 psig.
 - 9. Maximum Operating Temperature: 200 degrees F.

2.3 AIR-CONTROL DEVICES

- A. Manual Air Vents:
 - 1. Acceptable manufacturers:
 - a. Amtrol, Inc.
 - b. Bell & Gossett
 - c. Taco
 - 2. Body: Bronze.
 - 3. Internal Parts: Nonferrous.
 - 4. Operator: Screwdriver or thumbscrew.
 - 5. Inlet Connection: NPS 1/2.
 - 6. Discharge Connection: NPS 1/8.
 - 7. CWP Rating: 150 psig.
 - 8. Maximum Operating Temperature: 225 degrees F.

2.4 HYDRONIC PIPING SPECIALTIES

- A. Expansion Fittings: Comply with requirements in Section 230516 "Expansion Fittings and Loops for HVAC Piping."

PART 3 - EXECUTION

3.1 VALVE APPLICATIONS

- A. Install shutoff-duty valves at each branch connection to supply mains and at supply connection to each piece of equipment.
- B. Install throttling-duty valves at each branch connection to return main.
- C. Install calibrated-orifice, balancing valves in the return pipe of each heating or cooling terminal.

3.2 HYDRONIC SPECIALTIES INSTALLATION

- A. Install manual air vents at high points in piping, at heat-transfer coils, and elsewhere as required for system air venting.

END OF SECTION 232116

ADD ALTERNATE #1 – CHWP-1

SECTION 232123 - HYDRONIC PUMPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Close-coupled, in-line centrifugal pumps.

1.3 DEFINITIONS

- A. Buna-N: Nitrile rubber.
- B. EPT: Ethylene propylene terpolymer.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of pump. Include certified performance curves and rated capacities, operating characteristics, furnished specialties, final impeller dimensions, and accessories for each type of product indicated. Indicate pump's operating point on curves.
- B. Shop Drawings: For each pump.
 - 1. Show pump layout and connections.
 - 2. Include setting drawings with templates for installing foundation and anchor bolts and other anchorages.
 - 3. Include diagrams for power, signal, and control wiring.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For pumps to include in emergency, operation, and maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Mechanical Seals: One mechanical seal(s) for each pump.

PART 2 - PRODUCTS

2.1 CLOSE-COUPLED, IN-LINE CENTRIFUGAL PUMPS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Armstrong Pumps, Inc.
 2. Bell & Gossett.
 3. Grundfos Pumps Corporation.
- B. Description: Factory-assembled and -tested, centrifugal, overhung-impeller, close-coupled, in-line pump as defined in HI 1.1-1.2 and HI 1.3; designed for installation with pump and motor shafts mounted horizontally or vertically.
- C. Pump Construction:
 1. Casing: Cast iron, ASTM A48 Class B with threaded gage tappings at inlet and outlet, replaceable bronze wear rings, and threaded companion-flange connections.
 2. Impeller: ASTM B 584, cast bronze; statically and dynamically balanced, keyed to shaft, and secured with a locking cap screw. For constant-speed pumps, trim impeller to match specified performance.
 3. Pump Shaft: Carbon steel.
 4. Seal: Mechanical seal consisting of carbon rotating ring against a ceramic seat held by a stainless-steel spring, and Buna-N bellows and gasket. Include water slinger on shaft between motor and seal.
 5. Seal: Packing seal consisting of stuffing box with a minimum of four rings of graphite-impregnated braided yarn with bronze lantern ring between center two graphite rings, and bronze packing gland.
 6. Pump Bearings: Permanently lubricated ball bearings.
- D. Motor: Single speed and rigidly mounted to pump casing.
 1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 2. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
 - a. Enclosure: Open, drip proof or Totally enclosed, fan cooled.
 - b. Enclosure Materials: Cast iron.
 - c. Motor Bearings: Permanently lubricated ball bearings.
 - d. Efficiency: Premium efficient.
 - e. NEMA Design: NEMA Premium JM
- E. Capacities and Characteristics:
 1. Capacity: 318 GPM
 2. Total Dynamic Head: 52 feet.
 3. Maximum Operating Pressure: 175 psig.
 4. Maximum Continuous Operating Temperature: 225 deg F.
 5. Inlet and Outlet Size: NPS.

6. Impeller Size: 7.875 Inches.
7. Motor Speed: 1800 RPM
8. Motor Horsepower: 7.5 HP
9. Electrical Characteristics:
 - a. Volts: 208.
 - b. Phase: Three.
 - c. Hertz: 60.

2.2 PUMP SPECIALTY FITTINGS

A. Suction Diffuser:

1. Angle pattern.
2. 175-psig pressure rating, cast-iron body and end cap, pump-inlet fitting.
3. Bronze startup and bronze or stainless-steel permanent strainers.
4. Bronze or stainless-steel straightening vanes.
5. Drain plug.
6. Factory-fabricated support.

B. Triple-Duty Valve:

1. Angle or straight pattern.
2. 175-psig pressure rating, cast-iron body, pump-discharge fitting.
3. Drain plug and bronze-fitted shutoff, balancing, and check valve features.
4. Brass gage ports with integral check valve and orifice for flow measurement.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine equipment foundations and anchor-bolt locations for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for piping systems to verify actual locations of piping connections before pump installation.
- C. Examine foundations and inertia bases for suitable conditions where pumps are to be installed.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PUMP INSTALLATION

- A. Comply with HI 1.4 and HI 2.4.
- B. Install pumps to provide access for periodic maintenance including removing motors, impellers, couplings, and accessories.
- C. Independently support pumps and piping so weight of piping is not supported by pumps and weight of pumps is not supported by piping.

- D. Automatic Condensate Pump Units: Install units for collecting condensate and extend to open drain.
- E. Equipment Mounting:
 - 1. Comply with requirements for vibration isolation and seismic control devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."

3.3 ALIGNMENT

- A. Engage a factory-authorized service representative to perform alignment service.
- B. Comply with requirements in Hydronics Institute standards for alignment of pump and motor shaft. Add shims to the motor feet and bolt motor to base frame. Do not use grout between motor feet and base frame.
- C. Comply with pump and coupling manufacturers' written instructions.
- D. After alignment is correct, tighten foundation bolts evenly but not too firmly. Completely fill baseplate with nonshrink, nonmetallic grout while metal blocks and shims or wedges are in place. After grout has cured, fully tighten foundation bolts.

3.4 CONNECTIONS

- A. Drawings and details indicate general arrangement of piping, fittings, and specialties.
- B. Where installing piping adjacent to pump, allow space for service and maintenance.
- C. Connect piping to pumps. Install valves that are same size as piping connected to pumps.
- D. Install suction and discharge pipe sizes equal to or greater than diameter of pump nozzles.
- E. Install check, shutoff, and throttling valves or triple-duty valve on discharge side of pumps.
- F. Install Y-type strainer, suction diffuser and shutoff valve on suction side of pumps.
- G. Install flexible connectors on suction and discharge sides of base-mounted pump between pump casing and valves.
- H. Install pressure gages on pump suction and discharge or at integral pressure-gage tapping, or install single gage with multiple-input selector valve.
- I. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
- J. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.5 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
 - 1. Complete installation and startup checks according to manufacturer's written instructions.
 - 2. Check piping connections for tightness.
 - 3. Clean strainers on suction piping.

4. Perform the following startup checks for each pump before starting:
 - a. Verify bearing lubrication.
 - b. Verify that pump is free to rotate by hand and that pump for handling hot liquid is free to rotate with pump hot and cold. If pump is bound or drags, do not operate until cause of trouble is determined and corrected.
 - c. Verify that pump is rotating in the correct direction.
5. Prime pump by opening suction valves and closing drains, and prepare pump for operation.
6. Start motor.
7. Open discharge valve slowly.

3.6 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain hydronic pumps.

END OF SECTION 232123

SECTION 233113 - METAL DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Single-wall rectangular ducts and fittings.
2. Single-wall round ducts and fittings.
3. Sheet metal materials.
4. Sealants and gaskets.
5. Hangers and supports.
6. Seismic-restraint devices.

B. Related Sections:

1. Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
2. Section 233300 "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of the following products:

1. Liners and adhesives.
2. Sealants and gaskets.
3. Seismic-restraint devices.

B. Sustainable Design Submittals:

1. Product Data: For ventilation equipment, indicating compliance with ASHRAE 62.1, Section 5 - "Systems and Equipment."
2. Product Data: For adhesives, indicating VOC content.
3. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
4. Product Data: For sealants, indicating VOC content.
5. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.
6. Laboratory Test Reports: For antimicrobial coatings, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings:

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
2. Factory- and shop-fabricated ducts and fittings.
3. Duct layout indicating sizes, configuration, liner material, and static-pressure classes.
4. Elevation of top and bottom of ducts.
5. Dimensions of all duct runs from building grid lines.
6. Fittings.
7. Reinforcement and spacing.
8. Seam and joint construction.
9. Penetrations through fire-rated and other partitions.
10. Equipment installation based on equipment being used on Project.
11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
12. Hangers and supports, including methods for duct and building attachment, seismic restraints, and vibration isolation.
13. Provide shop drawings for all supply, return, exhaust and make-up air ducts.

D. Delegated-Design Submittal:

1. Sheet metal thicknesses.
2. Joint and seam construction and sealing.
3. Reinforcement details and spacing.
4. Materials, fabrication, assembly, and spacing of hangers and supports.
5. Design Calculations: Calculations, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation for selecting hangers and supports and seismic restraints.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: A single set of plans or BIM model, drawn to scale, showing the items described in this Section, and coordinated with all building trades.
- B. Welding certificates.
- C. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel in accordance with the following:
 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
 2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum," for aluminum supports.
 3. AWS D9.1/D9.1M, "Sheet Metal Welding Code," for duct joint and seam welding.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct

Construction Standards - Metal and Flexible" and with performance requirements and design criteria indicated in "Duct Schedule" Article.

- B. Structural Performance: Duct hangers, supports and seismic restraints shall withstand the effects of gravity and seismic loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and ASCE/SEI 7. Seismically brace duct hangers and supports in accordance with SMACNA's "Seismic Restraint Manual: Guidelines for Mechanical Systems."
 - 1. Seismic Hazard Level (SHL): B
 - 2. Connection Level: Connection Level as Defined in the IBC: Refer to geotechnical report and architectural/structural plans.
- C. Airstream Surfaces: Surfaces in contact with airstream shall comply with requirements in ASHRAE 62.1.
- D. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment," and Section 7 - "Construction and System Startup."
- E. ASHRAE/IES Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."
- F. Duct Dimensions: Unless otherwise indicated, all duct dimensions indicated on Drawings are inside clear dimensions and do not include insulation or duct wall thickness.

2.2 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.
 - 1. Construct ducts of galvanized sheet steel unless otherwise indicated.
 - 2. For ducts exposed to weather, construct of Type 304 or Type 316 stainless steel indicated by manufacturer to be suitable for outdoor installation.
- B. Transverse Joints: Fabricate joints in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 - 1. For ducts with longest side less than 36 inches, select joint types in accordance with Figure 2-1.
 - 2. For ducts with longest side 36 inches or greater, use flange joint connector Type T-22, T-24, T-24A, T-25a, or T-25b. Factory-fabricated flanged duct connection system may be used if submitted and approved by engineer of record.
 - 3. Where specified for specific applications, all joints shall be welded.
- C. Longitudinal Seams: Select seam types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible." All longitudinal seams shall be Pittsburgh lock seams unless otherwise specified for specific application.
 - 1. Where specified for specific applications, all joints shall be welded.

- D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Ch. 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 SINGLE-WALL ROUND DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Ch. 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.
 - 1. Construct ducts of galvanized sheet steel unless otherwise indicated.
 - 2. For ducts exposed to weather, construct of Type 304 or Type 316 stainless steel indicated by manufacturer to be suitable for outdoor installation.
 - 3. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Ductmate Industries, Inc.
 - b. MKT Metal Manufacturing.
 - c. Spiral Manufacturing Co., Inc.
- B. Transverse Joints: Select joint types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- C. Longitudinal Seams: Select seam types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- D. Tees and Laterals: Select types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.4 SHEET METAL MATERIALS

- A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
 - 1. Galvanized Coating Designation: G60 or G90.
 - 2. Finishes for Surfaces Exposed to View: Mill phosphatized.
- C. Carbon-Steel Sheets: Comply with ASTM A 1008/A 1008M, with oiled, matte finish for exposed ducts.

- D. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304 or 316, as indicated in "Duct Schedule" Article; cold rolled, annealed, sheet. Exposed surface finish shall be No. 2B, No. 2D, No. 3, or No. 4 as indicated in "Duct Schedule" Article.
- E. Aluminum Sheets: Comply with ASTM B 209 Alloy 3003, H14 temper; with mill finish for concealed ducts, and standard, one-side bright finish for duct surfaces exposed to view.
- F. Factory- or Shop-Applied Antimicrobial Coating:
 - 1. Apply to the surface of sheet metal that will form the interior surface of the duct. An untreated clear coating shall be applied to the exterior surface.
 - 2. Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.
 - 3. Coating containing the antimicrobial compound shall have a hardness of 2H, minimum, when tested in accordance with ASTM D 3363.
 - 4. Surface-Burning Characteristics: Maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested in accordance with UL 723; certified by an NRTL.
 - 5. Shop-Applied Coating Color: White.
 - 6. Antimicrobial coating on sheet metal is not required for duct containing liner treated with antimicrobial coating.
- G. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
 - 1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.
- H. Tie Rods: Galvanized steel, 1/4-inch-minimum diameter for lengths 36 inches or less; 3/8-inch-minimum diameter for lengths longer than 36 inches.

2.5 SEALANT AND GASKETS

- A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested in accordance with UL 723; certified by an NRTL.
- B. Two-Part Tape Sealing System:
 - 1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.
 - 2. Tape Width: 6 inches.
 - 3. Sealant: Modified styrene acrylic.
 - 4. Water resistant.
 - 5. Mold and mildew resistant.
 - 6. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
 - 7. Service: Indoor and outdoor.
 - 8. Service Temperature: Minus 40 to plus 200 deg F.
 - 9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum.
 - 10. Sealant shall have a VOC content of 420 g/L or less.
- C. Water-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Solids Content: Minimum 65 percent.
3. Shore A Hardness: Minimum 20.
4. Water resistant.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).
7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.
10. Sealant shall have a VOC content of 420 g/L or less.
11. Maximum Static-Pressure Class: 10-inch wg, positive or negative.
12. Service: Indoor or outdoor.
13. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

D. Flanged Joint Sealant: Comply with ASTM C 920.

1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.
3. Grade: NS.
4. Class: 25.
5. Use: O.
6. Sealant shall have a VOC content of 420 g/L or less.

E. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

F. Round Duct Joint O-Ring Seals:

1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for 10-inch wg static-pressure class, positive or negative.
2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.6 HANGERS AND SUPPORTS

- A. Hanger Rods for Noncorrosive Environments: Galvanized-steel rods and nuts.
- B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.
- C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."
- D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.
- E. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.
- F. Steel Cable End Connections: Galvanized-steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

- G. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- H. Trapeze and Riser Supports:
 - 1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
 - 2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
 - 3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

2.7 SEISMIC-RESTRAINT DEVICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. B-line, an Eaton business.
 - 2. Ductmate Industries, Inc.
 - 3. Hilti, Inc.
- B. General Requirements for Restraint Components: Rated strengths, features, and applications shall be as defined in reports by an agency acceptable to authorities having jurisdiction
 - 1. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they will be subjected.
- C. Channel Support System: Shop- or field-fabricated support assembly made of slotted steel channels rated in tension, compression, and torsion forces and with accessories for attachment to braced component at one end and to building structure at the other end. Include matching components and corrosion-resistant coating.
- D. Restraint Cables: ASTM A 603, galvanized-steel cables with end connections made of galvanized-steel assemblies with brackets, swivel, and bolts designed for restraining cable service; and with an automatic-locking and clamping device or double-cable clips.
- E. Hanger Rod Stiffener: Reinforcing steel angle clamped to hanger rod.
- F. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type. Select anchor bolts with strength required for anchor and as tested in accordance with ASTM E 488/E 488M.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and coordination drawings.
- B. Install ducts in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.
- C. Install ducts in maximum practical lengths with fewest possible joints.

- D. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.
- E. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
- F. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- G. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.
- H. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.
- I. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.
- J. Install fire, combination fire/smoke, and smoke dampers where indicated on Drawings and as required by code, and by local authorities having jurisdiction. Comply with requirements in Section 233300 "Air Duct Accessories" for fire and smoke dampers and specific installation requirements of the damper UL listing.
- K. Install heating coils, cooling coils, air filters, dampers, and all other duct-mounted accessories in air ducts where indicated on Drawings.
- L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials both before and after installation. Comply with SMACNA's "IAQ Guidelines for Occupied Buildings Under Construction," Appendix G, "Duct Cleanliness for New Construction Guidelines."
- M. Elbows: Use long-radius elbows wherever they fit.
 - 1. Fabricate 90-degree rectangular mitered elbows to include turning vanes.
 - 2. Fabricate 90-degree round elbows with a minimum of three segments for 12 inches and smaller and a minimum of five segments for 14 inches and larger.
- N. Branch Connections: Use lateral or conical branch connections.

3.2 INSTALLATION OF EXPOSED DUCTWORK

- A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.
- B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.
- C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.
- D. Maintain consistency, symmetry, and uniformity in arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.
- E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.3 ADDITIONAL INSTALLATION REQUIREMENTS FOR TYPE 1 COMMERCIAL KITCHEN GREASE HOOD EXHAUST DUCT

- A. Install ducts in accordance with NFPA 96, "Ventilation Control and Fire Protection of Commercial Cooking Operation"; SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; and SMACNA's "Kitchen Ventilation Systems and Food Service Equipment Fabrication and Installation Guidelines" unless otherwise indicated.
- B. Install all ducts without dips and traps that may hold grease, and sloped a minimum of 2 percent to drain grease back to the hood.
- C. All ducts exposed to view shall be constructed of stainless steel as per "Duct Schedule" Article. All ducts concealed from view shall be stainless steel as per "Duct Schedule" Article.
- D. All joints shall be welded and shall be telescoping, bell, or flange joint as per NFPA 96.
- E. Install fire-rated access panel assemblies at each change in direction and at maximum intervals of 12 feet in horizontal ducts, and at every floor for vertical ducts, or as indicated on Drawings.
- F. Do not penetrate fire-rated assemblies except as allowed by applicable building codes and authorities having jurisdiction.

3.4 ADDITIONAL INSTALLATION REQUIREMENTS FOR EXHAUST DUCTS SERVING COMMERCIAL DISHWASHERS AND OTHER HIGH-HUMIDITY LOCATIONS

- A. Install dishwasher exhaust ducts and other exhaust ducts from wet, high-humidity locations without dips and traps that may hold water. Slope ducts a minimum of 2 percent back to dishwasher or toward drain.
- B. Provide a drain pocket at each low point and at the base of each riser with a 1-inch trapped copper drain from each drain pocket to open site floor drain.
- C. Minimize number of transverse seams.
- D. Do not locate longitudinal seams on bottom of duct.

3.5 DUCT SEALING

- A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- B. Seal ducts at a minimum to the following seal classes in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":
 - 1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 - 2. Unconditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class B.
 - 3. Unconditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class A.
 - 4. Unconditioned Space, Exhaust Ducts: Seal Class C.
 - 5. Unconditioned Space, Return-Air Ducts: Seal Class B.
 - 6. Conditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class C.
 - 7. Conditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class B.
 - 8. Conditioned Space, Exhaust Ducts: Seal Class B.

9. Conditioned Space, Return-Air Ducts: Seal Class C.

3.6 HANGER AND SUPPORT INSTALLATION

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."
- B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
1. Where practical, install concrete inserts before placing concrete.
 2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
 3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
 4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.
 5. Do not use powder-actuated concrete fasteners for seismic restraints.
- C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.
- D. Hangers Exposed to View: Threaded rod and angle or channel supports.
- E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.
- F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.7 SEISMIC-RESTRAINT-DEVICE INSTALLATION

- A. Install ducts with hangers and braces designed to support the duct and to restrain against seismic forces required by applicable building codes. Comply with SMACNA's "Seismic Restraint Manual: Guidelines for Mechanical Systems."
1. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c.
 2. Brace a change of direction longer than 12 feet.
- B. Select seismic-restraint devices with capacities adequate to carry present and future static and seismic loads.
- C. Install cables so they do not bend across edges of adjacent equipment or building structure.
- D. Install cable restraints on ducts that are suspended with vibration isolators.
- E. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction.

- F. Attachment to Structure: If specific attachment is not indicated, anchor bracing and restraints to structure, to flanges of beams, to upper truss chords of bar joists, or to concrete members.
- G. Drilling for and Setting Anchors:
 - 1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcement or embedded items during drilling. Notify Architect if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
 - 2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
 - 3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
 - 4. Set anchors to manufacturer's recommended torque, using a torque wrench.
 - 5. Install zinc-coated steel anchors for interior applications and stainless-steel anchors for applications exposed to weather.

3.8 CONNECTIONS

- A. Make connections to equipment with flexible connectors complying with Section 233300 "Air Duct Accessories."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.9 PAINTING

- A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

3.10 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Leakage Tests:
 - 1. Comply with SMACNA's "HVAC Air Duct Leakage Test Manual." Submit a test report for each test.
 - 2. Test the following systems:
 - a. Ducts with a Pressure Class Higher Than 3-Inch wg: Test representative duct sections, totaling no less than 25 percent of total installed duct area for each designated pressure class.
 - b. Supply Ducts with a Pressure Class of 2-Inch wg or Higher: Test representative duct sections, totaling no less than 100 percent of total installed duct area for each designated pressure class.

- c. Return Ducts with a Pressure Class of 2-Inch wg or Higher: Test representative duct sections, totaling no less than 100 percent of total installed duct area for each designated pressure class.
 - d. Exhaust Ducts with a Pressure Class of 1-Inch wg or Higher: Test representative duct sections, totaling no less than 100 percent of total installed duct area for each designated pressure class.
 - e. Outdoor-Air Ducts with a Pressure Class of 1-Inch wg or Higher: Test representative duct sections, totaling no less than 100 percent of total installed duct area for each designated pressure class.
 3. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
 4. Testing of each duct section is to be performed with access doors, coils, filters, dampers, and other duct-mounted devices in place as designed. No devices are to be removed or blanked off so as to reduce or prevent additional leakage.
 5. Test for leaks before applying external insulation.
 6. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If static-pressure classes are not indicated, test system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure.
 7. Give seven days advance notice for testing.
 - C. Duct System Cleanliness Tests:
 1. Visually inspect duct system to ensure that no visible contaminants are present.
 2. Test sections of metal duct system, chosen randomly by Owner, for cleanliness in accordance with "Description of Method 3 - NADCA Vacuum Test" in NADCA ACR, "Assessment, Cleaning and Restoration of HVAC Systems."
 - a. Acceptable Cleanliness Level: Net weight of debris collected on the filter media shall not exceed 0.75 mg/100 sq. cm.
 - D. Duct system will be considered defective if it does not pass tests and inspections.
 - E. Prepare test and inspection reports.
- 3.11 DUCT CLEANING
- A. Clean new duct system(s) before testing, adjusting, and balancing.
 - B. For cleaning of existing ductwork, see Section 230130.52 "Existing HVAC Air Distribution System Cleaning."
 - C. Use duct cleaning methodology as indicated in NADCA ACR.
 - D. Use service openings for entry and inspection.
 1. Provide openings with access panels appropriate for duct static-pressure and leakage class at dampers, coils, and any other locations where required for inspection and cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer. Comply with Section 233300 "Air Duct Accessories" for access panels and doors.
 2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
 3. Remove and reinstall ceiling to gain access during the cleaning process.

E. Particulate Collection and Odor Control:

1. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron-size (or larger) particles.
2. When venting vacuuming system to outdoors, use filter to collect debris removed from HVAC system, and locate exhaust downwind and away from air intakes and other points of entry into building.

F. Clean the following components by removing surface contaminants and deposits:

1. Air outlets and inlets (registers, grilles, and diffusers).
2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
4. Coils and related components.
5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
6. Supply-air ducts, dampers, actuators, and turning vanes.
7. Dedicated exhaust and ventilation components and makeup air systems.

G. Mechanical Cleaning Methodology:

1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.
5. Clean coils and coil drain pans in accordance with NADCA ACR. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
6. Provide drainage and cleanup for wash-down procedures.
7. Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents in accordance with manufacturer's written instructions after removal of surface deposits and debris.

3.12 STARTUP

- A. Air Balance: Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC."

3.13 DUCT SCHEDULE

- A. Fabricate ducts with galvanized sheet steel except as otherwise indicated and as follows:

1. Fabricate all ducts to achieve SMACNA pressure class, seal class, and leakage class as indicated below.

B. Supply Ducts:

1. Ducts Connected to Air Outlets:
 - a. Pressure Class: Up to Positive 2-inch wg.
 - b. Minimum SMACNA Seal Class: C.
 - c. SMACNA Leakage Class for Rectangular: 24.
 - d. SMACNA Leakage Class for Round: 12.
2. Ducts Connected to Constant-Volume Air-Handling Units:
 - a. Pressure Class: Positive 3-inch wg.
 - b. Minimum SMACNA Seal Class: B.
 - c. SMACNA Leakage Class for Rectangular: 12.
 - d. SMACNA Leakage Class for Round: 6.
3. Ducts Connected to Equipment Not Listed Above:
 - a. Pressure Class: Positive 4-inch wg.
 - b. Minimum SMACNA Seal Class: A.
 - c. SMACNA Leakage Class for Rectangular: 6.
 - d. SMACNA Leakage Class for Round and Flat Oval: 3.

C. Return Ducts:

1. Ducts Connected to Air Outlets:
 - a. Pressure Class: Up to Positive or Negative 2-inch wg.
 - b. Minimum SMACNA Seal Class: C.
 - c. SMACNA Leakage Class for Rectangular: 24.
 - d. SMACNA Leakage Class for Round: 12.
2. Ducts Connected to Air-Handling Units.
 - a. Pressure Class: Positive or Negative 3-inch wg.
 - b. Minimum SMACNA Seal Class: B.
 - c. SMACNA Leakage Class for Rectangular: 12.
 - d. SMACNA Leakage Class for Round: 6.
3. Ducts Connected to Equipment Not Listed above:
 - a. Pressure Class: Positive or negative 4-inch wg.
 - b. Minimum SMACNA Seal Class: A.
 - c. SMACNA Leakage Class for Rectangular: 6.
 - d. SMACNA Leakage Class for Round: 3.

D. Exhaust Ducts:

1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:
 - a. Pressure Class: Negative 1-inch wg.
 - b. Minimum SMACNA Seal Class: C if negative pressure, and A if positive pressure.
 - c. SMACNA Leakage Class for Rectangular: 24.
 - d. SMACNA Leakage Class for Round and Flat Oval: 12.

2. Ducts Connected to Commercial Kitchen Hoods: Comply with NFPA 96.
 - a. Exposed to View: Type 304, stainless-steel sheet, No. 4 finish.
 - b. Concealed: Type 304, stainless-steel sheet, No. 2D finish.
 - c. Welded seams and joints.
 - d. Pressure Class: Positive or negative 2-inch wg.
 - e. Airtight/watertight.
 3. Ducts Connected to Dishwashers, Dishwasher Hoods, and Other High-Humidity Locations:
 - a. Type 304, stainless-steel sheet.
 - b. Exposed to View: No. 4 finish.
 - c. Concealed: No. 2D finish.
 - d. Welded longitudinal seams; welded or flanged transverse joints with watertight EPDM gaskets.
 - e. Pressure Class: Positive or negative 2-inch wg.
 - f. Airtight/watertight.
- E. Outdoor-Air (Filtered, Heated) Ducts:
1. Ducts Connected to Make-Up Air Units:
 - a. Pressure Class: Positive 2-inch wg.
 - b. Minimum SMACNA Seal Class: C
 - c. SMACNA Leakage Class for Rectangular: 24.
 - d. SMACNA Leakage Class for Round: 12.
- F. Intermediate Reinforcement:
1. Galvanized-Steel Ducts: Galvanized steel.
 2. Stainless-Steel Ducts:
 - a. Exposed to Airstream: Match duct material.
 - b. Not Exposed to Airstream: Match duct material.
 3. Aluminum Ducts: Aluminum.
- G. Elbow Configuration:
1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."
 - a. Velocity 1000 fpm or Lower:
 - 1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
 - 2) Mitered Type RE 4 without vanes.
 - b. Velocity 1000 to 1500 fpm:
 - 1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
 - 2) Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two vanes.
 - 3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

- c. Velocity 1500 fpm or Higher:
 - 1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
 - 2) Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
 - 3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
- 2. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."
 - a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
 - b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
 - c. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
- 3. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "Round Duct Elbows."
 - a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.
 - 1) Velocity 1000 fpm or Lower: 0.5 radius-to-diameter ratio and three segments for 90-degree elbow.
 - 2) Velocity 1000 to 1500 fpm: 1.0 radius-to-diameter ratio and four segments for 90-degree elbow.
 - 3) Velocity 1500 fpm or Higher: 1.5 radius-to-diameter ratio and five segments for 90-degree elbow.
 - 4) Radius-to Diameter Ratio: 1.5.
 - b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.
 - c. Round Elbows, 14 Inches and Larger in Diameter: Welded.

H. Branch Configuration:

- 1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."
 - a. Rectangular Main to Rectangular Branch: 45-degree entry.
 - b. Rectangular Main to Round Branch: Conical spin in.
- 2. Round: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees." Saddle taps are permitted in existing duct.
 - a. Velocity 1000 fpm or Lower: 90-degree tap.
 - b. Velocity 1000 to 1500 fpm: Conical tap.
 - c. Velocity 1500 fpm or Higher: 45-degree lateral.

END OF SECTION 233113

SECTION 233300 - AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Backdraft and pressure relief dampers.
2. Manual volume dampers.
3. Control dampers.
4. Fire dampers.
5. Smoke dampers.
6. Flange connectors.
7. Turning vanes.
8. Duct-mounted access doors.
9. Flexible connectors.
10. Duct accessory hardware.

B. Related Requirements:

1. Section 233723 "HVAC Gravity Ventilators" for roof-mounted ventilator caps.
2. Section 284621.11 "Addressable Fire-Alarm Systems" for duct-mounted fire and smoke detectors.
3. Section 284621.13 "Conventional Fire-Alarm Systems" for duct-mounted fire and smoke detectors.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. Product data showing compliance with ASHRAE 62.1.
2. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances; and method of field assembly into duct systems and other construction. Include the following:
 - a. Special fittings.
 - b. Manual volume damper installations.
 - c. Control-damper installations.
 - d. Fire-damper and smoke-damper installations, including sleeves; and duct-mounted access doors.
 - e. Wiring Diagrams: For power, signal, and control wiring.

1.3 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

- A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

2.2 MATERIALS

- A. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
 - 1. Galvanized Coating Designation: G60 or G90.
 - 2. Exposed-Surface Finish: Mill phosphatized.
- B. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304, and having a No. 2 finish for concealed ducts.
- C. Aluminum Sheets: Comply with ASTM B 209, Alloy 3003, Temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.
- D. Extruded Aluminum: Comply with ASTM B 221, Alloy 6063, Temper T6.
- E. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.
- F. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.3 BACKDRAFT AND PRESSURE RELIEF DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Greenheck Fan Corporation.
 - 2. Pottorff.
 - 3. Ruskin Company.
- B. Description: Gravity balanced.
- C. Maximum Air Velocity: 1000 fpm.
- D. Maximum System Pressure: 1 to 2-inch wg.
- E. Frame: Hat-shaped, 0.094-inch-thick, galvanized sheet steel, with welded corners or mechanically attached and mounting flange.

- F. Blades: Multiple single-piece blades, center or end pivoted, maximum 6-inch width, 0.025-inch-thick, roll-formed aluminum with sealed edges.
- G. Blade Action: Parallel.
- H. Blade Seals: Neoprene, mechanically locked.
- I. Blade Axles:
 - 1. Material: Nonferrous metal.
 - 2. Diameter: 0.20 inch.
- J. Tie Bars and Brackets: Aluminum or Galvanized steel.
- K. Return Spring: Adjustable tension.
- L. Bearings: Steel ball or synthetic pivot bushings.
- M. Accessories:
 - 1. Adjustment device to permit setting for varying differential static pressure.
 - 2. Counterweights and spring-assist kits for vertical airflow installations.
 - 3. Electric actuators.
 - 4. Chain pulls.
 - 5. Screen Mounting: Front mounted in sleeve.
 - a. Sleeve Thickness: 20 gage minimum.
 - b. Sleeve Length: 6 inches minimum.
 - 6. Screen Mounting: Rear mounted.
 - 7. Screen Material: Aluminum.
 - 8. Screen Type: Insect.
 - 9. 90-degree stops.

2.4 MANUAL VOLUME DAMPERS

- A. Standard, Steel, Manual Volume Dampers:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Nailor Industries Inc.
 - b. Pottorff.
 - c. Ruskin Company.
 - 2. Standard leakage rating, with linkage outside airstream.
 - 3. Suitable for horizontal or vertical applications.
 - 4. Frames:
 - a. Frame: Hat-shaped, 0.094-inch-thick, galvanized sheet steel.
 - b. Mitered and welded corners.
 - c. Flanges for attaching to walls and flangeless frames for installing in ducts.

5. Blades:
 - a. Multiple or single blade.
 - b. Parallel- or opposed-blade design.
 - c. Stiffen damper blades for stability.
 - d. Galvanized steel, 0.064 inch thick.
 6. Blade Axles: Nonferrous metal.
 7. Bearings:
 - a. Oil-impregnated bronze or Molded synthetic.
 - b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
 8. Tie Bars and Brackets: Galvanized steel.
- B. Standard, Aluminum, Manual Volume Dampers:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Nailor Industries Inc.
 - b. Pottorff.
 - c. Ruskin Company.
 2. Standard leakage rating, with linkage outside airstream.
 3. Suitable for horizontal or vertical applications.
 4. Frames: Hat-shaped, 0.10-inch-thick, aluminum sheet channels; frames with flanges for attaching to walls and flangeless frames for installing in ducts.
 5. Blades:
 - a. Multiple or single blade.
 - b. Parallel- or opposed-blade design.
 - c. Stiffen damper blades for stability.
 - d. Roll-Formed Aluminum Blades: 0.10-inch-thick aluminum sheet.
 - e. Extruded-Aluminum Blades: 0.050-inch-thick extruded aluminum.
 6. Blade Axles: Nonferrous metal.
 7. Bearings:
 - a. Oil-impregnated bronze or Molded synthetic.
 - b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
 8. Tie Bars and Brackets: Aluminum.
- C. Jackshaft:
1. Size: 0.5-inch to 1-inch diameter.
 2. Material: Galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
 3. Length and Number of Mountings: As required to connect linkage of each damper in multiple-damper assembly.

D. Damper Hardware:

1. Zinc-plated, die-cast core with dial and handle made of 3/32-inch-thick zinc-plated steel, and a 3/4-inch hexagon locking nut.
2. Include center hole to suit damper operating-rod size.
3. Include elevated platform for insulated duct mounting.

2.5 CONTROL DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Greenheck Fan Corporation.
2. Nailor Industries Inc.
3. Pottorff.
4. Ruskin Company.

B. Frames:

1. Hat, U or Angle shaped.
2. 0.094-inch-thick, galvanized sheet steel or 0.05-inch-thick stainless steel.
3. Mitered and welded or Interlocking, gusseted corners.

C. Blades:

1. Multiple blade with maximum blade width of 6 inches.
2. Parallel, Parallel- and opposed, or Opposed-blade design.
3. Galvanized-steel, Stainless steel or Aluminum.
4. 0.064 inch thick single skin or 0.0747-inch-thick dual skin.
5. Blade Edging: Closed-cell neoprene.
6. Blade Edging: Inflatable seal blade edging, or replaceable rubber seals.

D. Blade Axles: 1/2-inch-diameter; nonferrous metal; blade-linkage hardware of zinc-plated steel and brass; ends sealed against blade bearings.

1. Operating Temperature Range: From minus 40 to plus 200 deg F.

E. Bearings:

1. Oil-impregnated bronze or Molded synthetic.
2. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
3. Thrust bearings at each end of every blade.

2.6 FIRE DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Greenheck Fan Corporation.
2. Nailor Industries Inc.

3. Pottorff.
 4. Ruskin Company.
- B. Type: Static and dynamic; rated and labeled according to UL 555 by an NRTL.
- C. Closing rating in ducts up to 4-inch wg static pressure class and minimum 2000-fpm velocity.
- D. Fire Rating: 1-1/2 to 3 hours.
- E. Frame: Curtain type with blades outside airstream; fabricated with roll-formed, 0.034-inch-thick galvanized steel; with mitered and interlocking corners.
- F. Mounting Sleeve: Factory- or field-installed, galvanized sheet steel.
1. Minimum Thickness: 0.138 inch to 0.39 inch thick, as indicated, and of length to suit application.
 2. Exception: Omit sleeve where damper-frame width permits direct attachment of perimeter mounting angles on each side of wall or floor; thickness of damper frame must comply with sleeve requirements.
- G. Mounting Orientation: Vertical or horizontal as indicated.
- H. Blades: Roll-formed, interlocking, 0.024-inch to 0.034-inch-thick, galvanized sheet steel. In place of interlocking blades, use full-length, 0.034-inch-thick, galvanized-steel blade connectors.
- I. Horizontal Dampers: Include blade lock and stainless-steel closure spring.
- J. Heat-Responsive Device: Replaceable, 212 deg F rated, fusible links.
- 2.7 SMOKE DAMPERS
- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Greenheck Fan Corporation.
 2. Nailor Industries Inc.
 3. Pottorff.
 4. Ruskin Company.
- B. General Requirements: Label according to UL 555S by an NRTL.
- C. Smoke Detector: Integral, factory wired for single-point connection.
- D. Frame: Hat-shaped, 0.094-inch-thick, galvanized sheet steel, with interlocking, gusseted or mechanically attached corners and mounting flange.
- E. Blades: Roll-formed, horizontal, interlocking or overlapping, 0.034-inch or 0.063-inch-thick, galvanized sheet steel.
- F. Leakage: [Class I] [Class II] <Insert class>.
- G. Rated pressure and velocity to exceed design airflow conditions.

- H. Mounting Sleeve: Factory-installed, 0.039-inch-thick, galvanized sheet steel; length to suit wall or floor application with factory-furnished silicone calking.
- I. Damper Motors: two-position action.
- J. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
 - 1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
 - 2. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Section 230923 "Direct Digital Control (DDC) System for HVAC"
 - 3. Permanent-Split-Capacitor or Shaded-Pole Motors: With oil-immersed and sealed gear trains.
 - 4. Spring-Return Motors: Equip with an integral spiral-spring mechanism where indicated. Enclose entire spring mechanism in a removable housing designed for service or adjustments. Size for running torque rating of 150 in. x lbf and breakaway torque rating of 150 in. x lbf.
 - 5. Outdoor Motors and Motors in Outdoor-Air Intakes: Equip with O-ring gaskets designed to make motors weatherproof. Equip motors with internal heaters to permit normal operation at minus 40 deg F.
 - 6. Nonspring-Return Motors: For dampers larger than 25 sq. ft., size motor for running torque rating of 150 in. x lbf and breakaway torque rating of 300 in. x lbf.
 - 7. Electrical Connection: 115 V, single phase, 60 Hz.
- K. Accessories:
 - 1. Auxiliary switches for signaling, fan control or position indication.
 - 2. Test and reset switches, remote mounted.

2.8 FLANGE CONNECTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Ductmate Industries, Inc.
 - 2. Hardcast, Inc.
 - 3. Ward Industries; a brand of Hart & Cooley, Inc.
- B. Description: Add-on or roll-formed, factory-fabricated, slide-on transverse flange connectors, gaskets, and components.
- C. Material: Galvanized steel.
- D. Gage and Shape: Match connecting ductwork.

2.9 TURNING VANES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Ductmate Industries, Inc.

2. METALAIRE, Inc.
 3. SEMCO LLC.
- B. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.
1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.
- C. Manufactured Turning Vanes for Nonmetal Ducts: Fabricate curved blades of resin-bonded fiberglass with acrylic polymer coating; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.
- D. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 4-3, "Vanes and Vane Runners," and 4-4, "Vane Support in Elbows."
- E. Vane Construction: Double wall.

2.10 DUCT-MOUNTED ACCESS DOORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Greenheck Fan Corporation.
 2. Nailor Industries Inc.
 3. Pottorff.
- B. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 7-2, "Duct Access Doors and Panels," and 7-3, "Access Doors - Round Duct."
1. Door:
 - a. Double wall, rectangular.
 - b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
 - c. Vision panel.
 - d. Hinges and Latches: 1-by-1-inch butt or piano hinge and cam latches.
 - e. Fabricate doors airtight and suitable for duct pressure class.
 2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
 3. Number of Hinges and Locks:
 - a. Access Doors Less Than 12 Inches Square: No hinges and two sash locks.
 - b. Access Doors up to 18 Inches Square: Two hinges and two sash locks.
 - c. Access Doors up to 24 by 48 Inches: Three hinges and two compression latches with outside handles.
 - d. Access Doors Larger Than 24 by 48 Inches: Four hinges and two compression latches with outside and inside handles.

2.11 DUCT ACCESS PANEL ASSEMBLIES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. 3M.
 - 2. Ductmate Industries, Inc.
 - 3. Flame Gard, Inc.
- B. Labeled according to UL 1978 by an NRTL.
- C. Panel and Frame: Minimum thickness 0.0428-inch stainless steel.
- D. Fasteners: Stainless steel. Panel fasteners shall not penetrate duct wall.
- E. Gasket: Comply with NFPA 96; grease-tight, high-temperature ceramic fiber, rated for minimum 2000 deg F.
- F. Minimum Pressure Rating: 10-inch wg, positive or negative.

2.12 FLEXIBLE CONNECTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Ductmate Industries, Inc.
 - 2. Duro Dyne Inc.
 - 3. Ward Industries; a brand of Hart & Cooley, Inc.
- B. Materials: Flame-retardant or noncombustible fabrics.
- C. Coatings and Adhesives: Comply with UL 181, Class 1.
- D. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches wide attached to two strips of 2-3/4-inch-wide, 0.028-inch-thick, galvanized sheet steel or 0.032-inch-thick aluminum sheets. Provide metal compatible with connected ducts.
- E. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.
 - 1. Minimum Weight: 26 oz./sq. yd..
 - 2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
 - 3. Service Temperature: Minus 40 to plus 200 deg F.

2.13 DUCT ACCESSORY HARDWARE

- A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.
- B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.
- B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.
- C. Install backdraft and control dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.
- D. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.
 - 1. Install steel volume dampers in steel ducts.
 - 2. Install aluminum volume dampers in aluminum ducts.
- E. Set dampers to fully open position before testing, adjusting, and balancing.
- F. Install test holes at fan inlets and outlets and elsewhere as indicated.
- G. Install fire and smoke dampers according to UL listing.
- H. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:
 - 1. On both sides of duct coils.
 - 2. At outdoor-air intakes and mixed-air plenums.
 - 3. At drain pans and seals.
 - 4. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.
 - 5. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
 - 6. At each change in direction and at maximum 50-foot spacing.
 - 7. Upstream and downstream from turning vanes.
 - 8. Control devices requiring inspection.
 - 9. Elsewhere as indicated.
- I. Install access doors with swing against duct static pressure.
- J. Access Door Sizes:
 - 1. One-Hand or Inspection Access: 8 by 5 inches.
 - 2. Two-Hand Access: 12 by 6 inches.
 - 3. Head and Hand Access: 18 by 10 inches.
 - 4. Head and Shoulders Access: 21 by 14 inches.
 - 5. Body Access: 25 by 14 inches.

6. Body plus Ladder Access: 25 by 17 inches.

- K. Label access doors according to Section 230553 "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.
- L. Install flexible connectors to connect ducts to equipment.
- M. Connect terminal units to supply ducts directly or with maximum 12-inch lengths of flexible duct. Do not use flexible ducts to change directions.
- N. Connect diffusers or light troffer boots to ducts directly or with maximum 96-inch lengths of flexible duct clamped or strapped in place.
- O. Connect flexible ducts to metal ducts with liquid adhesive plus tape.
- P. Install duct test holes where required for testing and balancing purposes.

3.2 FIELD QUALITY CONTROL

- A. Tests and Inspections:
 - 1. Operate dampers to verify full range of movement.
 - 2. Inspect locations of access doors and verify that purpose of access door can be performed.
 - 3. Operate fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
 - 4. Inspect turning vanes for proper and secure installation.

END OF SECTION 233300

SECTION 233346 - FLEXIBLE DUCTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Insulated flexible ducts.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Sustainable Design Submittals:
 - 1. Product data showing compliance with ASHRAE 62.1.
 - 2. Product Data: For adhesives and sealants, indicating VOC content.
 - 3. Laboratory Test Reports: For adhesives and sealants, indicating compliance with requirements for low-emitting materials.
 - 4. Laboratory Test Reports: For insulation, indicating compliance with requirements for low-emitting materials.
 - 5. Product Data : For insulation, indicating that R-values comply with tables in ASHRAE/IES 90.1, Section 6 - "Heating, Ventilating, and Air Conditioning."
- C. Shop Drawings: For flexible ducts.
 - 1. Include plans showing locations and mounting and attachment details.

1.3 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plans, drawn to scale, and coordinated with each other, using input from installers of the items involved.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

- A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- C. Comply with the Air Diffusion Council's "ADC Flexible Air Duct Test Code FD 72-R1."

- D. Comply with ASTM E 96/E 96M, "Test Methods for Water Vapor Transmission of Materials."

2.2 INSULATED FLEXIBLE DUCTS

- A. Insulated, Flexible Duct: UL 181, Class 1, two-ply vinyl film supported by helically wound, spring-steel wire; fibrous-glass insulation; polyethylene or aluminized vapor-barrier film.
 - 1. Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.
 - 2. Maximum Air Velocity: 4000 fpm.
 - 3. Temperature Range: Minus 10 to plus 160 deg F.
 - 4. Insulation R-Value: Comply with ASHRAE/IES 90.1.
- B. Insulated, Flexible Duct: UL 181, Class 1, multiple layers of aluminum laminate supported by helically wound, spring-steel wire; fibrous-glass insulation; polyethylene or aluminized vapor-barrier film.
 - 1. Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.
 - 2. Maximum Air Velocity: 4000 fpm.
 - 3. Temperature Range: Minus 20 to plus 210 deg F.
 - 4. Insulation R-Value: Comply with ASHRAE/IES 90.1.

2.3 FLEXIBLE DUCT CONNECTORS

- A. Clamps: Nylon strap in sizes 3 through 18 inches, to suit duct size.
- B. Non-Clamp Connectors: Liquid adhesive plus tape.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install flexible ducts according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.
- B. Install in indoor applications only. Flexible ductwork should not be exposed to UV lighting.
- C. Connect terminal units to supply ducts directly or with maximum 12-inch lengths of flexible duct. Do not use flexible ducts to change directions.
- D. Connect diffusers or light troffer boots to ducts directly or with maximum 96-inch lengths of flexible duct clamped or strapped in place.
- E. Connect flexible ducts to metal ducts with liquid adhesive plus tape.
- F. Install duct test holes where required for testing and balancing purposes.
- G. Installation:
 - 1. Install ducts fully extended.
 - 2. Do not bend ducts across sharp corners.

3. Bends of flexible ducting shall not exceed a minimum of one duct diameter.
4. Avoid contact with metal fixtures, water lines, pipes, or conduits.
5. Install flexible ducts in a direct line, without sags, twists, or turns.

H. Supporting Flexible Ducts:

1. Suspend flexible ducts with bands 1-1/2 inches wide or wider and spaced a maximum of 48 inches apart. Maximum centerline sag between supports shall not exceed 1/2 inch per 12 inches.
2. Install extra supports at bends placed approximately one duct diameter from center line of the bend.
3. Ducts may rest on ceiling joists or truss supports. Spacing between supports shall not exceed the maximum spacing per manufacturer's written installation instructions.
4. Vertically installed ducts shall be stabilized by support straps at a maximum of 72 inches o.c.

END OF SECTION 233346

SECTION 233713.13 - AIR DIFFUSERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Rectangular and square ceiling diffusers.
 - 2. Louver face diffusers.
 - 3. Linear slot diffusers.
- B. Related Requirements:
 - 1. Section 233300 "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers.
 - 2. Section 233713.23 "Air Registers and Grilles" for adjustable-bar register and grilles, fixed-face registers and grilles, and linear bar grilles.
 - 3. Section 233713.43 "Security Registers and Grilles" for security registers and security grilles.
 - 4. Section 233716 "Fabric Air-Diffusion Devices" for continuous tubular diffusers.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 RECTANGULAR AND SQUARE CEILING DIFFUSERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. METALAIRE, Inc.
 - 2. Price Industries.
 - 3. Titus.
- B. Devices shall be specifically designed for variable-air-volume flows.
- C. Material: Aluminum.
- D. Finish: Baked enamel, color selected by Architect.
- E. Face Size: 24 by 24 inches.
- F. Face Style: Louvered Face.
- G. Mounting: T-bar (Lay-In).

- H. Pattern: Adjustable.
- I. Dampers: Radial opposed blade.
- J. Accessories:
 - 1. See Mechanical Schedules Sheet.

2.2 LOUVER FACE DIFFUSERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. METALAIRE, Inc.
 - 2. Price Industries.
 - 3. Titus.
- B. Devices shall be specifically designed for variable-air-volume flows.
- C. Material: Aluminum.
- D. Finish: Baked enamel, color selected by Architect.
- E. Face Size: Varies. See Plans and Mechanical Schedules Sheet.
- F. Mounting: Surface.
- G. Pattern: Adjustable core style.
- H. Dampers: Radial opposed blade.
- I. Accessories:
 - 1. See Mechanical Schedules Sheet.

2.3 LINEAR SLOT DIFFUSERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. METALAIRE, Inc.
 - 2. Price Industries.
 - 3. Titus.
- B. Devices shall be specifically designed for variable-air-volume flows.
- C. Material - Shell: Aluminum, insulated.
- D. Material - Pattern Controller and Tees: Aluminum.
- E. Finish - Face and Shell: Baked enamel, color by architect.

- F. Finish - Pattern Controller: Baked enamel, color by architect.
- G. Finish - Tees: Baked enamel, color selected by Architect.
- H. Slot Width: See Plans and Mechanical Schedules Sheet.
- I. Number of Slots: See Plans and Mechanical Schedules Sheet.
- J. Length: See Plans and Mechanical Schedules Sheet.
- K. Accessories: See Plans and Mechanical Schedules Sheet.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install diffusers level and plumb.
- B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.
- C. Install diffusers with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.2 ADJUSTING

- A. After installation, adjust diffusers to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 233713.13

SECTION 233713.23 - REGISTERS AND GRILLES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Fixed face registers and grilles.
- B. Related Requirements:
 - 1. Section 233300 "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to registers and grilles.
 - 2. Section 233713.13 "Air Diffusers" for various types of air diffusers.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 REGISTERS

- A. Fixed Face Register:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Metalaire.
 - b. Price Industries.
 - c. Titus.
 - 2. Material: Aluminum.
 - 3. Finish: Baked enamel, color selected by Architect.
 - 4. Face Arrangement: Perforated core.
 - 5. Core Construction: Integral or Removable.
 - 6. Frame: 1-1/4 inches wide.
 - 7. Mounting Frame: 24"x24".
 - 8. Mounting: Lay in.
 - 9. Damper Type: Adjustable opposed blade.

2.2 GRILLES

- A. Fixed Face Grille:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Metalaire.
 - b. Price Industries.
 - c. Titus.
2. Material: Aluminum.
3. Finish: Baked enamel, color selected by Architect.
4. Face Blade Arrangement: Horizontal spaced 3/4 inch or 1/2 inch.
5. Frame: 1-1/4 inches wide.
6. Mounting Frame: Surface Mount.
7. Mounting: Countersunk screw or Concealed.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install registers and grilles level and plumb.
- B. Outlets and Inlets Locations: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.
- C. Install registers and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.2 ADJUSTING

- A. After installation, adjust registers and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 233713.23

SECTION 238216.11 - HYDRONIC AIR COILS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes hydronic heating coils.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Sustainable Design Submittals:
 - 1. Product data showing compliance with ASHRAE 62.1.

1.3 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 DESCRIPTION

- A. ASHRAE Compliance: Comply with applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

2.2 COILS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. McQuay.
 - 2. Greenheck Fan Corporation.
 - 3. Trane.
- B. Performance Ratings: Tested and rated according to AHRI 410 and ASHRAE 33.
- C. Minimum Working-Pressure/Temperature Ratings: 250 psig, 300 deg F.
- D. Source Quality Control: Factory tested to 315 psig.
- E. Tubes: ASTM B 743 copper. Round, seamless 5/8" O.D. or 1/2" O.D. copper tube staggered in the direction of airflow. Tubes shall be on 1-1/2" or 3" centers. High pressure coils shall have cupro-nickel tubes and headers.

- F. Fins: Rippled, aluminum plate fins for higher capacity and structural strength. Fins shall have drawn collars to provide a continuous surface cover over the entire tube for maximum heat transfer. Bare copper tube shall not be visible between fins. Tubes shall be mechanical expanded into the fins to provide a continuous primary to secondary compression bond over the entire finned length for maximum heat transfer rates.
- G. Frames: Shall be constructed of continuous galvanized steel with 3/8" diameter bolt holes for mounting on 6" centers. Coil side plates shall be of reinforced flange type for greater strength and ease of stacking coils in banks. Furnish coils with flanges for slip-and-drive fasteners or full flanged casings for standard installation.
- H. Coils: Shall have the connections located to permit (unique) (universal) mounting of the coil for (right- or left-) hand airflow and have equal pressure drop through all circuits. Coils shall be circuited to provide the maximum mean effective temperature difference for maximum heat transfer rates. All coils over 45" fin length shall be furnished with four fin angles to properly position the coil core.
- I. Hot-Water Coil Capacities and Characteristics:
 - 1. See Mechanical Schedules Sheet.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install coils level and plumb.
- B. Install coils in metal ducts and casings constructed according to SMACNA's "HVAC Duct Construction Standards, Metal and Flexible."
- C. Straighten bent fins on air coils.
- D. Clean coils using materials and methods recommended in writing by manufacturers, and clean inside of casings and enclosures to remove dust and debris.

3.2 CONNECTIONS

- A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to coils to allow service and maintenance.
- C. Connect water piping with unions and shutoff valves to allow coils to be disconnected without draining piping. Control valves are specified in Section 230923.11 "Control Valves," and other piping specialties are specified in Section 232116 "Hydronic Piping Specialties."

END OF SECTION 238216.11

SECTION 238239.16 - PROPELLER UNIT HEATERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes propeller unit heaters with hot-water coils.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include rated capacities, operating characteristics, furnished specialties, and accessories.
- B. Sustainable Design Submittals:
 - 1. Product Data: For ventilation equipment, indicating compliance with ASHRAE 62.1, Section 5 - "Systems and Equipment."
- C. Shop Drawings:
 - 1. Include plans, elevations, sections, and details.
 - 2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 3. Include location and size of each field connection.
 - 4. Include details of anchorages and attachments to structure and to supported equipment.
 - 5. Include equipment schedules to indicate rated capacities, operating characteristics, furnished specialties, and accessories.
 - 6. Indicate location and arrangement of piping valves and specialties.
 - 7. Indicate location and arrangement of integral controls.
 - 8. Wiring Diagrams: Power, signal, and control wiring.

1.3 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Floor plans, reflected ceiling plans, and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Suspended ceiling components.
 - 2. Structural members to which propeller unit heaters will be attached.
 - 3. Method of attaching hangers to building structure.
 - 4. Size and location of initial access modules for acoustical tile.
 - 5. Items penetrating finished ceiling, including the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
 - c. Speakers.
 - d. Sprinklers.
 - e. Access panels.

f. Plumbing Piping.

- B. Seismic Qualification Data: Submit certification that propeller unit heaters, accessories, and components will withstand seismic forces defined in Section 230548 "Vibration and Seismic Controls for HVAC."
- C. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Airtherm; a Mestek company.
 - 2. Daikin.
 - 3. Modine.

2.2 DESCRIPTION

- A. Assembly including casing, coil, fan, and motor in horizontal discharge configuration with adjustable discharge louvers.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.3 PERFORMANCE REQUIREMENTS

- A. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."
- B. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."
- C. Seismic Performance: Propeller unit heaters shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 - 1. The term "withstand" means "the unit will remain in place without separation of any parts when subjected to the seismic forces specified."

2.4 HOUSINGS

- A. Finish: Manufacturer's standard baked enamel applied to factory-assembled and -tested propeller unit heaters before shipping.

- B. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
- C. Discharge Louver: Adjustable fin diffuser for horizontal units and conical diffuser for vertical units.

2.5 COILS

- A. General Coil Requirements: Test and rate hot-water propeller unit-heater coils according to ASHRAE 33.
- B. Hot-Water Coil: Copper tube, minimum 0.025-inch wall thickness, with mechanically bonded aluminum fins spaced no closer than 0.1 inch and rated for a minimum working pressure of 200 psig and a maximum entering-water temperature of 325 deg F, with manual air vent. Test for leaks to 350 psig underwater.

2.6 FAN AND MOTOR

- A. Fan: Propeller type with aluminum wheel directly mounted on motor shaft in the fan venturi.
- B. Motor: Permanently lubricated. Comply with requirements in Section 230513 "Common Motor Requirements for HVAC Equipment."

2.7 CONTROLS

- A. Control Devices:
 - 1. Wall-mounted thermostat.

2.8 CAPACITIES AND CHARACTERISTICS

- A. Refer to Mechanical Schedules Sheet.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive propeller unit heaters for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for piping and electrical connections to verify actual locations before unit-heater installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install propeller unit heaters to comply with NFPA 90A.
- B. Install propeller unit heaters level and plumb.

- C. Suspend propeller unit heaters from structure with all-thread hanger rods and elastomeric hangers. Hanger rods and attachments to structure are specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment." Vibration hangers are specified in Section 230548 "Vibration and Seismic Controls for HVAC."
- D. Install wall-mounted thermostats and switch controls in electrical outlet boxes at heights to match lighting controls. Verify location of thermostats and other exposed control sensors with Drawings and room details before installation.

3.3 CONNECTIONS

- A. Piping installation requirements are specified in Section 232113 "Hydronic Piping" and Section 232116 "Hydronic Piping Specialties." Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to machine to allow service and maintenance.
- C. Connect piping to propeller unit heater's factory, hot-water piping package. Install the piping package if shipped loose.
- D. Comply with safety requirements in UL 1995.
- E. Unless otherwise indicated, install union and gate or ball valve on supply-water connection and union and calibrated balancing valve on return-water connection of propeller unit heater. Hydronic specialties are specified in Section 232116 "Hydronic Piping Specialties."
- F. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
- G. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.4 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
 - 1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 2. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.
- B. Units will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

END OF SECTION 238239.16

SECTION 238239.19 - WALL AND CEILING UNIT HEATERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes wall and ceiling heaters with propeller fans and electric-resistance heating coils.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include rated capacities, operating characteristics, furnished specialties, and accessories.
- B. Shop Drawings:
 - 1. Include plans, elevations, sections, and details.
 - 2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 3. Include details of anchorages and attachments to structure and to supported equipment.
 - 4. Include equipment schedules to indicate rated capacities, operating characteristics, furnished specialties, and accessories.
 - 5. Wiring Diagrams: Power, signal, and control wiring.
- C. Samples: For each exposed product and for each color and texture specified.

1.3 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Berko; Marley Engineered Products.
 - 2. Marley Engineered Products.
 - 3. QMark; Marley Engineered Products.

2.2 DESCRIPTION

- A. Assembly including chassis, electric heating coil, fan, motor, and controls. Comply with UL 2021.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.3 CABINET

- A. Front Panel: Stamped-steel louver or Extruded-aluminum bar grille, with removable panels fastened with tamperproof fasteners.
- B. Finish: Baked enamel over baked-on primer with manufacturer's standard color selected by Architect, applied to factory-assembled and -tested wall and ceiling heaters before shipping.
- C. Surface-Mounted Cabinet Enclosure: Steel with finish to match cabinet.

2.4 COIL

- A. Electric-Resistance Heating Coil: Nickel-chromium heating wire, free from expansion noise and 60-Hz hum, embedded in magnesium oxide refractory and sealed in corrosion-resistant metallic sheath. Terminate elements in stainless-steel, machine-staked terminals secured with stainless-steel hardware, and limit controls for high-temperature protection. Provide integral circuit breaker for overcurrent protection.

2.5 FAN AND MOTOR

- A. Fan: Aluminum propeller directly connected to motor.
- B. Motor: Permanently lubricated. Comply with requirements in Section 230513 "Common Motor Requirements for HVAC Equipment."

2.6 CONTROLS

- A. Controls: Integral, Unit-mounted thermostat.
- B. Electrical Connection: Factory wire motors and controls for a single field connection with disconnect switch.

2.7 CAPACITIES AND CHARACTERISTICS

- A. Airflow: See Mechanical Schedules Sheet.
- B. Fan Speed: See Mechanical Schedules Sheet.
- C. Heating Coil: See Mechanical Schedules Sheet.
- D. Electrical Characteristics for Single-Point Connection:
 - 1. Volts: 208.
 - 2. Phase: 1.
 - 3. Hertz: 60.
 - 4. Full-Load Amperes: See Mechanical Schedules Sheet.
 - 5. Minimum Circuit Ampacity: See Mechanical Schedules Sheet.
 - 6. Maximum Overcurrent Protection: See Mechanical Schedules Sheet.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install wall and ceiling unit heaters to comply with NFPA 90A.
- B. Install wall and ceiling unit heaters level and plumb.
- C. Install wall-mounted thermostats and switch controls in electrical outlet boxes at heights to match lighting controls. Verify location of thermostats and other exposed control sensors with Drawings and room details before installation.
- D. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
- E. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

END OF SECTION 238239.19

SECTION 260100 - ELECTRICAL GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. All of the Contract Documents, as listed on the Table of Contents and including General and Supplementary Conditions and Division 1, General Requirements, shall be included in, and made part of, this Section.

1.2 DESCRIPTION OF WORK

- A. Carefully examine all of the Contract Documents, criteria sheets and all other Sections of the specifications for requirements which affect work under this Section, whether or not such work is specifically mentioned in this Section.
- B. The work under this Contract shall include all labor, materials, tools, equipment, transportation, insurance, temporary protection, supervision and incidental items essential for proper installation and operation, even though not specifically mentioned or indicated on the drawings, but which are usually provided or are essential for proper installation and operation, of all systems as indicated on the drawings and specified herein.
- C. The specifications and drawings describe the minimum requirements that must be met by the Electrical Subcontractor for the installation of all work as shown on the drawings and as specified hereinunder.
- D. Coordinate work with that of all other Trades affecting or affected by the work of this Section. Cooperate with such Trades to assure the steady progress of all work under the Contract.

1.3 RELATED WORK

- A. For work to be included as part of this Section, to be furnished and installed by the Electrical Subcontractor, refer to the following Sections:
 - 1. Section 260519 LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES
 - 2. Section 260523 CONTROL-VOLTAGE ELECTRICAL POWER CABLES
 - 3. Section 260526 GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS
 - 4. Section 260529 HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS
 - 5. Section 260533 RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS
 - 6. Section 260544 SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING
 - 7. Section 260548 SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS
 - 8. Section 260553 IDENTIFICATION FOR ELECTRICAL SYSTEMS
 - 9. Section 260573.13 SHORT-CIRCUIT STUDIES
 - 10. Section 260573.16 COORDINATION STUDIES
 - 11. Section 260573.19 ARC-FAULT HAZARD ANALYSIS
 - 12. Section 260923 LIGHTING CONTROL DEVICES
 - 13. Section 262416 PANELBOARDS
 - 14. Section 262726 WIRING DEVICES

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|-----|-------------------|--|
| 15. | Section 262813 | FUSES |
| 16. | Section 262816 | ENCLOSED SWITCHES AND CIRCUIT BREAKERS |
| 17. | Section 262913.03 | MANUAL AND MAGNETIC MOTOR CONTROLLERS |
| 18. | Section 263600 | TRANSFER SWITCHES |
| 19. | Section 265119 | LED INTERIOR LIGHTING |
| 20. | Section 265219 | EMERGENCY AND EXIT LIGHTING |

- B. For work related to, and to be coordinated with the electrical work, but not included in this Section and required to be performed under other designated Sections, see the following:

1. Division 4 Section "Masonry Work" for electrical construction.
2. Division 7 Section "Firestopping".
3. Division 7 Section "Caulking, Flashing, Waterproofing, Roofing and setting of Roof Drains".
4. Division 8 Section "Access Panels".
5. Division 9 Section "Painting".

1.4 REFERENCES

- A. All materials and workmanship shall comply with all applicable Codes, Specifications, Local and State Ordinances, Industry Standards and Utility Company Regulations, latest editions.
- B. In case of difference between Building Codes, State Laws, Local Ordinances, Industry Standards and Utility Company Regulations and the Contract Documents, the Electrical Subcontractor shall promptly notify the Architect in writing of any such difference.
- C. In case of conflict between the Contract Documents and the requirements of any Code or Authorities having jurisdiction, the most stringent requirements of the aforementioned shall govern.
- D. Should the Electrical Subcontractor perform any work that does not comply with the requirements of the applicable Building Codes, State Laws, Local Ordinances, Industry Standards and Utility Company Regulations, he shall bear all costs arising in correcting the deficiencies, as approved by the Architect/Owner.
- E. Applicable Codes and Standards shall include all State Laws, Local Ordinances, Utility Company Regulations, and the applicable requirements of the latest adopted edition of the following Codes and Standards, without limiting the number, as follows:
1. NFPA 13: Sprinkler Systems
 2. NFPA 70: National Electrical Code
 3. NFPA 72: National Fire Alarm Code
 4. NFPA 101: Life Safety Code
 5. Occupational Safety and Health Standards
 6. Environmental Protection Agency
 7. National Fire Protection Association
 8. Department of Environmental Protection
 9. Uniform Building Code (UBC)
 10. International Building Code (IBC)
 11. International Energy Conservation Code
 12. State Demolition Code
 13. State Fire Safety Code
 14. Local Building Code.
 15. ICC/ANSI A117.1, Accessible and Usable Buildings and Facilities

- F. In these specifications, references made to the following Industry Standards and Code Bodies are intended to indicate the latest volume or publication of the Standard. All equipment, materials and details of installation shall comply with the requirements and latest revisions of the following Bodies, as applicable:

ANSI:	AMERICAN NATIONAL STANDARDS INSTITUTE
ASTM:	AMERICAN SOCIETY OF TESTING MATERIALS
AWG:	AMERICAN WIRE GAUGE
FM:	FACTORY MUTUAL
IEEE:	INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS
IES:	ILLUMINATING ENGINEERING SOCIETY
NEMA:	NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
UL:	UNDERWRITERS' LABORATORIES
IRI:	INDUSTRIAL RISK INSURERS
ISO:	INSURANCE SERVICES OFFICE
NBS:	NATIONAL BUREAU OF STANDARDS
NSC:	NATIONAL SAFETY COUNCIL

- G. Electrical Subcontractor for the work in his scope of work shall give all necessary notices, obtain all permits, pay all governmental taxes, fees and other costs in connection with his work; file for necessary approvals with the jurisdiction under which the work is to be performed. Electrical Subcontractor shall obtain all required Certificates of Inspection for his respective work and deliver same to the Architect before request for acceptance of his portion of work is made and before final payment.

1.5 QUALITY ASSURANCE

- A. The manufacturers listed within these specifications have been preselected for use on this project. No submittal will be accepted from a manufacturer other than specified.
- B. Electrical Subcontractor shall furnish and install all equipment, accessories, connections and incidental items necessary to fully complete the work under his Contract for use, occupancy and operation by the Owner.
- C. Where equipment of a substitute manufacturer differ from that specified and require different arrangement or connections from those shown, it shall be the responsibility of the Subcontractor responsible for the substitution to modify the installation of the equipment/system to operate properly and in harmony with the original intent of the drawings and specifications. When directed by the Architect, the Electrical Subcontractor shall submit drawings showing the proposed, substitute installation. If the proposed installation is accepted, the Electrical Subcontractor shall make all necessary changes in all affected related work provided under his and other Sections including location of roughing-in connections by other Trades, conduit, supports, etc. All changes shall be made at no increase in the Contract amount or additional cost to the Owner. The General Contractor shall be responsible to assure that the Subcontractor responsible for the substitution bears the cost arising to all other Trades as a result of the substitution.
- D. Unless specifically indicated otherwise, all equipment and materials required for installation under these specifications shall be new, unused and without blemish or defect. Equipment and materials shall be products which will meet with the acceptance of the Authorities having jurisdiction over the work and as specified hereinbefore. Where such acceptance is contingent upon having the products listed and/or

labeled by FM or UL or another testing laboratory, the products shall be so listed and/or labeled. Where no specific indication as to the type or quality of material or equipment is indicated, a first class standard article shall be provided.

1.6 WARRANTY

- A. Attention is directed to provisions of the General Requirements and Supplementary General Requirements regarding and warranties for work under this Contract.
- B. All warranties shall begin on the Date of Substantial Completion of the entire project or the Owner's acceptance of the workmanship and/or material covered by the warranty, whichever is later. The warranty coverage shall continue for the specified period. Refer to individual specification sections for warranty period. If no specific warranty period is specified, the warranty shall extend for a minimum of 365 days.
- C. Manufacturers shall provide their standard warranties for work under the Electrical Trades. However, such warranties shall be in addition to, and not in lieu of, all other liabilities which the manufacturer and Electrical Subcontractor may have by law or by other provisions of the Contract Documents.
- D. All materials, items of equipment and workmanship furnished under the Electrical Section shall carry the standard warranty against all defects in material and workmanship. Any fault due to defective or improper material, equipment, workmanship or design which may develop shall be made good, forthwith, by and at the expense of the Electrical Subcontractor for the work under his Contract, including all other damage done to areas, materials and other systems resulting from this failure.
- E. The Electrical Subcontractor shall warranty that all elements of the systems which are to be provided under his Contract, are of sufficient capacity to meet the specified performance requirements as set forth herein or as indicated.
- F. Upon receipt of notice from the Owner or Architect of failure of any part of the systems or equipment during the warranty period, the affected part or parts shall be replaced by the Electrical Subcontractor for his work or any other work affected by the failure(s).
- G. Electrical Subcontractor shall furnish, before the final payment is made, a written warranty covering the above requirements in accordance with the General Requirements.

1.7 DEFINITIONS

- A. Words in the singular shall also mean and include the plural, wherever the context so indicates, and words in the plural shall mean the singular, wherever the context so indicates.
- B. Wherever the terms "shown on drawings" are used in the specifications, they shall mean "noted", "indicated", "scheduled", "detailed", or any other diagrammatic or written reference made on the drawings.
- C. Wherever the term "provide" is used in the specifications it will mean "furnish" and "install", "connect", "apply", "erect", "construct", or similar terms, unless otherwise indicated in the specifications.
- D. "Work": Labor, materials, equipment, apparatus, controls and accessories required for proper and complete installation.
- E. "Concealed": Embedded in masonry or other construction; or installed in furred spaces, trenches or crawl spaces; or installed within double partitions or hung ceilings; or in enclosures.

- F. "Exposed": Visible to building occupants, excluding mechanical room and utility tunnel locations.
- G. "Acceptable equivalent" or "Equal": Of weight, size, design, capacity and efficiency to meet requirements specified and shown, and of acceptable manufacturer, as determined in the opinion of the Architect.
- H. "Acceptable": Acceptable, as determined in the opinion of the Architect.
- I. "Contractor": General Contractor.
- J. "Named" Product: Manufacturer's name for product, as recorded in published documents of latest issue as of date of Contract Documents. Obtain Architect's permission before using products of later or earlier model.
- K. Wherever the term "material" is used in the specifications it will mean any "product", "equipment", "device", "assembly", or "item" required under the Contract, as indicated by trade or brand name, manufacturer's name, standard specification reference or other description.
- L. The terms "approved", or "approval" shall mean the written approval of the Architect.
- M. The term "Contract Documents" shall mean the entire set of Drawings and Specifications as listed in the Table of Contents of the General Conditions including all bound and unbound material and all items officially issued to date such as addenda, bulletins, job modifications, etc.
- N. The term "specification" shall mean all information contained in the bound or unbound volume, including all "Contract Documents" defined therein, except for the drawings.
- O. The terms "directed", "required", "permitted", "ordered", "designated", "prescribed", and similar words shall mean the direction, requirement, permission, order, designation or prescription of the Architect; the terms "approved", "acceptable", "satisfactory", and similar words shall mean approved by, acceptable or satisfactory to the Architect; and, the terms "necessary", "reasonable", "proper", "correct", and similar words shall mean necessary, reasonable, proper or correct in the judgment of the Architect.
- P. "Accessible" indicates ease of access with or without the use of ladders and without requiring extensive removal of other equipment, such as ductwork, piping, etc. to gain access. "Accessible ceiling" indicates acoustic tile type hung ceilings. Concealed spline or sheetrock ceilings with access panels shall not be considered accessible ceilings.
- Q. "Concealed" means hidden from sight in chases, furred spaces, shafts, hung ceilings, embedded in construction or in crawl spaces.
- R. "Exposed" means not installed underground or "concealed" as defined above.
- S. "Electrical Subcontractor" refers to the Subcontractor responsible for furnishing and installation of all work indicated on the Electrical drawings and in the Electrical specifications.
- T. "Architect" shall refer to the Architect: "Phase Zero Design" and/or the Engineer "Innovative Engineering Services, LLC."
- U. "Owner" shall refer to the Owner or designated representative.
- V. "Other Work Contractor" (O.W.C.) refers to the Contractor(s), or Subcontractor(s) performing work under other Sections of the Contract Documents.

1.8 THE SUBCONTRACTOR

- A. The Electrical Subcontractor shall visit the site of the proposed new facility and base his bids from his own site examinations and estimates. The Electrical Subcontractor shall not hold the Architect, Engineer, Owner or their agents or employees responsible for, or bound by, any schedule, estimate or of any plan thereof. The Electrical Subcontractor shall study the Contract Documents included under this Contract to determine exactly the extent of work provided under this Contract, as well as to ascertain the difficulty to be encountered in performing the work, in installing new equipment and systems and coordinating the work with the other Trades and existing building conditions.
- B. The Electrical Subcontractor shall faithfully execute his work according to the terms and conditions of the Contract and specifications, and shall take all responsibility for and bear all losses resulting to him in the execution of his work.
- C. The Electrical Subcontractor shall be responsible for the location and performance of work provided under his Contract as indicated on the Contract Documents. All parties employed directly or indirectly by the Electrical Subcontractor shall perform their work according to all the conditions as set forth in these specifications.
- D. The Electrical Subcontractor shall furnish all materials and do all work in accordance with these specifications, and any supplementary documents provided by the Architect. The work shall include everything shown on the drawings and/or required by the specifications as interpreted by the Architect, regardless of where such information is indicated in the Contract Documents (Architectural, HVAC, Plumbing, Fire Protection, etc.). Unless specifically indicated otherwise, all work and materials furnished and installed shall be new, unused and of the best quality and workmanship. The Electrical Subcontractor shall cooperate with the Architect so that no error or discrepancy in the Contract Documents shall cause defective materials to be used or poor workmanship to be performed.

1.9 COORDINATION OF WORK

- A. The Electrical Subcontractor shall compare his drawings and specifications with those of other Trades as well as the Architectural drawings and specifications, and report any discrepancies between them to the Architect and obtain from the Architect written instructions for changes necessary in the electrical work.
- B. Coordinate work with that of all other Trades affecting or affected by the work of this Section. Cooperate with such Trades to assure the steady progress of all work under the Contract.
- C. All work shall be installed in cooperation with other Trades installing interrelated work. Before installation, Electrical Subcontractor shall make proper provisions to avoid interferences in a manner approved by the Architect. All changes required in the work of the Electrical Subcontractor or that of any other trade caused by the Electrical Subcontractor's neglect, shall be made by him at his own expense, to the Architect's satisfaction.
- D. The Electrical Subcontractor must include in his bid sufficient dollar amounts to coordinate the work of this Contract. This project is complex and will require additional time to coordinate all Trades and allow implementation of the Owners Standards and maintenance serviceability requirements. This requirement shall include, but not be limited to, producing the coordination drawings, as many times and as many drawings as required, to ensure serviceability of equipment, as approved by the Architect.
- E. Locations of conduits, boxes distribution equipment, systems, etc. shall be adjusted to accommodate the work with interferences anticipated and encountered. The Electrical Subcontractor shall determine the exact routing and location of his systems prior to fabrication or installation of any system component. Accurate measurements and coordination drawings shall be completed to verify dimensions and characteristics of the various systems installations.

- F. Lines which pitch shall have the right-of-way over those which do not pitch. For example, steam piping shall normally have the right-of-way. Lines whose elevations cannot be changed shall have the right-of-way over lines whose elevations can be changed.
- G. Offsets, transitions and changes of direction in all systems shall be made as required to maintain proper headroom and pitch of sloping lines whether or not indicated on the drawings. The Electrical Subcontractor shall provide elbows, conduit bends, "LB" fittings, offsets in busway, etc. as required for his work to affect these offsets, transitions and changes in direction.
- H. All work shall be installed in a way to permit removal (without damage to other parts) of pull and junction box covers, wiring, lighting fixtures, and all other system components provided under this Contract requiring periodic replacement or maintenance. All pull and junction boxes shall be arranged in a manner to clear the openings of swinging overhead access doors as well as ceiling tiles. All work shall be done to allow easy access for maintaining equipment. The Owner and Engineer will require proof via the preparation of large scale sections and part plans that pull and junction boxes, etc. are accessible after the work is completed. Any items in the field discovered to be in non-compliance shall be removed and relocated, as required, and as directed by the Architect.
- I. The Contract Drawings are diagrammatic only intending to show general runs and locations of conduits, distribution equipment, lighting fixtures, systems equipment, etc. and not necessarily showing all required offsets, details and accessories and equipment to be connected. All work shall be accurately laid out with other Trades to avoid conflicts and to obtain a neat and workmanlike installation which will afford maximum accessibility for operation, maintenance and headroom.
- J. Where discrepancies in scope of work as to what Trade provides items, such as starters, disconnects, flow switches, etc., exist, such conflicts shall be reported to the Architect during bidding and prior to signing of the Contract. If such action is not taken, the Electrical Subcontractor shall furnish such items as part of his work as necessary, for complete and operable systems and equipment, as determined by the Architect.
- K. The Electrical Subcontractor shall coordinate the installation of all equipment.
- L. Where drawing details, plans, specification requirements and/or scheduled equipment capacities are in conflict and where feeders, branch circuits or equipment are shown to be different between plans and/or between plans and riser diagrams, details or specifications, the most stringent requirement will be included in the Contract. Electrical systems and equipment called for in the specification and/or shown on the drawings shall be provided under this Contract as if it were required by both the drawings and specifications. However, prior to ordering or installation of any portion of work which appears to be in conflict, such work shall be brought to Architect's attention for direction as to what is to be provided.
- M. Final location of all CCTV cameras, smoke detectors, exit signs, switches, receptacles, fire alarm devices, etc., shall be coordinated with the Architectural reflected ceiling plans, architectural elevations, and/or other Architectural details, as applicable and shall not be scaled from locations indicated on the electrical drawings. Obtain approval of locations of all devices from Architect in the field. The Owner/Architect reserves the right to relocate any receptacle, device, lighting fixture, etc. 10'-0" in any direction prior to installation at no additional cost to the Project.
- N. Any equipment shown on the Electrical and/or Architectural drawings to be provided with services, shall be included under this Contract as applicable, including all conduit and wiring connections to systems, to make equipment complete and operable. Additional wiring, equipment, etc., shall be provided to accomplish the above requirement, as required, all as part of this Contract, at no extra cost to the Owner. This requirement necessitates that the Electrical Subcontractor review the Architectural drawings and the drawings of other Trades during bidding to ascertain the extent of all requirements, and interface between the Trades and scope of work.

- O. The Electrical Subcontractor shall coordinate his work with other Trades' work so that all equipment and systems can be easily, safely and properly serviced and maintained. It is imperative that service personnel can safely access all equipment. Provide safety rails, steps, ladders, valve chains, handle extensions, etc. as required, in addition to the ones shown on the drawings, to ensure safe and easy access to all equipment is provided in a manner approved by the Architect.

1.10 GIVING INFORMATION

- A. Electrical Subcontractor shall keep himself fully informed as to the shape, size and position of all openings required for his apparatus and shall give information to the General Contractor and other Subcontractors sufficiently in advance of the work so that all openings may be built in advance.

1.11 EQUIPMENT AND MATERIALS

- A. Equipment and materials shall be delivered to the site and stored in original sealed containers, suitably sheltered from the elements, but readily accessible for inspection by the Architect until installed. All items subject to moisture damage such as controls shall be stored in dry, heated spaces. Equipment such as switchgear with heater elements installed shall have the heater elements energized after the equipment is received by the Electrical Subcontractor.
- B. Equipment shall be tightly covered and protected against dirt, water, and chemical or mechanical injury and theft. At the completion of the work, equipment and materials shall be cleaned and polished thoroughly and turned over to the Owner in a condition satisfactory to the Architect. Damage or defects that develop before acceptance of the work shall be made good at the Electrical Subcontractor's expense.
- C. The Electrical Subcontractor shall make necessary field measurements to ascertain space requirements, for equipment and connections to be provided under his respective Trade and shall furnish and install such sizes and shapes of equipment to allow for the final installation to conform to the drawings and specifications.
- D. Manufacturer's directions shall be followed completely in the delivery, storage, protection and installation. Promptly notify the Architect in writing of any conflict between any requirements of the Contract Documents and the manufacturer's directions. Obtain the Architect's written instructions before proceeding with the work. Should Electrical Subcontractor perform any work that does not comply with the manufacturer's directions or written instructions from the Architect, he shall bear all costs arising in correcting any deficiencies that should arise.
- E. All equipment of one type (such as CCTV cameras, cable, wiring devices, fire alarm system, etc.) shall be the products of one manufacturer.
- F. Equipment prepurchased by the General Contractor on behalf of the Owner or by the Owner himself, if assigned to the Electrical Subcontractor, shall be received, installed, tested, etc., as if the equipment was purchased by the Electrical Subcontractor. All guarantees, service contracts, etc., shall be the same as for all other equipment provided under this Contract.

1.12 USE OF PREMISES

- A. The Electrical Subcontractor shall confine all apparatus, storage of materials and construction to the limits as directed by the Architect and he shall not encumber the premises with his materials. The Electrical Subcontractor shall be held responsible for repairs, patching, or cleaning arising from any unauthorized use of premises.

- B. Notwithstanding any approvals or instructions which must be obtained by the Electrical Subcontractor from the Architect in connection with the use of the premises, the responsibility for the safe working conditions at the site shall remain that of the Electrical Subcontractor. The Architect, Engineer or Owner shall not be deemed to have any responsibility or liability in connection with safe working conditions at the site.

1.13 PROTECTION

- A. Materials, conduit, lighting fixtures, switchgear, etc., shall be properly protected during construction and all conduit openings shall be temporarily closed so as to prevent obstruction and damage. Post notice prohibiting the use of all systems provided under the Electrical Contract, prior to completion of work and acceptance of all systems by the Owner except as otherwise, instructed by Architect. Take precautions to protect all materials furnished from damage and theft.
- B. The Electrical Subcontractor shall furnish, place and maintain proper safety guards for the prevention of accidents that might be caused by the workmanship, materials, equipment or electrical systems provided under his Contract.

1.14 DAMAGE TO OTHER WORK

- A. The Electrical Subcontractor shall be held responsible and shall pay for all damages caused by his work to the building structures, equipment, conduits, systems, etc., and all work and finishes installed under this Contract. Repair of such damage shall be done by the General Contractor at the expense of the Electrical Subcontractor, to the Architect's satisfaction.

1.15 CORRECTION OF WORK

- A. The Electrical Subcontractor shall promptly correct all work provided under his Contract and rejected by the Architect as defective or as failing to conform to the Contract Documents, whether observed before or after completion of work, and whether or not fabricated, installed or completed.

1.16 EXTRA WORK

- A. No claim for extra work will be allowed unless it is authorized by the Architect before commencement of the extra said work.

1.17 TOUCH-UP PAINTING

- A. All equipment and systems shall be thoroughly cleaned of rust, splatters and other foreign matter of discoloration leaving every part of all systems in an acceptable prime condition. The Electrical Subcontractor for the work under his Contract shall refinish and restore to the original condition all equipment which has sustained damage to the manufacturer's prime and finish coats of paint and/or enamel during the course of construction, regardless of the source of damage.

1.18 PARTS LIST AND INSTRUCTIONS FOR OPERATION AND MAINTENANCE

- A. The Electrical Subcontractor shall thoroughly instruct the Owner, to the complete satisfaction of the Architect, in the proper operation of all systems and equipment provided by him. The Electrical Subcontractor shall make arrangements, via the Architect, as to whom the instructions are to be given in

the operation of the basic and auxiliary systems and the period of time in which they are to be given. The Architect shall be completely satisfied that the Owner has been thoroughly and completely instructed in the proper operation of all systems and equipment before final payment is made. If the Architect determines that complete and thorough instructions have not been given by the Electrical Subcontractor to the Owner's representative, then the Electrical Subcontractor shall be directed by the Architect to provide whatever instructions are necessary until the intent of this specification has been complied with.

- B. Electrical Subcontractor shall submit to the Architect for approval, the required typed sets (see General Conditions and Division 1) bound neatly in loose-leaf binders, of all instructions for the installation, operation, emergency operation, start-up, care and maintenance of all equipment and systems (including instructions for the ordering and stocking of spare parts for all equipment installed under this Contract). The lists shall include part numbers and suggested supplier. Each set shall also include an itemized list of component parts that should be kept on hand and where such parts can be purchased.
- C. Information shall indicate possible problems with equipment and suggested corrective action. The manuals shall be indexed for each type of equipment. Each section shall be clearly divided from the other sections. A sub-index for each section shall also be provided. The methodology of setting-up the manuals shall be submitted to the Architect and Owner for review prior to final submission of manuals.

1.19 MANUFACTURER'S REPRESENTATIVE

- A. The Electrical Subcontractor shall provide, at the appropriate time or as directed by Architect, the on-site services of a competent factory trained Engineer of the manufacturer of specific equipment, such as the fire alarm system, CCTV camera system, etc., to inspect, test, adjust and place in proper operating condition any and all items of the same manufacturer. No additional compensation will be allowed for such services. A written report shall be issued by the particular manufacturer with his findings for the Architect's record.

1.20 COORDINATION DRAWINGS

- A. Before materials are purchased, fabricated or work is begun, each Subcontractor shall prepare and obtain approval of coordination drawings, and sections for all floors/areas, including buried system/services, resulting in one (1) set of all-Trade-composite at 3/8" scale drawings, showing the size and location of all equipment, in the manner described hereinunder General Requirements. Architects review and approval of coordination drawings must be obtained prior to any fabrication or installation of any equipment or systems.
- B. The coordination drawings shall be generated from a computer CAD program compatible with AutoCAD Release 2000, in DWG or DXF format. The HVAC Subcontractor shall take the lead, supervise, and coordinate production of coordinated layout drawings, to show and coordinate all equipment. These drawings shall then be circulated to the Electrical Subcontractor so that he can indicate all his work as directed by the General Contractor and Architect and as required, to result in a fully coordinated installation.
- C. The Electrical Subcontractor shall indicate all electrical equipment and conduit provided by him or his Sub-subcontractors on the coordination drawings. This equipment and conduit shall include, but not be limited to, the following:
 - 1. Conduit routing and rack locations for all conduits regardless of conduit size when more than 4 conduits are grouped in a rack.
 - 2. All pull and splice boxes over 8" in any direction.
 - 3. MC cable routing and rack locations for all MC cable when more than 4 runs are grouped in a rack.

4. Smoke detector locations relative to supply and return grilles.

- D. All costs associated with all aspects of coordination drawings, regardless as to how long they take to produce and how many times they have to be redrawn, shall be borne by the Electrical Subcontractor.
- E. The Electrical Subcontractor may purchase the electrical AutoCAD computer drawing files from the Electrical Contract set on disk or via modem from the Engineer at the nominal cost of \$500.00, if he so chooses.
- F. The Electrical Subcontractor shall issue to the HVAC Subcontractor, via diskette, a complete set of equipment installation layout documents in AutoCAD Release 2000 (DWG or DXF) format, for use in developing the required coordination drawings.
- G. The Electrical Subcontractor shall be responsible for coordinating the Electrical AutoCAD coordination drawings, including, but not limited to, the drawing lists, layering system, producing copies of the drawings for the Architect as directed, etc.

1.21 RECORD DRAWINGS/AS-BUILT DRAWINGS

- A. The Electrical Subcontractor shall maintain current at the site a set of his drawings on which he shall accurately show the actual installation of all work provided under his Contract indicating hereon any variation from the Contract Drawings, in accordance with the General Conditions and Division 1. Changes, whether resulting from formal change orders or other instructions issued by the Architect, shall be recorded. Include changes in sizes, location, and dimensions of conduit, switchgear, lighting fixtures, fire alarm equipment, wiring devices, etc.
- B. The Electrical Subcontractor shall indicate progress by coloring-in various conduits, equipment and associated appurtenances exactly as they are erected. This process shall incorporate both the changes noted above and all other deviations from the original drawings whether resulting from job conditions encountered or from any other causes.
- C. The marked-up and colored-up prints will be used as a guide for determining the progress of the work installed. They shall be inspected periodically by the Architect and Owner and they shall be corrected immediately if found either inaccurate or incomplete. This procedure is mandatory.
- D. At the completion of the job, these prints shall be submitted to the General Contractor and then to the Architect for final review and comment. The prints will be returned with appropriate comments and recommendations. These corrected prints, together with corrected prints indicating all the revisions, additions and deletions of work, shall form the basis for preparing a set of As-built Record Drawings.
- E. The Subcontractor shall be responsible for generating as-built Record Drawings utilizing CAD based documents in AutoCAD Release 2000 DWG or DXF format. A bound set of plans, as well as the computer files, on disk, shall be turned over to the Architect for review. After acceptance of the as-built documents by the Architect, the Electrical Subcontractor shall make any corrections necessary to the as-built documents and prepare one reproducible set of drawings as well as bound blueprint set(s) (quantity as determined by the Architect) for distribution to the Owner via the Architect.
- F. The Electrical Subcontractor may use the computer drawing files used for coordination drawings or purchase the Engineers most recently updated computer drawing files at a nominal charge of \$500.00 per drawing file. The updated drawings may not include all changes made during the course of construction and it shall be the Electrical Subcontractors responsibility to update the as-built documents to include all changes brought forth to the project resulting from bulletins, request for information (RFI's), change orders, etc. The Electrical Subcontractor may review the Engineers latest computer files for completeness prior to purchase, however the Engineer will not be responsible for updating the computer files.

- G. Included with the above shall be a complete drawing list and a standard layering system, which shall be required to be maintained within the as-built Record CAD documents.
- H. The Subcontractor shall be issued bulletins in the same manner as the original Design Documents described above.
- I. The as-built CAD documents required shall be in addition to other requirements stated elsewhere.

1.22 SUBMITTALS

- A. Prepare and submit shop drawings in accordance with the requirements hereinbefore specified, and with Division 1 Section "Submittal Procedures" in the manner described therein, modified as noted hereinafter.
- B. The selection and intention to use a product specified by name shall not excuse the need for timely submission of shop drawings for that product.
- C. Prior to submitting shop drawings, submit for review preliminary list of intended or proposed manufacturers for all items for which shop drawings are required.
- D. Submission of shop drawings of an unnamed manufacture or shop drawings at variance with the Contract Documents is not a proper request for substitution.
- E. Samples that are submitted in lieu of shop drawings shall be clearly identified and shall be submitted in duplicate. Only one sample will be returned and that accepted sample shall be kept available at appropriate job site office. Accepted sample retained by Architect will be kept available at Architect's home office.
- F. Upon completion of shop drawing review, shop drawings will be returned, marked with one of following notations: No Exception Taken, Revise as Noted, Revise and Resubmit, or Rejected. Only products whose shop drawings are marked "No Exception Taken" or "Revise as Noted" shall be used on the project.
- G. Submittals shall include the following information:
 - 1. Descriptive and product data necessary to verify compliance with Contract Documents.
 - 2. Manufacturer's specifications including materials of construction, metal gauge, thickness and finish.
 - 3. Certified dimensional drawings including clearances required for maintenance or access.
 - 4. Performance data, ratings, operating characteristics, and operating limits.
 - 5. Electrical ratings and characteristics.
 - 6. Wiring and control diagrams, where applicable.
 - 7. Certifications requested, including UL label or listing.
 - 8. List of accessories, which are required but are not being provided by the product manufacturer or are not being furnished under this Section. Identify the Section(s) under which the accessories are being furnished.
- H. In addition, submittals shall be clearly marked for the following:
 - 1. Specification Section and Paragraph, or Drawing Schedule/Note/Detail/etc., where equipment is specified.
 - 2. Equipment or fixture identification corresponding to that used in Contract Documents.
 - 3. Accessories and special or non-standard features and materials which are being furnished.
- I. The following is a list of electrical items that must be submitted for review:

1. Service and Metering Equipment
2. Panelboards
3. Interior light fixtures
4. Exterior light fixtures
5. Lighting control devices
6. Network lighting controls
7. Safety/disconnect switches
8. Circuit breakers
9. Raceways, wire and cable
10. Fire alarm equipment
11. Devices (receptacles, toggle switches, etc.)

1.23 INTENT

- A. It is the intent of the Contract Documents to require finished work, tested and ready for operation.
- B. It is not intended that Contract Documents show every pipe, wire, conduit, fitting and appurtenance; however, such parts as may be necessary to complete the systems in accordance with best trade practice and Code requirements and to Architect's satisfaction shall be deemed to be included.
- C. Drawings are diagrammatic and indicate the general arrangement of systems and work included in the Contract. DO NOT SCALE THE DRAWINGS.

1.24 PRODUCT SELECTION

- A. Contractor's options for selecting products are limited by Contract Document requirements and governing regulations and are not controlled by industry traditions or procedures experienced by Contractor on previous construction projects. Required procedures include, but are not necessarily limited to, following various methods of specifying:
 1. Single Product Manufacturer Named: Provide product indicated. Advise Architect, and obtain instructions before proceeding, when named product is known to be unacceptable or not feasible.
 2. Two or More Manufacturers' Products Named: Provide one of the named products, at Contractor's option, but excluding products which do not comply with requirements. Do not provide, nor offer to provide, an unnamed product unless named products do not comply with requirements or are not feasible.
 3. "Acceptable Equivalent" or "Or Equal": Where named products are accompanied by this term or words of similar effect, provide named products or propose substitute product according to paragraph 1.25, SUBSTITUTIONS.
 4. Standards, Codes and Regulations: Where specification requires only compliance with a standard, code or regulation, Contractor may select any product which complies with requirements of that standard, code or regulation.
 5. Performance Requirements: Provide products which comply with specific performances indicated and which are recommended by manufacturer (in published product literature or by individual certification) for application intended. Overall performance of product is implied where product is specified with only certain specific performance requirements.
 6. Prescriptive Requirements: Provide products which have been produced in accordance with prescriptive requirements using specified materials and components, and complying with specified requirements for fabricating, finishing, testing and other manufacturing processes.
 7. Visual Matching: Where matching with an established material is required, Architect's judgment of whether proposed product matches established material shall be final. Where product specified does NOT match established material, propose substitute product according to paragraph 1.25, SUBSTITUTIONS. Follow requirements for CHANGE

ORDERS, also, if matching product within cost category of specified product is not available.

8. "Color as Selected by Architect": Unless otherwise noted, where specified product requirements include "Color as Selected by Architect" or words of similar effect, the selection of manufacturer and basic product complying with Contract Documents is Contractor's option and subsequent selection of color is Architect's option.

- B. Inclusion by name, of more than one manufacturer or fabricator, does not necessarily imply acceptability of standard products of those named. All manufacturers, named or proposed, shall conform, with modification as necessary, to criteria established by contract documents for performance, efficiency, materials and special accessories.

1.25 SUBSTITUTIONS

- A. Contractor shall pay Architect/Engineer for time spent reviewing substitution requests. Charges shall be \$120/hour. Submittal of substitution request will be construed as evidence of Contractor's agreement to pay such charges, with no added cost to Owner.
- B. Contractor's request for substitution may be submitted only after award of Contract. Requests shall be in writing on Contractor's letterhead and shall include:
 1. Contractor's detailed comparison of significant qualities between specified item and proposed substitution.
 2. Statement of effect on construction time, coordination with other affected work, and cost information or proposal.
 3. Contractor's statement to the effect that proposed substitution will result in overall work equal to, or better than, work originally intended.
- C. Substitution requests will be considered: If extensive revisions to Contract Documents are not required; if changes are in keeping with general intent of Contract Documents; if submitted in timely and proper manner, fully documented; and if one or more of following conditions is satisfied; all as judged by Architect:
 1. Where request is directly related to "acceptable equivalent" clause, "or equal" clause or words of similar effect in Contract Documents.
 2. Where specified product, material or method cannot be provided within Contract Time; but not as a result of Contractor's failure to pursue the work promptly or to coordinate various activities properly.
 3. Where specified product, material or method can not be provided in manner which is compatible with other materials of the work and where Contractor certifies that proposed substitution is compatible.
 4. Where specified product, material or method can not be properly coordinated with other materials of the work and where Contractor certifies that proposed substitution can be properly coordinated.
 5. Where specified product, material or method cannot be warranted as required and where Contractor certifies that proposed substitution can be so warranted.
 6. Where specified product, material or method can not be used without adversely affecting Owner's insurance coverage on completed work and where Contractor certifies that proposed substitution can be so used.
 7. Where specified product, material or method will encounter other substantial non-compliance, which are not possible to otherwise overcome except by using proposed substitution.
 8. Where specified product, material or method cannot receive required approval by governing authority and proposed substitution can be so approved.
 9. Where substantial advantage is offered to the Owner; in terms of cost, time, energy conservation or other valuable considerations; after deducting offsetting responsibilities that Owner may be required to bear, including additional compensation to Architect for

redesign and evaluation services, increased cost of other work by Owner or separate contractors, and similar considerations.

- D. The burden is upon the Contractor, supplier and manufacturer to satisfy Architect that:
 - 1. Proposed substitute is equal to, or superior to, the item specified.
 - 2. Intent of the Contract Documents, including required performance, capacity, efficiency, quality, durability, safety, function, appearance, space clearances and delivery date, will be equaled or bettered.
- E. Submission of shop drawings of unspecified manufacturer or shop drawings at variance with the Contract Documents is not a proper request for substitution.
- F. Changes in work of other trades, such as structural supports, which are required as a result of substitution and the associated costs for such changes, shall be the complete responsibility of Contractor proposing substitution. Except as noted in subparagraph 1.25.C.9 above, there shall be no additional expense to the Owner.

1.26 SAMPLES

- A. Submit samples as requested by Architect.

1.27 EQUIPMENT AND BRANCH CIRCUITING DESIGN CRITERIA

- A. Receptacle Branch Circuit Criteria:
 - 1. Convenience receptacles for general use, such as Classrooms, Gross Motor areas, Lobbies, etc., will have a maximum of six (6) duplex receptacles per 20 ampere, single-pole circuit.
 - 2. All duplex and special purpose receptacles indicated for specific equipment will be on a dedicated circuit.
- B. Motors:
 - 1. All motors 1/8 HP and under shall be maximum wired three (3) per 20 ampere, single-pole circuit, 120 volt.
 - 2. All motors above 1/8 HP shall be served from an individual branch circuit.
 - 3. Refer to HVAC and Plumbing drawings for location and ratings of motors.
 - 4. All motors 1 HP and above shall be 208 volt, 3 phase and be on individual circuits.
- C. Telephone/Data Outlets:
 - 1. Telephone/data outlets shall be provided as indicated on plans.

PART 2 - PRODUCTS

2.1 GENERAL PRODUCT REQUIREMENTS

- A. Products shall be undamaged and unused at time of installation and shall be complete with accessories, trim, finish, safety guards and other devices and details needed for complete installation and for intended use.
- B. Where available, products shall be standard products of types which have been produced and use previously and successfully on other projects and in similar applications.

- C. Where products by their nature and their use are likely to need replacement parts on future date, for maintenance and repair or replacement work, products shall be standard domestically produced products likely to have such parts available to Owner in future.
- D. Labels and stamps which are required for observation after installation shall be located on accessible surfaces which, in occupied spaces, are not conspicuous. Other labels and stamps shall be located on concealed surfaces.

PART 3 - EXECUTION

3.1 COOPERATION AND WORK PROGRESS

- A. The Electrical work shall be carried on under the usual construction conditions, in conjunction with all other work at the site. The Electrical Subcontractor shall cooperate with the Architect, General Contractor, all other Subcontractors and equipment suppliers working at the site. The Electrical Subcontractor shall coordinate the work and proceed in a manner so as not to delay the progress of the project.
- B. The Electrical Subcontractor shall coordinate his work with the progress of the building and other Trades so that he will complete his work as soon as conditions permit and such that interruptions of the building functions will be at a minimum. Any overtime hours worked or additional costs incurred due to lack of or improper coordination with other Trades or the Owner by the Electrical Subcontractor, shall be assumed by him without any additional cost to the Owner.
- C. The Electrical Subcontractor shall furnish information on all equipment that is furnished under this Section but installed under another Section to the installing Subcontractor as specified herein.
- D. The Electrical Subcontractor shall provide all materials, equipment and workmanship to provide for adequate protection of all electrical equipment during the course of construction of the project. This shall also include protection from moisture and all foreign matter. The Electrical Subcontractor shall also be responsible for damage which he causes to the work of other Trades, and he shall remedy such injury at his own expense.
- E. Waste materials shall be removed promptly from the premises. All material and equipment stored on the premises shall be kept in a neat and orderly fashion. Material or equipment shall not be stored where exposed to the weather. The Electrical Subcontractor shall be responsible for the security, safekeeping and damages, including acts of vandalism, of all material and equipment stored at the job site.
- F. The Electrical Subcontractor shall be responsible for unloading all electrical equipment and materials delivered to the site. This shall also include all large and heavy items or equipment which require hoisting. Consult with the General Contractor for hoisting/crane requirements. During construction of the building, the Electrical Subcontractor shall provide additional protection against moisture, dust accumulation and physical damage of the main service and distribution equipment. This shall include furnishing and installing temporary heaters within these units, as approved, to evaporate excessive moisture and ventilate it from the room, as may be required.
- G. It shall be the responsibility of the Electrical Subcontractor to coordinate the delivery of the electrical equipment to the project prior to the time installation of equipment will be required; but he shall also make sure such equipment is not delivered too far in advance of such required installation, to ensure that possible damage and deterioration of such equipment will not occur. Such equipment stored for an excessively long period of time (as determined in the opinion of the Architect) on the project site prior to installation may be subject to rejection by the Architect.

- H. The Electrical Subcontractor shall erect and maintain, at all times, necessary safeguards for the protection of life and property of the Owner, Workmen, Staff and the Public.
- I. Prior to installation, the Electrical Subcontractor has the responsibility to coordinate the exact mounting arrangement and location of electrical equipment to allow proper space requirements as indicated in the NEC. Particular attention shall be given in the field to group installations. If it is questionable that sufficient space, conflict with the work of other Subcontractors, architectural or structural obstructions will result in an arrangement which will prevent proper access, operation or maintenance of the indicated equipment, the Electrical Subcontractor shall immediately notify the Contractor and not proceed with this part of the Contract work until definite instructions have been given to him by the Architect.
- J. The Electrical Subcontractor shall not allow any equipment or piping foreign to the electrical installation to be installed or pass through any room in which electrical systems or equipment are located, such as electric rooms, electric closets, telephone or data closets. The Electrical Subcontractor shall notify the Contractor of such violations and request immediate removal.
- K. The Electrical Subcontractor shall obtain from the Plumbing and HVAC Subcontractors copies of all shop drawing prints showing the ductwork and piping installation as they will be put in place on the project. These drawings shall be thoroughly checked by the Electrical Subcontractor and the routing of all conduits and installation of all outlets and electrical equipment shall be coordinated with the ductwork and piping so as to prevent any installation conflict. Such coordination shall be done prior to roughing in conduits, outlets and electrical equipment.
- L. Location of all wall outlets shall be verified with the Architect prior to roughing in conduits. Refer to details and wall elevations on the Architectural drawings. Mounting heights indicated on these drawings and/or specific dimensional information given to the Electrical Subcontractor by the Architect shall take precedence over such information indicated on the Electrical drawings.
- M. Refer to all other drawings associated with this project. Any and all equipment which require an electrical supply circuit, switch, controls or connections, whether indicated on the Electrical drawings or not, shall be furnished and installed as directed by the Architect. Locations of lighting fixtures shall conform to the Architectural reflected ceiling plans.
- N. Refer to the Architectural drawings for areas in which the concrete slab is poured on grade. In these areas a waterproofing membrane will be installed on the grade fill or earth prior to pouring of slab. Electrical conduits shall be installed to avoid the necessity of penetrating this waterproofing membrane. Penetration of the membrane, if required, shall only be made when specifically allowed by the Architect, and shall be made only at locations directed by the Architect.

3.2 INSTALLATION

- A. General:
 - 1. Unless specifically noted or indicated otherwise, all equipment and material specified in Division 26 of this specification or indicated on the drawings shall be installed under this Contract whether or not specifically itemized herein. This Section covers particular installation methods and requirements peculiar to certain items and classes of material and equipment.
 - 2. The Electrical Subcontractor shall obtain detailed information from manufacturers of equipment as to proper methods of installation.
 - 3. The Electrical Subcontractor shall obtain final roughing dimensions and other information as needed for complete installation of items furnished under other Sections or furnished by the Owner.
 - 4. The Electrical Subcontractor shall keep fully informed of size, shape and position of openings required for material and equipment provided under this and other Sections.

Ensure that openings required for work of this Section are coordinated with work of other Sections. Provide cutting and patching as necessary.

5. All miscellaneous hardware and support accessories, including support rods, nuts, bolts, screws and other such items, shall be of a galvanized or cadmium plated finish or of another approved rust-inhibiting coating.
6. Throughout this Section where reference is made to steel channel supports, it shall be understood to mean that the minimum size shall be 1 5/8" mild strip steel with minimum wall thickness of 0.105", similar to Unistrut P1000 or equal products manufactured by Kindorf or Husky Products Co.

3.3 MATERIALS AND WORKMANSHIP

- A. All materials and equipment shall be new and unused and shall meet requirements of the latest Standards of NEMA, UL, IPCEA, ANSI and IEEE. Equipment shall have components required or recommended by OSHA, applicable NFPA documents and shall be UL listed and labeled.
- B. Despite references in the specifications or on the drawings to materials or pieces of equipment by name, make or catalog number, such references shall be interpreted as establishing standards of quality for materials and performance.
- C. Finish of materials, components and equipment shall not be less than Industry good practice. When material or equipment is visible or subject to corrosive or atmospheric conditions, the finish shall be as approved by the Architect.
- D. Provide proper access to material or equipment that requires inspection, replacement, repair or service. If proper access cannot be provided, confer with the Architect as to the best method of approach to minimize effects of reduced access.
- E. All work shall be installed in a neat and workmanlike manner and shall be done in accordance with all Local and State Codes.
- F. The Owner will not be responsible for material, equipment or the installation of same before testing and acceptance.

3.4 CLEANING

- A. This Section of the specifications shall include the cleaning of all equipment on a day-to-day basis and final cleaning of all electrical equipment prior to turning building over to the Owner. All necessary cleaning referred to herein shall be cleaned to the satisfaction of the Architect.
- B. Electrical Distribution Equipment:
 1. All electrical distribution equipment shall be completely cleaned and dried inside and out prior to initial energizing.
 2. Cleaning shall consist of vacuuming all busses, windings, enclosures (inside and out), etc. After vacuuming is complete, all equipment shall be wiped down. If equipment is wet or contains moisture, it shall be thoroughly dried and inspected by the manufacturer's representative before energizing.
- C. Raceways and Junction Boxes:
 1. All raceways and junction boxes shall be blown out and dried prior to installation of feeder conductors and branch circuit conductors.
- D. Electric and Telephone Rooms:

1. Upon completion of cleaning electrical equipment as described in Paragraph B. above, but before energizing equipment, the entire room shall be swept clean and material storage and garbage shall be removed from the room. At this time, equipment may be energized.
2. Once equipment and room are cleaned and energized, the area shall remain clean and doors shall remain closed and locked until completion of job. Electric rooms shall not be used to store material after equipment is energized. If rooms and equipment are subject to dust and moisture after energizing equipment, the equipment shall be de-energized and recleaned to the same specifications.

E. Final Cleaning:

1. All lighting fixtures, devices, device plates, etc., shall be cleaned and left in "like new" condition to the satisfaction of the Architect, prior to occupancy.
2. All rubbish and discarded materials shall be disposed of and removed from the site on a day-to-day basis.
3. All equipment, whether part of the Electrical Subcontractor's Contract or not, which must be cleaned due to the Electrical Subcontractor's work, shall be cleaned by the Electrical Subcontractor to the satisfaction of the Architect.

3.5 FINAL INSPECTION

- A. When all Electrical work on the project has been completed and is ready for final inspection, such an inspection shall be made. At this time, and in addition to all other requirements in the Contract Documents, the Electrical Subcontractor, for the work under this Contract, shall demonstrate that the requirements of these specifications have been met to the Architect's satisfaction.

END OF SECTION 260100

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Copper building wire rated 600 V or less.
 - 2. Metal-clad cable, Type MC, rated 600 V or less.
 - 3. Connectors, splices, and terminations rated 600 V and less.
- B. Related Requirements:
 - 1. Section 260523 "Control-Voltage Electrical Power Cables" for control systems communications cables and Classes 1, 2, and 3 control cables.

1.3 DEFINITIONS

- A. RoHS: Restriction of Hazardous Substances.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Member company of NETA.
 - 1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

PART 2 - PRODUCTS

2.1 COPPER BUILDING WIRE

- A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Belden Inc.
 - 2. Encore Wire Corporation.
 - 3. General Cable Technologies Corporation.
 - 4. Service Wire Co.
 - 5. Southwire Company.
- C. Standards:
 - 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
 - 2. RoHS compliant.
 - 3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."
- D. Conductors: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.
- E. Conductor Insulation:
 - 1. Type NM: Comply with UL 83 and UL 719.
 - 2. Type THHN and Type THWN-2: Comply with UL 83.

2.2 METAL-CLAD CABLE, TYPE MC.

- A. Description: A factory assembly of one or more current-carrying insulated conductors in an overall metallic sheath.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Belden Inc.
 - 2. Encore Wire Corporation.
 - 3. Encore Wire Corporation.
 - 4. General Cable Technologies Corporation.
 - 5. Southwire Company.
- C. Standards:
 - 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
 - 2. Comply with UL 1569.
 - 3. RoHS compliant.
 - 4. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."
- D. Circuits:
 - 1. Single circuit and multicircuit with color-coded conductors.
 - 2. Power-Limited Fire-Alarm Circuits: Comply with UL 1424.

- E. Conductors: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.
- F. Ground Conductor: Insulated.
- G. Conductor Insulation:
 - 1. Type TFN/THHN/THWN-2: Comply with UL 83.
- H. Armor: Steel, interlocked.

2.3 CONNECTORS AND SPLICES

- A. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. AFC Cable Systems; a part of Atkore International.
 - 2. Hubbell Power Systems, Inc.
 - 3. Ideal Industries, Inc.
 - 4. O-Z/Gedney; a brand of Emerson Industrial Automation.
 - 5. Thomas & Betts Corporation; A Member of the ABB Group.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders: Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- C. Power-Limited Fire Alarm and Control: Solid for No. 12 AWG and smaller.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Exposed Feeders: Type THHN/THWN-2, single conductors in raceway.
- B. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type THHN/THWN-2, single conductors in raceway.
- C. Exposed Branch Circuits, Including in Crawlspace: Type THHN/THWN-2, single conductors in raceway.
- D. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway or Metal-clad cable, Type MC with ground wire, Nonmetallic-sheathed cable, Type NM.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

- B. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.
- C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- F. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

3.4 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
- B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
 - 1. Use oxide inhibitor in each splice, termination, and tap for aluminum conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.5 IDENTIFICATION

- A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."
- B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.7 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078413 "Penetration Firestopping."

3.8 FIELD QUALITY CONTROL

- A. Perform tests and inspections with the assistance of a factory-authorized service representative.
 - 1. After installing conductors and cables and before electrical circuitry has been energized, test conductors feeding the following critical equipment and services for compliance with requirements:

- a. Panelboards
 2. Perform each of the following visual and electrical tests:
 - a. Inspect exposed sections of conductor and cable for physical damage and correct connection according to the single-line diagram.
 - b. Test bolted connections for high resistance using one of the following:
 - 1) A low-resistance ohmmeter.
 - 2) Calibrated torque wrench.
 - 3) Thermographic survey.
 - c. Inspect compression-applied connectors for correct cable match and indentation.
 - d. Inspect for correct identification.
 - e. Inspect cable jacket and condition.
 - f. Insulation-resistance test on each conductor for ground and adjacent conductors. Apply a potential of 500-V dc for 300-V rated cable and 1000-V dc for 600-V rated cable for a one-minute duration.
 - g. Continuity test on each conductor and cable.
 - h. Uniform resistance of parallel conductors.
 3. Initial Infrared Scanning: After Substantial Completion, but before Final Acceptance, perform an infrared scan of each splice in conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner. Correct deficiencies determined during the scan.
 - a. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
 - b. Record of Infrared Scanning: Prepare a certified report that identifies switches checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.
 4. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each switch 11 months after date of Substantial Completion.
- B. Cables will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports to record the following:
1. Procedures used.
 2. Results that comply with requirements.
 3. Results that do not comply with requirements, and corrective action taken to achieve compliance with requirements.

END OF SECTION 260519

SECTION 260523 - CONTROL-VOLTAGE ELECTRICAL POWER CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. UTP cabling.
 - 2. RS-485 cabling.
 - 3. Low-voltage control cabling.
 - 4. Control-circuit conductors.
 - 5. Identification products.

1.3 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control and signaling power-limited circuits.
- C. Plenum: A space forming part of the air distribution system to which one or more air ducts are connected. An air duct is a passageway, other than a plenum, for transporting air to or from heating, ventilating, or air-conditioning equipment.
- D. RCDD: Registered Communications Distribution Designer.
- E. UTP: Unshielded twisted pair.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency, RCDD, layout technician, installation supervisor, and field inspector.
- B. Source quality-control reports.
- C. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Accredited by NETA.
 - 1. Testing Agency's Field Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 PERFORMANCE REQUIREMENTS

- A. Flame Travel and Smoke Density in Plenums: As determined by testing identical products according to NFPA 262, by a qualified testing agency. Identify products for installation in plenums with appropriate markings of applicable testing agency.
 - 1. Flame Travel Distance: 60 inches or less.
 - 2. Peak Optical Smoke Density: 0.5 or less.
 - 3. Average Optical Smoke Density: 0.15 or less.
- B. Flame Travel and Smoke Density for Riser Cables in Non-Plenum Building Spaces: As determined by testing identical products according to UL 1666.
- C. Flame Travel and Smoke Density for Cables in Non-Riser Applications and Non-Plenum Building Spaces: As determined by testing identical products according to UL 1685.

2.3 BACKBOARDS

- A. Description: Plywood, fire-retardant treated, 3/4 by 48 by 96 inches. Comply with requirements for plywood backing panels in Section 061000 "Rough Carpentry."
- B. Painting: Paint plywood on all sides and edges with flat black latex paint. Comply with requirements in Section 099123 "Interior Painting."

2.4 UTP CABLE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Belden CDT Networking Division/NORDX.
 - 2. CommScope, Inc.
 - 3. General Cable; General Cable Corporation.
- B. Description: 100-ohm, four-pair UTP.
 - 1. Comply with ICEA S-90-661 for mechanical properties of Category 5e cables.
 - 2. Comply with ICEA S-102-700 for mechanical properties of Category 6 cables.
 - 3. Comply with TIA-568-C.1 for performance specifications.
 - 4. Comply with TIA-568-C.2, Category 6.
 - 5. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with NFPA 70 for the following types:
 - a. Communications, Plenum Rated: Type CMP complying with UL 1685.

- b. Communications, Plenum Rated: Type CM, Type CMG, Type CMP, Type CMR, or Type CMX in metallic conduit installed per NFPA 70, Article 300.22, "Wiring in Ducts, Plenums, and Other Air-Handling Spaces."
- c. Communications, Riser Rated: Type CMR complying with UL 1666 and ICEA S-103-701.
- d. Communications, Riser Rated: Type CMP, or Type CMR in listed plenum or riser communications raceway.
- e. Communications, Riser Rated: Type CMP or Type CMR in metallic conduit installed per NFPA 70, Article 300.22, "Wiring in Ducts, Plenums, and Other Air-Handling Spaces."
- f. Communications, General Purpose: Type CM or Type CMG.
- g. Communications, General Purpose: Type CM, Type CMG, Type CMP, Type CMR, or Type CMX in metallic conduit installed per NFPA 70, Article 300.22, "Wiring in Ducts, Plenums, and Other Air-Handling Spaces."
- h. Communications, Limited Purpose: Type CMX.

2.5 UTP CABLE HARDWARE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Belden Inc.
 - 2. Hubbell Incorporated; Wiring Device-Kellems.
 - 3. Leviton Manufacturing Co., Inc.
- B. General Requirements for Cable Connecting Hardware: Comply with TIA-568-C.2, IDC type, with modules designed for punch-down caps or tools. Cables shall be terminated with connecting hardware of same category or higher.
- C. Connecting Blocks: 110-style IDC for Category 6. Provide blocks for the number of cables terminated on the block, plus 25 percent spare. Integral with connector bodies, including plugs and jacks where indicated.
- D. Cross-Connect: Modular array of connecting blocks arranged to terminate building cables and permit interconnection between cables.
 - 1. Number of Terminals per Field: One for each conductor in assigned cables.
- E. Patch Panel: Modular panels housing multiple-numbered jack units with IDC-type connectors at each jack for permanent termination of pair groups of installed cables.
 - 1. Number of Jacks per Field: One for each four-pair conductor group of indicated cables, plus spares and blank positions adequate to suit specified expansion criteria.
- F. Jacks and Jack Assemblies: 100-ohm, balanced, twisted-pair connector; four-pair, eight-position modular. Comply with TIA-568-C.1.
- G. Patch Cords: Factory-made, four-pair cables in 36-inch lengths; terminated with eight-position modular plug at each end.
 - 1. Patch cords shall have bend-relief-compliant boots and color-coded icons to ensure Category 6 performance. Patch cords shall have latch guards to protect against snagging.
 - 2. Patch cords shall have color-coded boots for circuit identification.
- H. Faceplates:
 - 1. Metal Faceplate: Stainless steel, complying with requirements in Section 262726 "Wiring Devices."
 - 2. For use with snap-in jacks accommodating any combination of UTP, and coaxial work area cords.
 - a. Flush-mounted jacks, positioning the cord at a 45-degree angle.
- I. Legend:
 - 1. Factory labeled by silk-screening or engraving for stainless steel faceplates.
 - 2. Machine printed, in the field, using adhesive-tape label.

3. Snap-in, clear-label covers and machine-printed paper inserts.

2.6 RS-485 CABLE

- A. Standard Cable: NFPA 70, Type CMG.
 1. Paired, one pair, twisted, No. 22 AWG, stranded (7x30) tinned-copper conductors.
 2. PVC insulation.
 3. Unshielded.
 4. PVC jacket.
 5. Flame Resistance: Comply with UL 1685.
- B. Plenum-Rated Cable: NFPA 70, Type CMP.
 1. Paired, [one pair] [two pairs], No. 22 AWG, stranded (7x30) tinned-copper conductors.
 2. Fluorinated ethylene propylene insulation.
 3. Unshielded.
 4. Fluorinated ethylene propylene jacket.
 5. Flame Resistance: NFPA 262.

2.7 LOW-VOLTAGE CONTROL CABLE

- A. Paired Cable: NFPA 70, Type CMG.
 1. One-pair, twisted, No. 16 AWG, stranded (19x29) tinned-copper conductors.
 2. PVC insulation.
 3. Unshielded.
 4. PVC jacket.
 5. Flame Resistance: Comply with UL 1685.
- B. Plenum-Rated, Paired Cable: NFPA 70, Type CMP.
 1. One-pair, twisted, No. 16 AWG, stranded (19x29) tinned-copper conductors.
 2. PVC insulation.
 3. Unshielded.
 4. PVC jacket.
 5. Flame Resistance: Comply with NFPA 262.

2.8 CONTROL-CIRCUIT CONDUCTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Encore Wire Corporation.
 2. General Cable; General Cable Corporation.
 3. Southwire Company.
- B. Class 1 Control Circuits: Stranded copper, Type THHN/THWN-2, complying with UL 83 in raceway.
- C. Class 2 Control Circuits: Stranded copper, Type THHN/THWN-2, complying with UL 83 in raceway.
- D. Class 3 Remote-Control and Signal Circuits: Stranded copper, Type THHN/THWN-2, complying with UL 83 in raceway.
- E. Class 2 Control Circuits and Class 3 Remote-Control and Signal Circuits That Supply Critical Circuits: Circuit Integrity (CI) cable.
 1. Smoke control signaling and control circuits.

2.9 SOURCE QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to evaluate cables.
- B. Factory test UTP cables according to TIA-568-C.2.
- C. Factory test optical-fiber cables according to TIA-568-C.3.
- D. Cable will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Test cables on receipt at Project site.
 - 1. Test each pair of UTP cable for open and short circuits.

3.2 INSTALLATION OF RACEWAYS AND BOXES

- A. Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems" for raceway selection and installation requirements for boxes, conduits, and wireways as supplemented or modified in this Section.
 - 1. Outlet boxes shall be no smaller than 2 inches wide, 3 inches high, and 2-1/2 inches deep.
 - 2. Outlet boxes for optical-fiber cables shall be no smaller than 4 inches square by 2-1/8 inches deep with extension ring sized to bring edge of ring to within 1/8 inch of the finished wall surface.
 - 3. Flexible metal conduit shall not be used.
- B. Comply with TIA-569-C for pull-box sizing and length of conduit and number of bends between pull points.
- C. Install manufactured conduit sweeps and long-radius elbows if possible.
- D. Raceway Installation in Equipment Rooms:
 - 1. Position conduit ends adjacent to a corner on backboard if a single piece of plywood is installed, or in the corner of the room if multiple sheets of plywood are installed around perimeter walls of the room.
 - 2. Install cable trays to route cables if conduits cannot be located in these positions.
 - 3. Secure conduits to backboard if entering the room from overhead.
 - 4. Extend conduits 3 inches above finished floor.
 - 5. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.
- E. Backboards: Install backboards with 96-inch dimension vertical. Butt adjacent sheets tightly and form smooth gap-free corners and joints.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Comply with NECA 1.
- B. General Requirements for Cabling:
 - 1. Comply with TIA-568-C Series of standards.
 - 2. Comply with BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems" and Ch. 6, "Optical Fiber Structured Cabling Systems."

3. Terminate all conductors and optical fibers; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, and cross-connect and patch panels.
 4. Cables may not be spliced.
 5. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
 6. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems" and Ch. 6, "Optical Fiber Structured Cabling Systems." Install lacing bars and distribution spools.
 7. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
 8. Cold-Weather Installation: Bring cable to room temperature before dereeling. Do not use heat lamps for heating.
 9. Pulling Cable: Comply with BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems" and Ch. 6, "Optical Fiber Structured Cabling Systems." Monitor cable pull tensions.
 10. Support: Do not allow cables to lay on removable ceiling tiles.
 11. Secure: Fasten securely in place with hardware specifically designed and installed so as to not damage cables.
- C. UTP Cable Installation:
1. Comply with TIA-568-C.2.
 2. Install termination hardware as specified in Section 271500 "Communications Horizontal Cabling" unless otherwise indicated.
 3. Do not untwist UTP cables more than 1/2 inch at the point of termination to maintain cable geometry.
- D. Installation of Control-Circuit Conductors:
1. Install wiring in raceways. Comply with requirements specified in Section 260533 "Raceways and Boxes for Electrical Systems."
- E. Optical-Fiber Cable Installation:
1. Comply with TIA-568-C.3.
 2. Terminate cable on connecting hardware that is rack or cabinet mounted.
- F. Open-Cable Installation:
1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
 2. Suspend copper cable not in a wireway or pathway a minimum of 8 inches above ceilings by cable supports not more than 30 inches apart.
 3. Cable shall not be run through or on structural members or in contact with pipes, ducts, or other potentially damaging items. Do not run cables between structural members and corrugated panels.
- G. Separation from EMI Sources:
1. Comply with BICSI TDMM and TIA-569-C recommendations for separating unshielded copper voice and data communications cable from potential EMI sources including electrical power lines and equipment.
 2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
 - a. Electrical Equipment or Circuit Rating Less Than 2 kVA: A minimum of 5 inches.
 - b. Electrical Equipment or Circuit Rating between 2 and 5 kVA: A minimum of 12 inches.
 - c. Electrical Equipment or Circuit Rating More Than 5 kVA: A minimum of 24 inches.
 3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
 - a. Electrical Equipment or Circuit Rating Less Than 2 kVA: A minimum of 2-1/2 inches.
 - b. Electrical Equipment or Circuit Rating between 2 and 5 kVA: A minimum of 6 inches.
 - c. Electrical Equipment or Circuit Rating More Than 5 kVA: A minimum of 12 inches.
 4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:

- a. Electrical Equipment or Circuit Rating Less Than 2 kVA: No requirement.
 - b. Electrical Equipment or Circuit Rating between 2 and 5 kVA: A minimum of 3 inches.
 - c. Electrical Equipment or Circuit Rating More Than 5 kVA: A minimum of 6 inches.
5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or 5 HP and Larger: A minimum of 48 inches.
 6. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches.

3.4 REMOVAL OF CONDUCTORS AND CABLES

- A. Remove abandoned conductors and cables. Abandoned conductors and cables are those installed that are not terminated at equipment and are not identified with a tag for future use.

3.5 CONTROL-CIRCUIT CONDUCTORS

- A. Minimum Conductor Sizes:
 1. Class 1 remote-control and signal circuits; No 14 AWG.
 2. Class 2 low-energy, remote-control, and signal circuits; No. 16 AWG.
 3. Class 3 low-energy, remote-control, alarm, and signal circuits; No 12 AWG.

3.6 FIRESTOPPING

- A. Comply with requirements in Section 078413 "Penetration Firestopping."
- B. Comply with TIA-569-C, Annex A, "Firestopping."
- C. Comply with BICSI TDMM, "Firestopping" Chapter.

3.7 GROUNDING

- A. For data communication wiring, comply with TIA-607-B and with BICSI TDMM, "Bonding and Grounding (Earthing)" Chapter.
- B. For low-voltage control wiring and cabling, comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

3.8 IDENTIFICATION

- A. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- B. Identify data and communications system components, wiring, and cabling according to TIA-606-A; label printers shall use label stocks, laminating adhesives, and inks complying with UL 969.

3.9 FIELD QUALITY CONTROL

- A. Perform tests and inspections with the assistance of a factory-authorized service representative.
- B. Tests and Inspections:

1. Visually inspect UTP and optical-fiber cable jacket materials for UL or third-party certification markings. Inspect cabling terminations to confirm color-coding for pin assignments, and inspect cabling connections to confirm compliance with TIA-568-C.1.
 2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
 3. Test UTP cabling for direct-current loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination, but not after cross-connection.
 - a. Test instruments shall meet or exceed applicable requirements in TIA-568-C.2. Perform tests with a tester that complies with performance requirements in its "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in its "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
 4. Optical-Fiber Cable Tests:
 - a. Test instruments shall meet or exceed applicable requirements in TIA-568-C.0. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
 - b. Link End-to-End Attenuation Tests:
 - 1) Multimode Link Measurements: Test at 850 or 1300 nm in one direction according to TIA/EIA-526-14-A, Method B, One Reference Jumper.
 - 2) Attenuation test results for links shall be less than 2.0 dB that calculated according to equation in TIA-568-C.0.
- C. Document data for each measurement. Print data for submittals in a summary report that is formatted using Table 10.1 in BICSI TDMM as a guide, or transfer the data from the instrument to the computer, save as text files, print, and submit.
- D. End-to-end cabling will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

END OF SECTION 260523

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes grounding and bonding systems and equipment.
- B. Section includes grounding and bonding systems and equipment, plus the following special applications:
 - 1. Underground distribution grounding.
 - 2. Foundation steel electrodes.
 - 3. Grounding conductors.
 - 4. Grounding connectors.
 - 5. Grounding busbars.
 - 6. Grounding rods.
 - 7. Grounding labeling.

1.3 DEFINITIONS

- A. BCT: Bonding conductor for telecommunications.
- B. EMT: Electrical metallic tubing.
- C. TGB: Telecommunications grounding busbar.
- D. TMGB: Telecommunications main grounding busbar.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

1.5 INFORMATIONAL SUBMITTALS

- A. As-Built Data: Plans showing dimensioned as-built locations of grounding features specified in "Field Quality Control" Article, including the following:
 - 1. Test wells.
 - 2. Ground rods.
 - 3. Ground rings.
 - 4. Grounding arrangements and connections for separately derived systems.
- B. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals.
 - 1. In addition to items specified in "Operation and Maintenance Data," include the following:
 - a. Instructions for periodic testing and inspection of grounding features at test wells based on NFPA 70B.
 - 1) Tests shall determine if ground-resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if values do not.
 - 2) Include recommended testing intervals.

1.7 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Burndy; Part of Hubbell Electrical Systems.
 - 2. O-Z/Gedney; a brand of Emerson Industrial Automation.
 - 3. Thomas & Betts Corporation; A Member of the ABB Group.

2.2 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

2.3 CONNECTORS

- A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
- B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy.
- C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
- D. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

2.4 CONDUCTORS

- A. Insulated Conductors: Stranded copper wire, green or green with yellow stripe insulation, insulated for 600 V, and complying with UL 83.
 - 1. Ground wire for custom-length equipment ground jumpers shall be No. 6 AWG, 19-strand, UL-listed, Type THHN wire.
- B. Cable Tray Equipment Grounding Wire: No. 8 AWG.
- C. Bare Copper Conductors:
 - 1. Solid Conductors: ASTM B 3.
 - 2. Stranded Conductors: ASTM B 8.
 - 3. Tinned Conductors: ASTM B 33.
 - 4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
 - 5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
 - 6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
 - 7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

2.5 GROUNDING BUSBARS

- A. TMGB: Predrilled, wall-mounted, rectangular bars of hard-drawn solid copper, 1/4 by 4 inches in cross section, length as indicated on Drawings. The busbar shall be NRTL listed for use as TMGB and shall comply with J-STD-607-A.
 - 1. Predrilling shall be with holes for use with lugs specified in this Section.
 - 2. Mounting Hardware: Stand-off brackets that provide a 4-inch clearance to access the rear of the busbar. Brackets and bolts shall be stainless steel.
 - 3. Stand-off insulators for mounting shall be Lexan or PVC. Comply with UL 891 for use in 600-V switchboards, impulse tested at 5000 V.
- B. TGB: Predrilled rectangular bars of hard-drawn solid copper, 1/4 by 2 inches in cross section, length as indicated on Drawings. The busbar shall be for wall mounting, shall be NRTL listed as complying with UL 467, and shall comply with J-STD-607-A.
 - 1. Predrilling shall be with holes for use with lugs specified in this Section.
 - 2. Mounting Hardware: Stand-off brackets that provide at least a 2-inch clearance to access the rear of the busbar. Brackets and bolts shall be stainless steel.
 - 3. Stand-off insulators for mounting shall be Lexan or PVC. Comply with UL 891 for use in 600-V switchboards, impulse tested at 5000 V.
- C. Rack and Cabinet Grounding Busbars: Rectangular bars of hard-drawn solid copper, accepting conductors ranging from No. 14 to No. 2/0 AWG, NRTL listed as complying with UL 467, and complying with J-STD-607-A. Predrilling shall be with holes for use with lugs specified in this Section.
 - 1. Cabinet-Mounted Busbar: Terminal block, with stainless-steel or copper-plated hardware for attachment to the cabinet.
 - 2. Rack-Mounted Horizontal Busbar: Designed for mounting in 19- or 23-inch equipment racks. Include a copper splice bar for transitioning to an adjoining rack, and stainless-steel or copper-plated hardware for attachment to the rack.
 - 3. Rack-Mounted Vertical Busbar: 72 or 36 inches long, with stainless-steel or copper-plated hardware for attachment to the rack.

2.6 GROUND RODS

- A. Ground Rods: Copper-clad steel 3/4 inch by 10 feet in diameter.

2.7 LABELING

- A. Comply with TIA/EIA-606-A and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.
- B. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch. Overlay shall provide a weatherproof and UV-resistant seal for label.

PART 3 - EXECUTION

3.1 APPLICATIONS

- A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.
- B. Underground Grounding Conductors: Install bare copper conductor, No. 2/0 AWG minimum.
 - 1. Bury at least 24 inches below grade.
 - 2. Duct-Bank Grounding Conductor: Bury 12 inches above duct bank when indicated as part of duct-bank installation.
- C. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.
- D. Grounding Bus: Install in electrical equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
 - 1. Install bus horizontally, on insulated spacers 2 inches minimum from wall, 6 inches above finished floor unless otherwise indicated.
 - 2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.
- E. Conductor Terminations and Connections:
 - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
 - 2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
 - 3. Connections to Ground Rods at Test Wells: Bolted connectors.
 - 4. Connections to Structural Steel: Welded connectors.

3.2 GROUNDING AT THE SERVICE

- A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus.

3.3 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.
- B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
 - 1. Feeders and branch circuits.
 - 2. Lighting circuits.
 - 3. Receptacle circuits.
 - 4. Single-phase motor and appliance branch circuits.
 - 5. Three-phase motor and appliance branch circuits.
 - 6. Flexible raceway runs.
 - 7. Armored and metal-clad cable runs.
- C. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.
- D. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.
- E. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply circuit raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate insulated equipment grounding conductor. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.
- F. Metallic Fences: Comply with requirements of IEEE C2.
 - 1. Grounding Conductor: Bare copper, not less than No. 8 AWG.
 - 2. Gates: Shall be bonded to the grounding conductor with a flexible bonding jumper.
 - 3. Barbed Wire: Strands shall be bonded to the grounding conductor.

3.4 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.
- C. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade unless otherwise indicated.
 - 1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
 - 2. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.

- D. Test Wells: Ground rod driven through drilled hole in bottom of handhole. Handholes are specified in Section "Underground Ducts and Raceways for Electrical Systems," and shall be at least 12 inches deep, with cover.
 - 1. Test Wells: Install at least one test well for each service unless otherwise indicated. Install at the ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.
- E. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
 - 1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
 - 2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
 - 3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.
- F. Grounding and Bonding for Piping:
 - 1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
 - 2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
 - 3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.
- G. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install bonding jumper to bond across flexible duct connections to achieve continuity.
- H. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet apart.
- I. Ground Ring: Install a grounding conductor, electrically connected to each building structure ground rod and to each indicated item, extending around the perimeter of the building or area or item indicated.
 - 1. Install tinned-copper conductor not less than No. 2/0 AWG for ground ring and for taps to building steel.
 - 2. Bury ground ring not less than 24 inches from building's foundation.
- J. Concrete-Encased Grounding Electrode (Ufer Ground): Fabricate according to NFPA 70; use a minimum of 20 feet of bare copper conductor not smaller than No. 4 AWG.
 - 1. If concrete foundation is less than 20 feet long, coil excess conductor within base of foundation.
 - 2. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building's grounding grid or to grounding electrode external to concrete.

3.5 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
 2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
 3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at ground test wells. Make tests at ground rods before any conductors are connected.
 - a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
 - b. Perform tests by fall-of-potential method according to IEEE 81.
 4. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.
- C. Grounding system will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.
- E. Report measured ground resistances that exceed the following values:
1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
 2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 ohms.
 3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
 4. Power Distribution Units or Panelboards Serving Electronic Equipment: 3 ohm(s).
 5. Substations and Pad-Mounted Equipment: 5 ohms.
 6. Manhole Grounds: 10 ohms.
- F. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 260526

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Hangers and supports for electrical equipment and systems.
 - 2. Construction requirements for concrete bases.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:
 - a. Hangers.
 - b. Steel slotted support systems.
 - c. Trapeze hangers.
 - d. Clamps.
 - e. Turnbuckles.
 - f. Sockets.
 - g. Eye nuts.
 - h. Saddles.
 - i. Brackets.
 - 2. Include rated capacities and furnished specialties and accessories.
- B. Shop Drawings: Signed and sealed by a qualified professional engineer. For fabrication and installation details for electrical hangers and support systems.
 - 1. Trapeze hangers. Include product data for components.
 - 2. Steel slotted-channel systems.
 - 3. Equipment supports.
 - 4. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.
- C. Delegated-Design Submittal: For hangers and supports for electrical systems.
 - 1. Include design calculations and details of trapeze hangers.
 - 2. Include design calculations for seismic restraints.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Suspended ceiling components.
 2. Structural members to which hangers and supports will be attached.
 3. Size and location of initial access modules for acoustical tile.
 4. Items penetrating finished ceiling, including the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
 - c. Access panels.
- B. Seismic Qualification Certificates: For hangers and supports for electrical equipment and systems, accessories, and components, from manufacturer.
1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- C. Welding certificates.

1.5 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to the following:
1. AWS D1.1/D1.1M.
 2. AWS D1.2/D1.2M.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design hanger and support system.
- B. Seismic Performance: Hangers and supports shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
1. The term "withstand" means "the supported equipment and systems will remain in place without separation of any parts when subjected to the seismic forces specified and the system will be fully operational after the seismic event."
 2. Component Importance Factor: 1.5.
- C. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. Flame Rating: Class 1.
 2. Self-extinguishing according to ASTM D 635.

2.2 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Comply with MFMA-4 factory-fabricated components for field assembly.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Allied Tube & Conduit; a part of Atkore International.
 - b. B-line, an Eaton business.

- c. ERICO International Corporation.
 - d. Unistrut; Part of Atkore International.
 2. Material: Galvanized steel.
 3. Channel Width: 1-5/8 inches.
 4. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
 5. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
 6. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
 7. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
 8. Channel Dimensions: Selected for applicable load criteria.
- B. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- C. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for nonarmored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be made of malleable iron.
- D. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M steel plates, shapes, and bars; black and galvanized.
- E. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
 1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Hilti, Inc.
 - 2) ITW Ramset/Red Head; Illinois Tool Works, Inc.
 - 3) MKT Fastening, LLC.
 - 4) Simpson Strong-Tie Co., Inc.
 2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel or stainless steel, for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) B-line, an Eaton business.
 - 2) Hilti, Inc.
 - 3) ITW Ramset/Red Head; Illinois Tool Works, Inc.
 - 4) MKT Fastening, LLC.
 3. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
 4. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
 5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
 6. Toggle Bolts: All-steel or Stainless-steel springhead type.
 7. Hanger Rods: Threaded steel.

2.3 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

- A. Description: Welded or bolted structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

- B. Materials: Comply with requirements in Section 055000 "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems unless requirements in this Section are stricter.
- B. Comply with requirements for raceways and boxes specified in Section 260533 "Raceways and Boxes for Electrical Systems."
- C. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMTs, IMCs, and RMCs as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.
- D. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
1. Secure raceways and cables to these supports with single-bolt conduit clamps using spring friction action for retention in support channel.
- E. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this article.
- B. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.
- C. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
1. To Wood: Fasten with lag screws or through bolts.
 2. To New Concrete: Bolt to concrete inserts.
 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 4. To Existing Concrete: Expansion anchor fasteners.
 5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
 6. To Steel: Beam clamps (MSS SP-58, Type 19, 21, 23, 25, or 27), complying with MSS SP-69.
 7. To Light Steel: Sheet metal screws.
 8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that comply with seismic-restraint strength and anchorage requirements.

- D. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Comply with installation requirements in Division 05 Section "Metal Fabrications" for site-fabricated metal supports.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

- A. Construct concrete bases of dimensions indicated but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.
- B. Use 3000-psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Division 03 Section "Cast-in-Place Concrete."
- C. Anchor equipment to concrete base as follows:
 - 1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 2. Install anchor bolts to elevations required for proper attachment to supported equipment.
 - 3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.5 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.
- B. Touchup: Comply with requirements in Division 09 painting Sections for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 260529

SECTION 260533 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

1.3 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. ENT: Electrical nonmetallic tubing.
- C. EPDM: Ethylene-propylene-diene terpolymer rubber.
- D. FMC: Flexible metal conduit.
- E. IMC: Intermediate metal conduit.
- F. LFMC: Liquidtight flexible metal conduit.
- G. LFNC: Liquidtight flexible nonmetallic conduit.
- H. NBR: Acrylonitrile-butadiene rubber.
- I. RNC: Rigid nonmetallic conduit.

1.4 SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.
- B. Shop Drawings: For the following raceway components. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Custom enclosures and cabinets.
 - 2. For handholes and boxes for underground wiring, including the following:
 - a. Duct entry provisions, including locations and duct sizes.
 - b. Frame and cover design.
 - c. Grounding details.
 - d. Dimensioned locations of cable rack inserts, and pulling-in and lifting irons.

- e. Joint details.
- C. Samples for Verification: For each type of exposed finish required for surface raceways, prepared on Samples of size indicated below.
 - 1. Size: 4".
- D. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
 - 1. Structural members in the paths of conduit groups with common supports.
 - 2. HVAC and plumbing items and architectural features in the paths of conduit groups with common supports.
- E. Manufacturer Seismic Qualification Certification: Submit certification that enclosures and cabinets and their mounting provisions, including those for internal components, will withstand seismic forces defined in Division 26 Section "Vibration and Seismic Controls for Electrical Systems." Include the following:
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - a. The term "withstand" means "the cabinet or enclosure will remain in place without separation of any parts when subjected to the seismic forces specified and the unit will retain its enclosure characteristics, including its interior accessibility, after the seismic event."
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- F. Qualification Data: For professional engineer and testing agency.
- G. Source quality-control test reports.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND TUBING

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. AFC Cable Systems, Inc.
 - 2. Alflex Inc.

3. Allied Tube & Conduit; a Tyco International Ltd. Co.
 4. Anamet Electrical, Inc.; Anaconda Metal Hose.
 5. Manhattan/CDT/Cole-Flex.
 6. Maverick Tube Corporation.
 7. O-Z Gedney; a unit of General Signal.
 8. Wheatland Tube Company.
- B. Rigid Steel Conduit: ANSI C80.1.
- C. IMC: ANSI C80.6.
- D. EMT: ANSI C80.3.
- E. FMC: Zinc-coated steel.
- F. LFMC: Flexible steel conduit with PVC jacket.
- G. Fittings for Conduit (Including all Types and Flexible and Liquidtight), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.
1. Fittings for EMT: Steel set-screw type.
 2. Coating for Fittings for PVC-Coated Conduit: Minimum thickness, 0.040 inch, with overlapping sleeves protecting threaded joints.
- H. Joint Compound for Rigid Steel Conduit or IMC: Listed for use in cable connector assemblies, and compounded for use to lubricate and protect threaded raceway joints from corrosion and enhance their conductivity.

2.2 NONMETALLIC CONDUIT AND TUBING

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. AFC Cable Systems, Inc.
 2. Anamet Electrical, Inc.; Anaconda Metal Hose.
 3. Arnco Corporation.
 4. CANTEX Inc.
 5. CertainTeed Corp.; Pipe & Plastics Group.
 6. Condux International, Inc.
 7. ElecSYS, Inc.
 8. Lamson & Sessions; Carlon Electrical Products.
 9. Manhattan/CDT/Cole-Flex.
 10. RACO; a Hubbell Company.
 11. Thomas & Betts Corporation.
- B. RNC: NEMA TC 2, Type EPC-40-PVC, unless otherwise indicated.
- C. LFNC: UL 1660.
- D. Fittings for RNC: NEMA TC 3; match to conduit or tubing type and material.
- E. Fittings for LFNC: UL 514B.

2.3 METAL WIREWAYS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Cooper B-Line, Inc.
 - 2. Hoffman.
 - 3. Square D; Schneider Electric.
- B. Description: Sheet metal sized and shaped as indicated, NEMA 250, Type 1, unless otherwise indicated.
- C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- D. Wireway Covers: Hinged type.
- E. Finish: Manufacturer's standard enamel finish.

2.4 NONMETALLIC WIREWAYS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Hoffman.
 - 2. Lamson & Sessions; Carlon Electrical Products.
- B. Description: Fiberglass polyester, extruded and fabricated to size and shape indicated, with no holes or knockouts. Cover is gasketed with oil-resistant gasket material and fastened with captive screws treated for corrosion resistance. Connections are flanged, with stainless-steel screws and oil-resistant gaskets.
- C. Description: PVC plastic, extruded and fabricated to size and shape indicated, with snap-on cover and mechanically coupled connections with plastic fasteners.
- D. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

2.5 SURFACE RACEWAYS

- A. Surface Metal Raceways: Galvanized steel with snap-on covers. Manufacturer's standard enamel finish in color selected by Architect.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Thomas & Betts Corporation.
 - b. Walker Systems, Inc.; Wiremold Company (The).
 - c. Wiremold Company (The); Electrical Sales Division.

2.6 BOXES, ENCLOSURES, AND CABINETS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
 - 2. EGS/Appleton Electric.

3. Hoffman.
 4. Hubbell Incorporated; Killark Electric Manufacturing Co. Division.
 5. O-Z/Gedney; a unit of General Signal.
 6. RACO; a Hubbell Company.
 7. Spring City Electrical Manufacturing Company.
 8. Thomas & Betts Corporation.
 9. Walker Systems, Inc.; Wiremold Company (The).
 10. Woodhead, Daniel Company; Woodhead Industries, Inc. Subsidiary.
- B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.
- C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, aluminum, Type FD, with gasketed cover.
- D. Metal Floor Boxes: Cast metal, fully adjustable, rectangular.
- E. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- F. Cast-Metal Access, Pull, and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.
- G. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous-hinge cover with flush latch, unless otherwise indicated.
1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
- H. Cabinets:
1. NEMA 250, Type 1, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
 2. Hinged door in front cover with flush latch and concealed hinge.
 3. Key latch to match panelboards.
 4. Metal barriers to separate wiring of different systems and voltage.
 5. Accessory feet where required for freestanding equipment.

2.7 GENERATOR TAP BOX

- A. Manufacturers: Generator tap boxes shall be TempTap Inlet Boxes as manufactured by ESL Power Systems, Inc. or equal as approved by the Engineer.
- B. Generator tap box shall consist of cam-style male connectors and grounding terminals, all housed within a padlockable enclosure.
- C. Generator tap box enclosure shall be Type 3R, constructed of continuous seam-welded, powder coated galvanized steel. The main access shall be through a hinged door that extends the full height of the enclosure. Access for portable generator cables with female cam-style plugs shall be via cable entry openings in the bottom of the enclosure. A hinged flap door shall be provided to cover the cable openings when cables are not connected; the hinged flap door shall allow cable entry only after the main access door has been opened. Enclosure shall be powder coated after fabrication; color shall be wrinkle gray RAL 7038.
- D. Cam-style male connectors (inlets) shall be UL Listed single-pole separable type and rated 400 amps at 600VAC. Cam-style male connectors shall be color coded. Cam-style male connectors shall be provided for each phase and for ground, and shall also be provided for neutral if required. The ground cam-style male connectors shall be bonded to the enclosure, and a ground lug shall be provided for connection of

the facility ground conductor. None of the cam-style male connectors shall be accessible unless the main access door is open.

2.8 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

- A. Description: Comply with SCTE 77.
1. Color of Frame and Cover: Green.
 2. Configuration: Units shall be designed for flush burial and have integral closed bottom, unless otherwise indicated.
 3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.
 4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
 5. Cover Legend: Molded lettering, as indicated for each service.
 6. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
 7. Handholes 12 inches wide by 24 inches long and larger shall have inserts for cable racks and pulling-in irons installed before concrete is poured.
- B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel or fiberglass or a combination of the two.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Quazite (Hubbell Power Systems)
 - b. Armorcast Products Company.
 - c. Carson Industries LLC.
 - d. CDR Systems Corporation.

2.9 SLEEVES FOR RACEWAYS

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
- B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- C. Sleeves for Rectangular Openings: Galvanized sheet steel with minimum 0.052- or 0.138-inch thickness as indicated and of length to suit application.
- D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."

2.10 SLEEVE SEALS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Advance Products & Systems, Inc.
 2. Calpico, Inc.
 3. Metraflex Co.
 4. Pipeline Seal and Insulator, Inc.

- B. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and cable.
1. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
 2. Pressure Plates: Carbon steel. Include two for each sealing element.
 3. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:
1. Exposed Conduit: Rigid steel conduit.
 2. Concealed Conduit, Aboveground: Rigid steel conduit.
 3. Underground Conduit: RNC, Type EPC- 40 -PVC, direct buried.
 4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
 5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.
 6. Application of Handholes and Boxes for Underground Wiring:
 - a. Handholes and Pull Boxes in Driveway, Parking Lot, and Off-Roadway Locations, Subject to Occasional, Nondeliberate Loading by Heavy Vehicles: Polymer concrete, SCTE 77, Tier 15 structural load rating.
 - b. Handholes and Pull Boxes in Sidewalk and Similar Applications with a Safety Factor for Nondeliberate Loading by Vehicles: Polymer-concrete units, SCTE 77, Tier 8 structural load rating.
 - c. Handholes and Pull Boxes Subject to Light-Duty Pedestrian Traffic Only: Fiberglass-reinforced polyester resin, structurally tested according to SCTE 77 with 3000-lbf vertical loading.
- B. Comply with the following indoor applications, unless otherwise indicated:
1. Exposed, Not Subject to Physical Damage: EMT.
 2. Exposed, Not Subject to Severe Physical Damage: EMT.
 3. Exposed and Subject to Severe Physical Damage: Rigid steel conduit. Includes raceways in the following locations:
 - a. Loading dock.
 - b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
 - c. Mechanical rooms.
 4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
 5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
 6. Damp or Wet Locations: Rigid steel conduit.
 7. Raceways for Optical Fiber or Communications Cable in Spaces Used for Environmental Air: Plenum-type, optical fiber/communications cable raceway.
 8. Raceways for Concealed General Purpose Distribution of Optical Fiber or Communications Cable: EMT.

- 9. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 3R, in damp or wet locations.
- C. Minimum Raceway Size: 3/4-inch trade size.
- D. Raceway Fittings: Compatible with raceways and suitable for use and location.
 - 1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.
 - 2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with that material. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer.
- E. Do not install aluminum conduits in contact with concrete.

3.2 INSTALLATION

- A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.
- B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- C. Complete raceway installation before starting conductor installation.
- D. Support raceways as specified in Division 26 Section "Hangers and Supports for Electrical Systems."
- E. Arrange stub-ups so curved portions of bends are not visible above the finished slab.
- F. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications conduits, for which fewer bends are allowed.
- G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.
- H. Raceways Embedded in Slabs:
 - 1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
 - 2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
- I. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- J. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.
- K. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire.
- L. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover

plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 2. Where otherwise required by NFPA 70.
 3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change.
 4. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at the time of installation.
- M. Flexible Conduit Connections: Use maximum of 72 inches of flexible conduit for recessed and semirecessed lighting fixtures, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
1. Use LFMC in damp or wet locations subject to severe physical damage.
 2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.
- N. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall.
- O. Set metal floor boxes level and flush with finished floor surface.
- P. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

- A. Direct-Buried Conduit:
1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Division 31 Section "Earth Moving" for pipe less than 6 inches in nominal diameter.
 2. Install backfill as specified in Division 31 Section "Earth Moving."
 3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Division 31 Section "Earth Moving."
 4. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through the floor, unless otherwise indicated. Encase elbows for stub-up ducts throughout the length of the elbow.
 5. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through the floor.
 - a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete.
 - b. For stub-ups at equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches from edge of equipment pad or foundation. Install insulated grounding bushings on terminations at equipment.

3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

- A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.
- B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.
- C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch above finished grade.
- D. Install handholes and boxes with bottom below the frost line, Insert depth of frost line below grade at Project site below grade.
- E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables, but short enough to preserve adequate working clearances in the enclosure.
- F. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.5 INSTALLATION OF GENERATOR TAP BOXES

- A. Prior to installation of generator tap boxes, Contractor shall examine the areas and conditions under which the generator tap box is to be installed and notify the Engineer in writing if unsatisfactory conditions exist.
- B. Generator tap box shall be installed as shown on the drawings and per the manufacturer's written instructions. In addition, the installation shall meet the requirements of local codes, the National Electrical Code and National Electrical Contractors Association's "Standard of Installation".
- C. Conduit entry into the manual transfer switch shall be by Contractor; Contractor shall furnish and install listed watertight conduit hubs, as manufactured by MYERS or T&B, for each conduit entry on the generator tap box. The hub size shall match the conduit size for conductors and ground as shown on the drawings. Hubs shall be properly installed and tightened to maintain Type 3R integrity of the generator tap box.
- D. Contractor shall terminate conductors and ground per the manufacturer's instructions. Use copper wire only for all conductors and grounds. All field wiring terminations in the generator tap box shall be torqued as required per the instructions on the generator tap box.

3.6 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."
- B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
- C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

- D. Rectangular Sleeve Minimum Metal Thickness:
1. For sleeve cross-section rectangle perimeter less than 50 inches and no side greater than 16 inches, thickness shall be 0.052 inch.
 2. For sleeve cross-section rectangle perimeter equal to, or greater than, 50 inches and 1 or more sides equal to, or greater than, 16 inches, thickness shall be 0.138 inch.
- E. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
- F. Cut sleeves to length for mounting flush with both surfaces of walls.
- G. Extend sleeves installed in floors 2 inches above finished floor level.
- H. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway unless sleeve seal is to be installed or unless seismic criteria require different clearance.
- I. Seal space outside of sleeves with grout for penetrations of concrete and masonry and with approved joint compound for gypsum board assemblies.
- J. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway, using joint sealant appropriate for size, depth, and location of joint. Refer to Division 07 Section "Joint Sealants" for materials and installation.
- K. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway penetrations. Install sleeves and seal with firestop materials. Comply with Division 07 Section "Penetration Firestopping."
- L. Roof-Penetration Sleeves: Seal penetration of individual raceways with flexible, boot-type flashing units applied in coordination with roofing work.
- M. Aboveground, Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- N. Underground, Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for 1-inch annular clear space between raceway and sleeve for installing mechanical sleeve seals.

3.7 SLEEVE-SEAL INSTALLATION

- A. Install to seal underground, exterior wall penetrations.
- B. Use type and number of sealing elements recommended by manufacturer for raceway material and size. Position raceway in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.8 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Penetration Firestopping."

3.9 PROTECTION

- A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533

SECTION 260544 - SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
 - 2. Sleeve-seal systems.
 - 3. Sleeve-seal fittings.
 - 4. Grout.
 - 5. Silicone sealants.
- B. Related Requirements:
 - 1. Section 078413 "Penetration Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 SLEEVES

- A. Wall Sleeves:
 - 1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.
 - 2. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.
- B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.
- C. Sleeves for Rectangular Openings:
 - 1. Material: Galvanized sheet steel.
 - 2. Minimum Metal Thickness:

- a. For sleeve cross-section rectangle perimeter less than 50 inches and with no side larger than 16 inches, thickness shall be 0.052 inch.
- b. For sleeve cross-section rectangle perimeter 50 inches or more and one or more sides larger than 16 inches, thickness shall be 0.138 inch.

2.2 SLEEVE-SEAL SYSTEMS

- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Advance Products & Systems, Inc.
 - b. CALPICO, Inc.
 - c. Metraflex Company (The).
 - d. Pipeline Seal and Insulator, Inc.
 - e. Proco Products, Inc.
 2. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
 3. Pressure Plates: Stainless steel.
 4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

2.3 SLEEVE-SEAL FITTINGS

- A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. HOLDRITE.

2.4 GROUT

- A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.
- B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- C. Design Mix: 5000-psi, 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

2.5 SILICONE SEALANTS

- A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.
 - 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.
- B. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

- A. Comply with NECA 1.
- B. Comply with NEMA VE 2 for cable tray and cable penetrations.
- C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:
 - 1. Interior Penetrations of Non-Fire-Rated Walls and Floors:
 - a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 079200 "Joint Sealants."
 - b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.
 - 2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
 - 3. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed or unless seismic criteria require different clearance.
 - 4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
 - 5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches above finished floor level. Install sleeves during erection of floors.
- D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:
 - 1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
 - 2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.
- E. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.
- F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

- G. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing sleeve-seal system.

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.
- B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.3 SLEEVE-SEAL-FITTING INSTALLATION

- A. Install sleeve-seal fittings in new walls and slabs as they are constructed.
- B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.
- C. Secure nailing flanges to concrete forms.
- D. Using grout, seal the space around outside of sleeve-seal fittings.

END OF SECTION 260544

SECTION 260548.16 - SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Restraint channel bracings.
 - 2. Restraint cables.
 - 3. Seismic-restraint accessories.
 - 4. Mechanical anchor bolts.
 - 5. Adhesive anchor bolts.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic-restraint component used.
 - a. Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear as evaluated by an agency acceptable to authorities having jurisdiction.
 - b. Annotate to indicate application of each product submitted and compliance with requirements.
- B. Delegated-Design Submittal: For each seismic-restraint device.
 - 1. Include design calculations and details for selecting seismic restraints complying with performance requirements, design criteria, and analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - 2. Design Calculations: Calculate static and dynamic loading caused by equipment weight, operation, and seismic and wind forces required to select seismic and wind restraints.
 - a. Coordinate design calculations with wind load calculations required for equipment mounted outdoors. Comply with requirements in other Sections for equipment mounted outdoors.
 - 3. Seismic- and Wind-Restraint Details:
 - a. Design Analysis: To support selection and arrangement of seismic and wind restraints. Include calculations of combined tensile and shear loads.

- b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to the restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events.
- c. Preapproval and Evaluation Documentation: By an agency acceptable to authorities having jurisdiction, showing maximum ratings of restraint items and the basis for approval (tests or calculations).

1.4 QUALITY ASSURANCE

- A. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.
- B. Seismic-restraint devices shall have horizontal and vertical load testing and analysis. They shall bear anchorage preapproval from OSHPD in addition to preapproval, showing maximum seismic-restraint ratings, by ICC-ES or another agency acceptable to authorities having jurisdiction. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) that support seismic-restraint designs must be signed and sealed by a qualified professional engineer.
- C. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Wind-Restraint Loading: (Refer to Structural and Architectural drawings if no value indicated)
 - 1. Basic Wind Speed: 110MPH.
 - 2. Minimum 10 lb. /sq. ft. multiplied by maximum area of HVAC component projected on vertical plane normal to wind direction and 45 degrees either side of normal.
- B. Seismic-Restraint Loading:
 - 1. Site Class as Defined in the Applicable edition of the building code governing the installation.
 - a. Class C Seismic Design Category B
 - b. Component Importance Factor: 1.5. (varies per specific component)
 - c. Component Response Modification Factor:
 - 1) Equipment: 2.5
 - 2) Conduit, bus duct, cable tray: 5.0.
 - d. Component Amplification Factor:
 - 1) Equipment: 1.0
 - 2) Conduit, bus duct, cable tray: 2.5.
 - 2. Design Spectral Response Acceleration at Short Periods (0.2 Second): 0.29g.
 - 3. Design Spectral Response Acceleration at 1.0-Second Period: 0.076g.

2.2 RESTRAINT CHANNEL BRACINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. B-line, an Eaton business.
 - 2. Hilti, Inc.
 - 3. Mason Industries, Inc.
 - 4. Unistrut; Part of Atkore International.
- B. Description: MFMA-4, shop- or field-fabricated bracing assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end, with other matching components, and with corrosion-resistant coating; rated in tension, compression, and torsion forces.

2.3 RESTRAINT CABLES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Kinetics Noise Control, Inc.
 - 2. Loos & Co., Inc.
 - 3. Vibration Mountings & Controls, Inc.
- B. Restraint Cables: ASTM A 603 galvanized ASTM A 492 stainless-steel cables. End connections made of steel assemblies with thimbles, brackets, swivel, and bolts designed for restraining cable service; with a minimum of two clamping bolts for cable engagement.

2.4 SEISMIC-RESTRAINT ACCESSORIES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. B-line, an Eaton business.
 - 2. Kinetics Noise Control, Inc.
 - 3. Mason Industries, Inc.
 - 4. TOLCO; a brand of NIBCO INC.
- B. Hanger-Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod.
- C. Hinged and Swivel Brace Attachments: Multifunctional steel connectors for attaching hangers to rigid channel bracings and restraint cables.
- D. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings and matched to type and size of anchor bolts and studs.
- E. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings and matched to type and size of attachment devices used.
- F. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

2.5 MECHANICAL ANCHOR BOLTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. B-line, an Eaton business.
 - 2. Hilti, Inc.
 - 3. Kinetics Noise Control, Inc.
 - 4. Mason Industries, Inc.
- B. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

2.6 ADHESIVE ANCHOR BOLTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Hilti, Inc.
 - 2. Kinetics Noise Control, Inc.
 - 3. Mason Industries, Inc.
- B. Adhesive Anchor Bolts: Drilled-in and capsule anchor system containing PVC or urethane methacrylate-based resin and accelerator, or injected polymer or hybrid mortar adhesive. Provide anchor bolts and hardware with zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

PART 3 - EXECUTION

3.1 APPLICATIONS

- A. Multiple Raceways or Cables: Secure raceways and cables to trapeze member with clamps approved for application by an agency acceptable to authorities having jurisdiction.
- B. Hanger-Rod Stiffeners: Install hanger-rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods caused by seismic forces.
- C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits.

3.2 SEISMIC-RESTRAINT DEVICE INSTALLATION

- A. Equipment and Hanger Restraints:
 - 1. Install resilient, bolt-isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.
 - 2. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction providing required submittals for component.
- B. Install cables so they do not bend across edges of adjacent equipment or building structure.

- C. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.
- D. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.
- E. Drilled-in Anchors:
 - 1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
 - 2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
 - 3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
 - 4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
 - 5. Set anchors to manufacturer's recommended torque using a torque wrench.
 - 6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.3 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

- A. Install flexible connections in runs of raceways, cables, wireways, cable trays, and busways where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where connection is terminated to equipment that is anchored to a different structural element from the one supporting them as they approach equipment.

3.4 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
 - 2. Test at least four of each type and size of installed anchors and fasteners selected by Architect.
 - 3. Test to 90 percent of rated proof load of device.
- B. Seismic controls will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

3.5 ADJUSTING

- A. Adjust restraints to permit free movement of equipment within normal mode of operation.

END OF SECTION 260548.16

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Color and legend requirements for raceways, conductors, and warning labels and signs.
 - 2. Labels.
 - 3. Bands and tubes.
 - 4. Tapes and stencils.
 - 5. Tags.
 - 6. Signs.
 - 7. Cable ties.
 - 8. Paint for identification.
 - 9. Fasteners for labels and signs.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for electrical identification products.
- B. Samples: For each type of label and sign to illustrate composition, size, colors, lettering style, mounting provisions, and graphic features of identification products.
- C. Identification Schedule: For each piece of electrical equipment and electrical system components to be an index of nomenclature for electrical equipment and system components used in identification signs and labels. Use same designations indicated on Drawings.
- D. Delegated-Design Submittal: For arc-flash hazard study.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Comply with ASME A13.1.
- B. Comply with NFPA 70.
- C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
- D. Comply with ANSI Z535.4 for safety signs and labels.

- E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.
- F. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
 - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 COLOR AND LEGEND REQUIREMENTS

- A. Raceways and Cables Carrying Circuits at 600 V or Less:
 - 1. Black letters on an orange field.
 - 2. Legend: Indicate voltage.
- B. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded feeder and branch-circuit conductors.
 - 1. Color shall be factory applied or field applied for sizes larger than No. 8 AWG if authorities having jurisdiction permit.
 - 2. Colors for 208/120-V Circuits:
 - a. Phase A: Black.
 - b. Phase B: Red.
 - c. Phase C: Blue.
 - 3. Color for Neutral: White.
 - 4. Color for Equipment Grounds: Green.
 - 5. Colors for Isolated Grounds: Green with white stripe.
- C. Warning Label Colors:
 - 1. Identify system voltage with black letters on an orange background.
- D. Warning labels and signs shall include, but are not limited to, the following legends:
 - 1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
 - 2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."

2.3 LABELS

- A. Vinyl Wraparound Labels: Preprinted, flexible labels laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Brady Corporation.
 - b. Champion America.
 - c. LEM Products Inc.
 - d. Panduit Corp.
- B. Snap-around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameters sized to suit diameters and that stay in place by gripping action.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Brady Corporation.
 - b. Marking Services, Inc.
 - c. Panduit Corp.
 - d. Seton Identification Products.

- C. Self-Adhesive Wraparound Labels: Preprinted, 3-mil-thick, polyester flexible label with acrylic pressure-sensitive adhesive.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Brady Corporation.
 - b. Emedco.
 - c. LEM Products Inc.
 - d. Panduit Corp.
 - 2. Self-Lamination: Clear; UV-, weather- and chemical-resistant; self-laminating, protective shield over the legend. Labels sized such that the clear shield overlaps the entire printed legend.
 - 3. Marker for Labels: Permanent, waterproof, black ink marker recommended by tag manufacturer.
 - 4. Marker for Labels: Machine-printed, permanent, waterproof, black ink recommended by printer manufacturer.
- D. Self-Adhesive Labels: Polyester, thermal, transfer-printed, 3-mil-thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Brady Corporation.
 - b. Emedco.
 - c. LEM Products Inc.
 - d. Panduit Corp.
 - 2. Minimum Nominal Size:
 - a. 1-1/2 by 6 inches for raceway and conductors.
 - b. 3-1/2 by 5 inches for equipment.
 - c. As required by authorities having jurisdiction.

2.4 BANDS AND TUBES

- A. Snap-around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeves, 2 inches long, with diameters sized to suit diameters and that stay in place by gripping action.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Brady Corporation.
 - b. Panduit Corp.
- B. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tubes with machine-printed identification labels, sized to suit diameter and shrunk to fit firmly. Full shrink recovery occurs at a maximum of 200 deg F. Comply with UL 224.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Brady Corporation.
 - b. Panduit Corp.

2.5 TAPES AND STENCILS

- A. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Ideal Industries, Inc.
 - b. Panduit Corp.

- B. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; not less than 3 mils thick by 1 to 2 inches wide; compounded for outdoor use.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Brady Corporation.
 - b. Emedco.
- C. Tape and Stencil: 4-inch-wide black stripes on 10-inch centers placed diagonally over orange background and is 12 inches wide. Stop stripes at legends.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. LEM Products Inc.
 - b. Seton Identification Products.
- D. Floor Marking Tape: 2-inch-wide, 5-mil pressure-sensitive vinyl tape, with yellow and black stripes and clear vinyl overlay.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Carlton Industries, LP.
 - b. Seton Identification Products.

2.6 TAGS

- A. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch, with stamped legend, punched for use with self-locking cable tie fastener.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Brady Corporation.
 - b. Carlton Industries, LP.
- B. Nonmetallic Preprinted Tags: Polyethylene tags, [0.015 inch] [0.023 inch] thick, color-coded for phase and voltage level, with factory [screened] [printed] permanent designations; punched for use with self-locking cable tie fastener.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Brady Corporation.
 - b. Carlton Industries, LP.
- C. Write-on Tags:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Carlton Industries, LP.
 - b. LEM Products Inc.
 - 2. Polyester Tags: 0.010 inch thick, with corrosion-resistant grommet and cable tie for attachment.
 - 3. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
 - 4. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

2.7 SIGNS

- A. Baked-Enamel Signs:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Carlton Industries, LP.
 - b. Champion America.
 2. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
 3. 1/4-inch grommets in corners for mounting.
 4. Nominal Size: 7 by 10 inches.
- B. Metal-Backed Butyrate Signs:
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Brady Corporation.
 - b. Champion America.
 2. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs, with 0.0396-inch galvanized-steel backing, punched and drilled for fasteners, and with colors, legend, and size required for application.
 3. 1/4-inch grommets in corners for mounting.
 4. Nominal Size: 10 by 14 inches.
- C. Laminated Acrylic or Melamine Plastic Signs:
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Brady Corporation.
 - b. Carlton Industries, LP.
 2. Engraved legend.
 3. Thickness:
 - a. For signs up to 20 sq. in., minimum 1/16 inch.
 - b. For signs larger than 20 sq. in., 1/8 inch thick.
 - c. Engraved legend with black letters on white face.
 - d. Self-adhesive.
 - e. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.8 CABLE TIES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Ideal Industries, Inc.
 2. Panduit Corp.
- B. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.
 1. Minimum Width: 3/16 inch.
 2. Tensile Strength at 73 Deg F according to ASTM D 638: 12,000 psi.
 3. Temperature Range: Minus 40 to plus 185 deg F.
 4. Color: Black, except where used for color-coding.
- C. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.
 1. Minimum Width: 3/16 inch.
 2. Tensile Strength at 73 Deg F according to ASTM D 638: 12,000 psi.
 3. Temperature Range: Minus 40 to plus 185 deg F.
 4. Color: Black.
- D. Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one piece, and self-locking.
 1. Minimum Width: 3/16 inch.
 2. Tensile Strength at 73 Deg F according to ASTM D 638: 7000 psi.
 3. UL 94 Flame Rating: 94V-0.

- 4. Temperature Range: Minus 50 to plus 284 deg F.
- 5. Color: Black.

2.9 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).
- B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

3.2 INSTALLATION

- A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.
- B. Install identifying devices before installing acoustical ceilings and similar concealment.
- C. Verify identity of each item before installing identification products.
- D. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.
- E. Apply identification devices to surfaces that require finish after completing finish work.
- F. Install signs with approved legend to facilitate proper identification, operation, and maintenance of electrical systems and connected items.
- G. System Identification for Raceways and Cables under 600 V: Identification shall completely encircle cable or conduit. Place identification of two-color markings in contact, side by side.
 - 1. Secure tight to surface of conductor, cable, or raceway.
- H. System Identification for Raceways and Cables over 600 V: Identification shall completely encircle cable or conduit. Place adjacent identification of two-color markings in contact, side by side.
 - 1. Secure tight to surface of conductor, cable, or raceway.
- I. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
- J. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from the floor.

- K. Accessible Fittings for Raceways: Identify the covers of each junction and pull box of the following systems with the wiring system legend and system voltage. System legends shall be as follows:
 - 1. "POWER."
 - 2. "FIRE ALARM"
- L. Vinyl Wraparound Labels:
 - 1. Secure tight to surface of raceway or cable at a location with high visibility and accessibility.
 - 2. Attach labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to the location and substrate.
- M. Snap-around Labels: Secure tight to surface at a location with high visibility and accessibility.
- N. Self-Adhesive Wraparound Labels: Secure tight to surface at a location with high visibility and accessibility.
- O. Self-Adhesive Labels:
 - 1. On each item, install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual.
 - 2. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on 1-1/2-inch-high label; where two lines of text are required, use labels 2 inches high.
- P. Snap-around Color-Coding Bands: Secure tight to surface at a location with high visibility and accessibility.
- Q. Heat-Shrink, Preprinted Tubes: Secure tight to surface at a location with high visibility and accessibility.
- R. Marker Tapes: Secure tight to surface at a location with high visibility and accessibility.
- S. Self-Adhesive Vinyl Tape: Secure tight to surface at a location with high visibility and accessibility.
 - 1. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding.
- T. Tape and Stencil: Comply with requirements in painting Sections for surface preparation and paint application.
- U. Floor Marking Tape: Apply stripes to finished surfaces following manufacturer's written instructions.
- V. Metal Tags:
 - 1. Place in a location with high visibility and accessibility.
 - 2. Secure using plenum-rated cable ties.
- W. Nonmetallic Preprinted Tags:
 - 1. Place in a location with high visibility and accessibility.
 - 2. Secure using plenum-rated cable ties.
- X. Write-on Tags:
 - 1. Place in a location with high visibility and accessibility.
 - 2. Secure using plenum-rated cable ties.
- Y. Baked-Enamel Signs:
 - 1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
 - 2. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on minimum 1-1/2-inch-high sign; where two lines of text are required, use signs minimum 2 inches high.

- Z. Metal-Backed Butyrate Signs:
 - 1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
 - 2. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on 1-1/2-inch-high sign; where two lines of text are required, use labels 2 inches high.
- AA. Laminated Acrylic or Melamine Plastic Signs:
 - 1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
 - 2. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on 1-1/2-inch-high sign; where two lines of text are required, use labels 2 inches high.
- BB. Cable Ties: General purpose, for attaching tags, except as listed below:
 - 1. Outdoors: UV-stabilized nylon.
 - 2. In Spaces Handling Environmental Air: Plenum rated.

3.3 IDENTIFICATION SCHEDULE

- A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.
- B. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations of high visibility. Identify by system and circuit designation.
- C. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits, More Than 30A and 120V to Ground: Identify with self-adhesive vinyl tape applied in bands.
 - 1. Locate identification at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.
- D. Accessible Fittings for Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive labels containing the wiring system legend and system voltage. System legends shall be as follows:
 - 1. "POWER."
 - 2. "FIRE ALARM"
- E. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use self-adhesive vinyl wraparound labels to identify the phase.
 - 1. Locate identification at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.
- F. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use self-adhesive labels with the conductor or cable designation, origin, and destination.
- G. Control-Circuit Conductor Termination Identification: For identification at terminations, provide self-adhesive labels with the conductor designation.
- H. Conductors to Be Extended in the Future: Attach write-on tags to conductors and list source.
- I. Auxiliary Electrical Systems Conductor Identification: Self-adhesive vinyl tape that is uniform and consistent with system used by manufacturer for factory-installed connections.
 - 1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.

- J. Workspace Indication: Apply floor marking tape to finished surfaces. Show working clearances in the direction of access to live parts. Workspace shall comply with NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.
- K. Instructional Signs: Self-adhesive labels, including the color code for grounded and ungrounded conductors.
- L. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive labels.
 - 1. Apply to exterior of door, cover, or other access.
 - 2. For equipment with multiple power or control sources, apply to door or cover of equipment, including, but not limited to, the following:
 - a. Power-transfer switches.
 - b. Controls with external control power connections.
- M. Arc Flash Warning Labeling: Self-adhesive labels.
- N. Operating Instruction Signs: Self-adhesive labels, Baked-enamel warning signs, Laminated acrylic or melamine plastic signs.
- O. Emergency Operating Instruction Signs: Self-adhesive labels, Baked-enamel warning signs, Laminated acrylic or melamine plastic signs with white legend on a red background with minimum 3/8-inch-high letters for emergency instructions at equipment used for power transfer and load shedding.
- P. Equipment Identification Labels:
 - 1. Indoor Equipment: Self-adhesive label, Baked-enamel signs, laminated acrylic or melamine plastic sign.
 - 2. Outdoor Equipment: Laminated acrylic or melamine sign.
 - 3. Equipment to Be Labeled:
 - a. Panelboards/Load Centers: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be in the form of a self-adhesive, engraved, laminated acrylic or melamine label.
 - b. Enclosures and electrical cabinets.
 - c. Access doors and panels for concealed electrical items.
 - d. Switchgear.
 - e. Enclosed switches.
 - f. Enclosed circuit breakers.
 - g. Enclosed controllers.
 - h. Push-button stations.
 - i. Contactors.
 - j. Remote-controlled switches, dimmer modules, and control devices.
 - k. Monitoring and control equipment.

END OF SECTION 260553

SECTION 260573.13 - SHORT-CIRCUIT STUDIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes a computer-based, fault-current study to determine the minimum interrupting capacity of circuit protective devices.

1.3 DEFINITIONS

- A. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed and salvaged, or removed and reinstalled. Existing to remain items shall remain functional throughout the construction period.
- B. Field Adjusting Agency: An independent electrical testing agency with full-time employees and the capability to adjust devices and conduct testing indicated and that is a member company of NETA.
- C. One-Line Diagram: A diagram that shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.
- D. Power System Analysis Software Developer: An entity that commercially develops, maintains, and distributes computer software used for power system studies.
- E. Power Systems Analysis Specialist: Professional engineer in charge of performing the study and documenting recommendations, licensed in the state where Project is located.
- F. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion of the circuit from the system.
- G. SCCR: Short-circuit current rating.
- H. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.
- I. Single-Line Diagram: See "One-Line Diagram."

1.4 ACTION SUBMITTALS

- A. Product Data:
 - 1. For computer software program to be used for studies.
 - 2. Submit the following after the approval of system protective devices submittals. Submittals shall be in digital form.

- a. Short-circuit study input data, including completed computer program input data sheets.
- b. Short-circuit study and equipment evaluation report; signed, dated, and sealed by a qualified professional engineer.
 - 1) Submit study report for action prior to receiving final approval of distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Architect for preliminary submittal of sufficient study data to ensure that selection of devices and associated characteristics is satisfactory.
 - 2) Revised one-line diagram, reflecting field investigation results and results of short-circuit study.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data:

1. For Power Systems Analysis Software Developer.
2. For Power System Analysis Specialist.
3. For Field Adjusting Agency.

B. Product Certificates: For short-circuit study software, certifying compliance with IEEE 399.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data:

1. For overcurrent protective devices to include in emergency, operation, and maintenance manuals.
2. The following are from the Short-Circuit Study Report:
 - a. Final one-line diagram.
 - b. Final Short-Circuit Study Report.
 - c. Short-circuit study data files.
 - d. Power system data.

1.7 QUALITY ASSURANCE

- A. Study shall be performed using commercially developed and distributed software designed specifically for power system analysis.
- B. Software algorithms shall comply with requirements of standards and guides specified in this Section.
- C. Manual calculations are unacceptable.
 1. Power System Analysis Software Qualifications: Computer program shall be designed to perform short-circuit studies or have a function, component, or add-on module designed to perform short-circuit studies.
 2. Computer program shall be developed under the charge of a licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.
- D. Power Systems Analysis Specialist Qualifications: Professional engineer licensed in the state where Project is located. All elements of the study shall be performed under the direct supervision and control of this professional engineer.

- E. Short-Circuit Study Certification: Short-Circuit Study Report shall be signed and sealed by Power Systems Analysis Specialist.
- F. Field Adjusting Agency Qualifications:
 - 1. Employer of a NETA ETT-Certified Technician Level III or NICET Electrical Power Testing Level III certification responsible for all field adjusting of the Work.
 - 2. A member company of NETA.
 - 3. Acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 POWER SYSTEM ANALYSIS SOFTWARE DEVELOPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. CGI CYME.
 - 2. Power Analytics, Corporation.
 - 3. SKM Systems Analysis, Inc.
- B. Comply with IEEE 399 and IEEE 551.
 - 1. Analytical features of power systems analysis software program shall have capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.
- C. Computer software program shall be capable of plotting and diagramming time-current-characteristic curves as part of its output.

2.2 SHORT-CIRCUIT STUDY REPORT CONTENTS

- A. Executive summary of study findings.
- B. Study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpretation of results.
- C. One-line diagram of modeled power system, showing the following:
 - 1. Protective device designations and ampere ratings.
 - 2. Conductor types, sizes, and lengths.
 - 3. Transformer kilovolt ampere (kVA) and voltage ratings.
 - 4. Motor and generator designations and kVA ratings.
 - 5. Switchgear, switchboard, motor-control center, and panelboard designations and ratings.
 - 6. Derating factors and environmental conditions.
 - 7. Any revisions to electrical equipment required by the study.
- D. Comments and recommendations for system improvements or revisions in a written document, separate from one-line diagram.
- E. Protective Device Evaluation:

1. Evaluate equipment and protective devices and compare to available short-circuit currents. Verify that equipment withstand ratings exceed available short-circuit current at equipment installation locations.
2. Tabulations of circuit breaker, fuse, and other protective device ratings versus calculated short-circuit duties.
3. For 600-V overcurrent protective devices, ensure that interrupting ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.
4. For devices and equipment rated for asymmetrical fault current, apply multiplication factors listed in standards to 1/2-cycle symmetrical fault current.
5. Verify adequacy of phase conductors at maximum three-phase bolted fault currents; verify adequacy of equipment grounding conductors and grounding electrode conductors at maximum ground-fault currents. Ensure that short-circuit withstand ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.

F. Short-Circuit Study Input Data:

1. One-line diagram of system being studied.
2. Power sources available.
3. Manufacturer, model, and interrupting rating of protective devices.
4. Conductors.
5. Transformer data.

G. Short-Circuit Study Output Reports:

1. Low-Voltage Fault Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:
 - a. Voltage.
 - b. Calculated fault-current magnitude and angle.
 - c. Fault-point X/R ratio.
 - d. Equivalent impedance.
2. Momentary Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:
 - a. Voltage.
 - b. Calculated symmetrical fault-current magnitude and angle.
 - c. Fault-point X/R ratio.
 - d. Calculated asymmetrical fault currents:
 - 1) Based on fault-point X/R ratio.
 - 2) Based on calculated symmetrical value multiplied by 1.6.
 - 3) Based on calculated symmetrical value multiplied by 2.7.
3. Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:
 - a. Voltage.
 - b. Calculated symmetrical fault-current magnitude and angle.
 - c. Fault-point X/R ratio.
 - d. No AC Decrement (NACD) ratio.
 - e. Equivalent impedance.
 - f. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a symmetrical basis.
 - g. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a total basis.

PART 3 - EXECUTION

3.1 POWER SYSTEM DATA

- A. Obtain all data necessary for conduct of the study.
 - 1. Verify completeness of data supplied on one-line diagram. Call any discrepancies to Architect's attention.
 - 2. For equipment included as Work of this Project, use characteristics submitted under provisions of action submittals and information submittals for this Project.
 - 3. For relocated equipment, obtain required electrical distribution system data by field investigation and surveys, conducted by qualified technicians and engineers. Qualifications of technicians and engineers shall be as defined by NFPA 70E.
- B. Gather and tabulate the required input data to support the short-circuit study. Comply with requirements in Section 017839 "Project Record Documents" for recording circuit protective device characteristics. Record data on a Record Document copy of one-line diagram. Comply with recommendations in IEEE 551 as to the amount of detail that is required to be acquired in the field. Field data gathering shall be under direct supervision and control of the engineer in charge of performing the study, and shall be by the engineer or its representative who holds NETA ETT-Certified Technician Level III or NICET Electrical Power Testing Level III certification. Data include, but are not limited to, the following:
 - 1. Product Data for Project's overcurrent protective devices involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
 - 2. Obtain electrical power utility impedance at the service.
 - 3. Power sources and ties.
 - 4. For transformers, include kVA, primary and secondary voltages, connection type, impedance, X/R ratio, taps measured in percent, and phase shift.
 - 5. For reactors, provide manufacturer and model designation, voltage rating, and impedance.
 - 6. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip, SCCR, current rating, and breaker settings.
 - 7. Generator short-circuit current contribution data, including short-circuit reactance, rated kVA, rated voltage, and X/R ratio.
 - 8. Busway manufacturer and model designation, current rating, impedance, lengths, and conductor material.
 - 9. Motor horsepower and NEMA MG 1 code letter designation.
 - 10. Conductor sizes, lengths, number, conductor material and conduit material (magnetic or nonmagnetic).
 - 11. Derating factors.

3.2 SHORT-CIRCUIT STUDY

- A. Perform study following the general study procedures contained in IEEE 399.
- B. Calculate short-circuit currents according to IEEE 551.
- C. Base study on device characteristics supplied by device manufacturer.
- D. Extent of electrical power system to be studied is indicated on Drawings.

- E. Begin short-circuit current analysis at the service, extending down to system overcurrent protective devices as follows:
 - 1. To normal system low-voltage load buses where fault current is 10 kA or less.
 - 2. Exclude equipment rated 240 V ac or less when supplied by a single transformer rated less than 125 kVA.
- F. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for Project. Study all cases of system-switching configurations and alternate operations that could result in maximum fault conditions.
- G. Include the ac fault-current decay from induction motors, synchronous motors, and asynchronous generators and apply to low- and medium-voltage, three-phase ac systems. Also account for the fault-current dc decrement to address asymmetrical requirements of interrupting equipment.
- H. Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault and a single line-to-ground fault at each equipment indicated on one-line diagram.
 - 1. For grounded systems, provide a bolted line-to-ground fault-current study for areas as defined for the three-phase bolted fault short-circuit study.
- I. Include in the report identification of any protective device applied outside its capacity.

END OF SECTION 260573.13

SECTION 260573.16 - COORDINATION STUDIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes computer-based, overcurrent protective device coordination studies to determine overcurrent protective devices and to determine overcurrent protective device settings for selective tripping.
 - 1. Study results shall be used to determine coordination of series-rated devices.

1.3 DEFINITIONS

- A. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled. Existing to remain items shall remain functional throughout the construction period.
- B. Field Adjusting Agency: An independent electrical testing agency with full-time employees and the capability to adjust devices and conduct testing indicated and that is a member company of NETA.
- C. One-Line Diagram: A diagram that shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.
- D. Power System Analysis Software Developer: An entity that commercially develops, maintains, and distributes computer software used for power system studies.
- E. Power System Analysis Specialist: Professional engineer in charge of performing the study and documenting recommendations, licensed in the state where Project is located.
- F. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion of the circuit from the system.
- G. SCCR: Short-circuit current rating.
- H. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.
- I. Single-Line Diagram: See "One-Line Diagram."

1.4 ACTION SUBMITTALS

- A. Product Data:

1. For computer software program to be used for studies.
2. Submit the following after the approval of system protective devices submittals. Submittals shall be in digital form.
 - a. Coordination-study input data, including completed computer program input data sheets.
 - b. Study and equipment evaluation reports.
3. Overcurrent protective device coordination study report; signed, dated, and sealed by a qualified professional engineer.
 - a. Submit study report for action prior to receiving final approval of distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Architect for preliminary submittal of sufficient study data to ensure that selection of devices and associated characteristics is satisfactory.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data:

1. For Power System Analysis Software Developer.
2. For Power Systems Analysis Specialist.
3. For Field Adjusting Agency.

B. Product Certificates: For overcurrent protective device coordination study software, certifying compliance with IEEE 399.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For overcurrent protective devices to include in emergency, operation, and maintenance manuals.

1. The following are from the Coordination Study Report:
 - a. Final one-line diagram.
 - b. Final protective device coordination study.
 - c. Coordination study data files.
 - d. List of all protective device settings.
 - e. Time-current coordination curves.
 - f. Power system data.

1.7 QUALITY ASSURANCE

- A. Studies shall be performed using commercially developed and distributed software designed specifically for power system analysis.
- B. Software algorithms shall comply with requirements of standards and guides specified in this Section.
- C. Manual calculations are unacceptable.
- D. Power System Analysis Software Qualifications:

1. Computer program shall be designed to perform coordination studies or have a function, component, or add-on module designed to perform coordination studies.
 2. Computer program shall be developed under the charge of a licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.
- E. Power Systems Analysis Specialist Qualifications: Professional engineer licensed in the state where Project is located. All elements of the study shall be performed under the direct supervision and control of this professional engineer.
- F. Field Adjusting Agency Qualifications:
1. Employer of a NETA ETT-Certified Technician Level III responsible for all field adjusting of the Work.
 2. A member company of NETA.
 3. Acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 POWER SYSTEM ANALYSIS SOFTWARE DEVELOPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. CGI CYME.
 2. Power Analytics, Corporation.
 3. SKM Systems Analysis, Inc.
- B. Comply with IEEE 242 and IEEE 399.
- C. Analytical features of device coordination study computer software program shall have the capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.
- D. Computer software program shall be capable of plotting and diagramming time-current-characteristic curves as part of its output. Computer software program shall report device settings and ratings of all overcurrent protective devices and shall demonstrate selective coordination by computer-generated, time-current coordination plots.
1. Optional Features:
 - a. Arcing faults.
 - b. Simultaneous faults.
 - c. Explicit negative sequence.
 - d. Mutual coupling in zero sequence.

2.2 COORDINATION STUDY REPORT CONTENTS

- A. Executive summary of study findings.
- B. Study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpretation of results.
- C. One-line diagram of modeled power system, showing the following:

1. Protective device designations and ampere ratings.
 2. Conductor types, sizes, and lengths.
 3. Transformer kilovolt ampere (kVA) and voltage ratings.
 4. Motor and generator designations and kVA ratings.
 5. Switchgear, switchboard, motor-control center, and panelboard designations.
 6. Any revisions to electrical equipment required by the study.
 7. Study Input Data: As described in "Power System Data" Article.
 - a. Short-Circuit Study Output: As specified in "Short-Circuit Study Output Reports" Paragraph in "Short-Circuit Study Report Contents" Article in Section 260573.13 "Short-Circuit Studies."
- D. Protective Device Coordination Study:
1. Report recommended settings of protective devices, ready to be applied in the field. Use manufacturer's data sheets for recording the recommended setting of overcurrent protective devices when available.
 - a. Phase and Ground Relays:
 - 1) Device tag.
 - 2) Relay current transformer ratio and tap, time dial, and instantaneous pickup value.
 - 3) Recommendations on improved relaying systems, if applicable.
 - b. Circuit Breakers:
 - 1) Adjustable pickups and time delays (long time, short time, and ground).
 - 2) Adjustable time-current characteristic.
 - 3) Adjustable instantaneous pickup.
 - 4) Recommendations on improved trip systems, if applicable.
 - c. Fuses: Show current rating, voltage, and class.
- E. Time-Current Coordination Curves: Determine settings of overcurrent protective devices to achieve selective coordination. Graphically illustrate that adequate time separation exists between devices installed in series, including power utility company's upstream devices. Prepare separate sets of curves for the switching schemes and for emergency periods where the power source is local generation. Show the following information:
1. Device tag and title, one-line diagram with legend identifying the portion of the system covered.
 2. Terminate device characteristic curves at a point reflecting maximum symmetrical or asymmetrical fault current to which the device is exposed.
 3. Identify the device associated with each curve by manufacturer type, function, and, if applicable, tap, time delay, and instantaneous settings recommended.
 4. Plot the following listed characteristic curves, as applicable:
 - a. Power utility's overcurrent protective device.
 - b. Medium-voltage equipment overcurrent relays.
 - c. Medium- and low-voltage fuses including manufacturer's minimum melt, total clearing, tolerance, and damage bands.
 - d. Low-voltage equipment circuit-breaker trip devices, including manufacturer's tolerance bands.
 - e. Transformer full-load current, magnetizing inrush current, and ANSI through-fault protection curves.

- f. Cables and conductors damage curves.
 - g. Ground-fault protective devices.
 - h. Motor-starting characteristics and motor damage points.
 - i. Generator short-circuit decrement curve and generator damage point.
 - j. The largest feeder circuit breaker in each motor-control center and panelboard.
- 5. Maintain selectivity for tripping currents caused by overloads.
- 6. Maintain maximum achievable selectivity for tripping currents caused by overloads on series-rated devices.
- 7. Provide adequate time margins between device characteristics such that selective operation is achieved.
- 8. Comments and recommendations for system improvements.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine Project overcurrent protective device submittals for compliance with electrical distribution system coordination requirements and other conditions affecting performance of the Work. Devices to be coordinated are indicated on Drawings.
 - 1. Proceed with coordination study only after relevant equipment submittals have been assembled. Overcurrent protective devices that have not been submitted and approved prior to coordination study may not be used in study.

3.2 POWER SYSTEM DATA

- A. Obtain all data necessary for conduct of the overcurrent protective device study.
 - 1. Verify completeness of data supplied in one-line diagram on Drawings. Call any discrepancies to Architect's attention.
 - 2. For equipment included as Work of this Project, use characteristics submitted under provisions of action submittals and information submittals for this Project.
 - 3. For relocated equipment and that which is existing to remain, obtain required electrical distribution system data by field investigation and surveys, conducted by qualified technicians and engineers. Qualifications of technicians and engineers shall be as defined by NFPA 70E.
- B. Gather and tabulate all required input data to support the coordination study. List below is a guide. Comply with recommendations in IEEE 551 for the amount of detail required to be acquired in the field. Field data gathering shall be under direct supervision and control of the engineer in charge of performing the study, and shall be by the engineer or its representative who holds NETA ETT-Certified Technician Level III or NICET Electrical Power Testing Level III certification. Data include, but are not limited to, the following:
 - 1. Product Data for overcurrent protective devices specified in other Sections and involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
 - 2. Electrical power utility impedance at the service.
 - 3. Power sources and ties.
 - 4. Short-circuit current at each system bus (three phase and line to ground).

5. Full-load current of all loads.
6. Voltage level at each bus.
7. For transformers, include kVA, primary and secondary voltages, connection type, impedance, X/R ratio, taps measured in percent, and phase shift.
8. For reactors, provide manufacturer and model designation, voltage rating, and impedance.
9. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip and available range of settings, SCCR, current rating, and breaker settings.
10. Generator short-circuit current contribution data, including short-circuit reactance, rated kVA, rated voltage, and X/R ratio.
11. For relays, provide manufacturer and model designation, current transformer ratios, potential transformer ratios, and relay settings.
12. Maximum demands from service meters.
13. Busway manufacturer and model designation, current rating, impedance, lengths, size, and conductor material.
14. Motor horsepower and NEMA MG 1 code letter designation.
15. Low-voltage cable sizes, lengths, number, conductor material, and conduit material (magnetic or nonmagnetic).
16. Medium-voltage cable sizes, lengths, conductor material, cable construction, metallic shield performance parameters, and conduit material (magnetic or nonmagnetic).
17. Data sheets to supplement electrical distribution system one-line diagram, cross-referenced with tag numbers on diagram, showing the following:
 - a. Special load considerations, including starting inrush currents and frequent starting and stopping.
 - b. Transformer characteristics, including primary protective device, magnetic inrush current, and overload capability.
 - c. Motor full-load current, locked rotor current, service factor, starting time, type of start, and thermal-damage curve.
 - d. Generator thermal-damage curve.
 - e. Ratings, types, and settings of utility company's overcurrent protective devices.
 - f. Special overcurrent protective device settings or types stipulated by utility company.
 - g. Time-current-characteristic curves of devices indicated to be coordinated.
 - h. Manufacturer, frame size, interrupting rating in amperes root mean square (rms) symmetrical, ampere or current sensor rating, long-time adjustment range, short-time adjustment range, and instantaneous adjustment range for circuit breakers.
 - i. Manufacturer and type, ampere-tap adjustment range, time-delay adjustment range, instantaneous attachment adjustment range, and current transformer ratio for overcurrent relays.
 - j. Switchgear, switchboards, motor-control centers, and panelboards ampacity, and SCCR in amperes rms symmetrical.
 - k. Identify series-rated interrupting devices for a condition where the available fault current is greater than the interrupting rating of downstream equipment. Obtain device data details to allow verification that series application of these devices complies with NFPA 70 and UL 489 requirements.

3.3 COORDINATION STUDY

- A. Comply with IEEE 242 for calculating short-circuit currents and determining coordination time intervals.
- B. Comply with IEEE 399 for general study procedures.
- C. Base study on device characteristics supplied by device manufacturer.
- D. Extent of electrical power system to be studied is indicated on Drawings.

- E. Begin analysis at the service, extending down to system overcurrent protective devices as follows:
 - 1. To normal system low-voltage load buses where fault current is 10 kA or less.
 - 2. Exclude equipment rated 240 V ac or less when supplied by a single transformer rated less than 125 kVA.
- F. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for Project. Study all cases of system-switching configurations and alternate operations that could result in maximum fault conditions.
- G. Transformer Primary Overcurrent Protective Devices:
 - 1. Device shall not operate in response to the following:
 - a. Inrush current when first energized.
 - b. Self-cooled, full-load current or forced-air-cooled, full-load current, whichever is specified for that transformer.
 - c. Permissible transformer overloads according to IEEE C57.96 if required by unusual loading or emergency conditions.
 - 2. Device settings shall protect transformers according to IEEE C57.12.00, for fault currents.
- H. Motor Protection:
 - 1. Select protection for low-voltage motors according to IEEE 242 and NFPA 70.
 - 2. Select protection for motors served at voltages more than 600 V according to IEEE 620.
- I. Conductor Protection: Protect cables against damage from fault currents according to ICEA P-32-382, ICEA P-45-482, and protection recommendations in IEEE 242. Demonstrate that equipment withstands the maximum short-circuit current for a time equivalent to the tripping time of the primary relay protection or total clearing time of the fuse. To determine temperatures that damage insulation, use curves from cable manufacturers or from listed standards indicating conductor size and short-circuit current.
- J. Generator Protection: Select protection according to manufacturer's written instructions and to IEEE 242.
- K. Include the ac fault-current decay from induction motors, synchronous motors, and asynchronous generators and apply to low- and medium-voltage, three-phase ac systems. Also account for fault-current dc decrement, to address asymmetrical requirements of interrupting equipment.
- L. Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault and a single line-to-ground fault at each equipment indicated on one-line diagram.
 - 1. For grounded systems, provide a bolted line-to-ground fault-current study for areas as defined for the three-phase bolted fault short-circuit study.
- M. Protective Device Evaluation:
 - 1. Evaluate equipment and protective devices and compare to short-circuit ratings.
 - 2. Adequacy of switchgear, motor-control centers, and panelboard bus bars to withstand short-circuit stresses.
 - 3. Any application of series-rated devices shall be recertified, complying with requirements in NFPA 70.
 - 4. Include in the report identification of any protective device applied outside its capacity.

3.4 LOAD-FLOW AND VOLTAGE-DROP STUDY

- A. Perform a load-flow and voltage-drop study to determine the steady-state loading profile of the system. Analyze power system performance two times as follows:
 - 1. Determine load flow and voltage drop based on full-load currents obtained in "Power System Data" Article.
 - 2. Determine load flow and voltage drop based on 80 percent of the design capacity of load buses.
 - 3. Prepare load-flow and voltage-drop analysis and report to show power system components that are overloaded, or might become overloaded; show bus voltages that are less than as prescribed by NFPA 70.

3.5 MOTOR-STARTING STUDY

- A. Perform a motor-starting study to analyze the transient effect of system's voltage profile during motor starting. Calculate significant motor-starting voltage profiles and analyze the effects of motor starting on the power system stability.
- B. Prepare the motor-starting study report, noting light flicker for limits proposed by IEEE 141, and voltage sags so as not to affect operation of other utilization equipment on system supplying the motor.

3.6 FIELD ADJUSTING

- A. Adjust relay and protective device settings according to recommended settings provided by the coordination study. Field adjustments shall be completed by the engineering service division of equipment manufacturer under the "Startup and Acceptance Testing" contract portion.
- B. Make minor modifications to equipment as required to accomplish compliance with short-circuit and protective device coordination studies.
- C. Testing and adjusting shall be by a full-time employee of the Field Adjusting Agency, who holds NETA ETT-Certified Technician Level III or NICET Electrical Power Testing Level III certification.
 - 1. Perform each visual and mechanical inspection and electrical test stated in NETA ATS. Certify compliance with test parameters. Perform NETA tests and inspections for all adjustable overcurrent protective devices.

3.7 DEMONSTRATION

- A. Engage Power Systems Analysis Specialist to train Owner's maintenance personnel in the following:
 - 1. Acquaint personnel in fundamentals of operating the power system in normal and emergency modes.
 - 2. Hand-out and explain the coordination study objectives, study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpreting time-current coordination curves.
 - 3. For Owner's maintenance staff certified as NETA ETT-Certified Technicians Level III or NICET Electrical Power Testing Level III Technicians, teach how to adjust, operate, and maintain overcurrent protective device settings.

CHARTWELLS
735 ANDERSON HILL RD, PURCHASE, NY

SUNY PURCHASE HUB - CAFE RENOVATION
PHASE ZERO DESIGN PROJECT #1518416

END OF SECTION 260573.16

SECTION 260573.19 - ARC-FLASH HAZARD ANALYSIS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes a computer-based, arc-flash study to determine the arc-flash hazard distance and the incident energy to which personnel could be exposed during work on or near electrical equipment.

1.3 DEFINITIONS

- A. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.
- B. Field Adjusting Agency: An independent electrical testing agency with full-time employees and the capability to adjust devices and conduct testing indicated and that is a member company of NETA.
- C. One-Line Diagram: A diagram that shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.
- D. Power System Analysis Software Developer: An entity that commercially develops, maintains, and distributes computer software used for power system studies.
- E. Power Systems Analysis Specialist: Professional engineer in charge of performing the study and documenting recommendations, licensed in the state where Project is located.
- F. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion from the system.
- G. SCCR: Short-circuit current rating.
- H. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.
- I. Single-Line Diagram: See "One-Line Diagram."

1.4 ACTION SUBMITTALS

- A. Product Data: For computer software program to be used for studies.
- B. Study Submittals: Submit the following submittals after the approval of system protective devices submittals. Submittals shall be in digital form:

1. Arc-flash study input data, including completed computer program input data sheets.
2. Arc-flash study report; signed, dated, and sealed by Power Systems Analysis Specialist.
3. Submit study report for action prior to receiving final approval of distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Architect for preliminary submittal of sufficient study data to ensure that selection of devices and associated characteristics is satisfactory.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data:

1. For Power Systems Analysis Software Developer.
2. For Power System Analysis Specialist.
3. For Field Adjusting Agency.

B. Product Certificates: For arc-flash hazard analysis software, certifying compliance with IEEE 1584 and NFPA 70E.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data:

1. Provide maintenance procedures in equipment manuals according to requirements in NFPA 70E.
2. Operation and Maintenance Procedures: In addition to items specified in Section 017823 "Operation and Maintenance Data," provide maintenance procedures for use by Owner's personnel that comply with requirements in NFPA 70E.

1.7 QUALITY ASSURANCE

- A. Study shall be performed using commercially developed and distributed software designed specifically for power system analysis.
- B. Software algorithms shall comply with requirements of standards and guides specified in this Section.
- C. Manual calculations are unacceptable.
- D. Power System Analysis Software Qualifications: An entity that owns and markets computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices.
1. Computer program shall be designed to perform arc-flash analysis or have a function, component, or add-on module designed to perform arc-flash analysis.
 2. Computer program shall be developed under the charge of a licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.
- E. Power Systems Analysis Specialist Qualifications: Professional engineer in charge of performing the arc-flash study, analyzing the arc flash, and documenting recommendations, licensed in the state where Project is located. All elements of the study shall be performed under the direct supervision and control of this professional engineer.

- F. Arc-Flash Study Certification: Arc-Flash Study Report shall be signed and sealed by Power Systems Analysis Specialist.
- G. Field Adjusting Agency Qualifications:
 - 1. Employer of a NETA ETT-Certified Technician Level III or NICET Electrical Power Testing Level III certification responsible for all field adjusting of the Work.
 - 2. A member company of NETA.
 - 3. Acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 COMPUTER SOFTWARE DEVELOPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. CGI CYME.
 - 2. Power Analytics, Corporation.
 - 3. SKM Systems Analysis, Inc.
- B. Comply with IEEE 1584 and NFPA 70E.
- C. Analytical features of device coordination study computer software program shall have the capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.

2.2 ARC-FLASH STUDY REPORT CONTENT

- A. Executive summary of study findings.
- B. Study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpretation of results.
- C. One-line diagram, showing the following:
 - 1. Protective device designations and ampere ratings.
 - 2. Conductor types, sizes, and lengths.
 - 3. Transformer kilovolt ampere (kVA) and voltage ratings, including derating factors and environmental conditions.
 - 4. Motor and generator designations and kVA ratings.
 - 5. Switchgear, switchboard, motor-control center, panelboard designations, and ratings.
- D. Study Input Data: As described in "Power System Data" Article.
- E. Short-Circuit Study Output Data: As specified in "Short-Circuit Study Output Reports" Paragraph in "Short-Circuit Study Report Contents" Article in Section 260573.13 "Short-Circuit Studies."
- F. Protective Device Coordination Study Report Contents: As specified in "Coordination Study Report Contents" Article in Section 260573.16 "Coordination Studies."
- G. Arc-Flash Study Output Reports:

1. Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each equipment location included in the report:
 - a. Voltage.
 - b. Calculated symmetrical fault-current magnitude and angle.
 - c. Fault-point X/R ratio.
 - d. No AC Decrement (NACD) ratio.
 - e. Equivalent impedance.
 - f. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a symmetrical basis.
 - g. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a total basis.
- H. Incident Energy and Flash Protection Boundary Calculations:
 1. Arcing fault magnitude.
 2. Protective device clearing time.
 3. Duration of arc.
 4. Arc-flash boundary.
 5. Restricted approach boundary.
 6. Limited approach boundary.
 7. Working distance.
 8. Incident energy.
 9. Hazard risk category.
 10. Recommendations for arc-flash energy reduction.
- I. Fault study input data, case descriptions, and fault-current calculations including a definition of terms and guide for interpretation of computer printout.

2.3 ARC-FLASH WARNING LABELS

- A. Comply with requirements in Section 260553 "Identification for Electrical Systems" for self-adhesive equipment labels. Produce a 3.5-by-5-inch self-adhesive equipment label for each work location included in the analysis.
- B. Label shall have an orange header with the wording, "WARNING, ARC-FLASH HAZARD," and shall include the following information taken directly from the arc-flash hazard analysis:
 1. Location designation.
 2. Nominal voltage.
 3. Protection boundaries.
 - a. Arc-flash boundary.
 - b. Restricted approach boundary.
 - c. Limited approach boundary.
 4. Arc flash PPE category.
 5. Required minimum arc rating of PPE in Cal/cm squared.
 6. Available incident energy.
 7. Working distance.
 8. Engineering report number, revision number, and issue date.
- C. Labels shall be machine printed, with no field-applied markings.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine Project overcurrent protective device submittals. Proceed with arc-flash study only after relevant equipment submittals have been assembled. Overcurrent protective devices that have not been submitted and approved prior to arc-flash study may not be used in study.

3.2 ARC-FLASH HAZARD ANALYSIS

- A. Comply with NFPA 70E and its Annex D for hazard analysis study.
- B. Preparatory Studies: Perform the Short-Circuit Protective Device Coordination studies prior to starting the Arc-Flash Hazard Analysis.
 - 1. Short-Circuit Study Output: As specified in "Short-Circuit Study Output Reports" Paragraph in "Short-Circuit Study Report Contents" Article in Section 260573.13 "Short-Circuit Studies."
 - 2. Coordination Study Report Contents: As specified in "Coordination Study Report Contents" Article in Section 260573.16 "Coordination Studies."
- C. Calculate maximum and minimum contributions of fault-current size.
 - 1. Maximum calculation shall assume a maximum contribution from the utility and shall assume motors to be operating under full-load conditions.
 - 2. Calculate arc-flash energy at 85 percent of maximum short-circuit current according to IEEE 1584 recommendations.
 - 3. Calculate arc-flash energy at 38 percent of maximum short-circuit current according to NFPA 70E recommendations.
 - 4. Calculate arc-flash energy with the utility contribution at a minimum and assume no motor contribution.
- D. Calculate the arc-flash protection boundary and incident energy at locations in electrical distribution system where personnel could perform work on energized parts.
- E. Include medium- and low-voltage equipment locations, except equipment rated 240 V ac or less fed from transformers less than 125 kVA.
- F. Calculate the limited, restricted, and prohibited approach boundaries for each location.
- G. Incident energy calculations shall consider the accumulation of energy over time when performing arc-flash calculations on buses with multiple sources. Iterative calculations shall take into account the changing current contributions, as the sources are interrupted or decremented with time. Fault contribution from motors and generators shall be decremented as follows:
 - 1. Fault contribution from induction motors shall not be considered beyond three to five cycles.
 - 2. Fault contribution from synchronous motors and generators shall be decayed to match the actual decrement of each as closely as possible (for example, contributions from permanent magnet generators will typically decay from 10 per unit to three per unit after 10 cycles).
- H. Arc-flash energy shall generally be reported for the maximum of line or load side of a circuit breaker. However, arc-flash computation shall be performed and reported for both line and load side of a circuit breaker as follows:

1. When the circuit breaker is in a separate enclosure.
 2. When the line terminals of the circuit breaker are separate from the work location.
- I. Base arc-flash calculations on actual overcurrent protective device clearing time. Cap maximum clearing time at two seconds based on IEEE 1584, Section B.1.2.

3.3 POWER SYSTEM DATA

- A. Obtain all data necessary for conduct of the arc-flash hazard analysis.
1. Verify completeness of data supplied on one-line diagram on Drawings and under "Preparatory Studies" Paragraph in "Arc-Flash Hazard Analysis" Article. Call discrepancies to Architect's attention.
 2. For new equipment, use characteristics from approved submittals under provisions of action submittals and information submittals for this Project.
 3. For existing equipment, whether or not relocated, obtain required electrical distribution system data by field investigation and surveys conducted by qualified technicians and engineers.
- B. Electrical Survey Data: Gather and tabulate the following input data to support study. Comply with recommendations in IEEE 1584 and NFPA 70E as to the amount of detail that is required to be acquired in the field. Field data gathering shall be under the direct supervision and control of the engineer in charge of performing the study, and shall be by the engineer or its representative who holds NETA ETT-Certified Technician Level III or NICET Electrical Power Testing Level III certification. Data include, but are not limited to, the following:
1. Product Data for overcurrent protective devices specified in other Sections and involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
 2. Obtain electrical power utility impedance or available short circuit current at the service.
 3. Power sources and ties.
 4. Short-circuit current at each system bus (three phase and line to ground).
 5. Full-load current of all loads.
 6. Voltage level at each bus.
 7. For transformers, include kVA, primary and secondary voltages, connection type, impedance, X/R ratio, taps measured in percent, and phase shift.
 8. For reactors, provide manufacturer and model designation, voltage rating and impedance.
 9. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip and available range of settings, SCCR, current rating, and breaker settings.
 10. Generator short-circuit current contribution data, including short-circuit reactance, rated kVA, rated voltage, and X/R ratio.
 11. For relays, provide manufacturer and model designation, current transformer ratios, potential transformer ratios, and relay settings.
 12. Busway manufacturer and model designation, current rating, impedance, lengths, size, and conductor material.
 13. Motor horsepower and NEMA MG 1 code letter designation.
 14. Low-voltage conductor sizes, lengths, number, conductor material and conduit material (magnetic or nonmagnetic).
 15. Medium-voltage conductor sizes, lengths, conductor material, conductor construction and metallic shield performance parameters, and conduit material (magnetic or nonmagnetic).

3.4 LABELING

- A. Apply one arc-flash label on the front cover of each section of the equipment and on side or rear covers with accessible live parts and hinged doors or removable plates for each equipment included in the study. Base arc-flash label data on highest values calculated at each location.
- B. Each piece of equipment listed below shall have an arc-flash label applied to it:
 - 1. Low-voltage switchboard.
 - 2. Switchgear.
 - 3. Medium-voltage switch.
 - 4. Medium voltage transformers
 - 5. Low voltage transformers
 - 6. Panelboard and safety switch over 250 V.
 - 7. Applicable panelboard and safety switch under 250 V.
 - 8. Control panel.
- C. Note on record Drawings the location of equipment where the personnel could be exposed to arc-flash hazard during their work.
 - 1. Indicate arc-flash energy.
 - 2. Indicate protection level required.

3.5 APPLICATION OF WARNING LABELS

- A. Install arc-flash warning labels under the direct supervision and control of Power System Analysis Specialist.

3.6 DEMONSTRATION

- A. Engage Power Systems Analysis Specialist to train Owner's maintenance personnel in potential arc-flash hazards associated with working on energized equipment and the significance of arc-flash warning labels.

END OF SECTION 260573.19

SECTION 260923 - LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Time switches.
- 2. Photoelectric switches.
- 3. Indoor occupancy and vacancy sensors.
- 4. Switchbox-mounted occupancy sensors.
- 5. Digital timer light switches.

- B. Related Requirements:

- 1. Section 262726 "Wiring Devices" for wall-box dimmers, non-networkable wall-switch occupancy sensors, and manual light switches.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

- B. Shop Drawings:

- 1. Show installation details for the following:
 - a. Occupancy sensors.
 - b. Vacancy sensors.
- 2. Interconnection diagrams showing field-installed wiring.
- 3. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plan(s) and elevations, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

- 1. Suspended ceiling components.
- 2. Structural members to which equipment will be attached.
- 3. Items penetrating finished ceiling, including the following:
 - a. Luminaires.

- b. Air outlets and inlets.
- c. Access panels.
- d. Control modules.

- B. Field quality-control reports.
- C. Sample Warranty: For manufacturer's warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For each type of lighting control device to include in operation and maintenance manuals.
- B. Software and Firmware Operational Documentation:
 - 1. Software operating and upgrade manuals.
 - 2. Program Software Backup: On USB media. Provide names, versions, and website addresses for locations of installed software.
 - 3. Device address list.
 - 4. Printout of software application and graphic screens.

1.6 WARRANTY

- A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace lighting control devices that fail(s) in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Faulty operation of lighting control software.
 - b. Faulty operation of lighting control devices.
 - 2. Warranty Period: Two year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 TIME SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Intermatic, Inc.
 - 2. NSi Industries LLC.
- B. Electronic Time Switches: Solid state, programmable, with alphanumeric display; complying with UL 917.
 - 1. Listed and labeled as defined in NFPA 70 and marked for intended location and application.
 - 2. Contact Configuration: SPDT.
 - 3. Contact Rating: 30-A inductive or resistive, 240-V AC.
 - 4. Programs: 99 on-off set points on a 24-hour schedule and an annual holiday schedule that overrides the weekly operation on holidays.

5. Programs: 2 channels; each channel is individually programmable with 99 ON/OFF set points on a 24-hour schedule.
6. Circuitry: Allow connection of a photoelectric relay as substitute for on-off function of a program.
7. Astronomic Time: All channels.
8. Automatic daylight savings time changeover.
9. Battery Backup: Not less than seven days reserve, to maintain schedules and time clock.

2.2 INDOOR OCCUPANCY AND VACANCY SENSORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Hubbell Building Automation, Inc.
2. Leviton Manufacturing Co., Inc.
3. Lutron Electronics Co., Inc.
4. Sensor Switch, Inc.
5. Watt Stopper.

B. General Requirements for Sensors:

1. Wall or Ceiling-mounted, solid-state indoor occupancy and vacancy sensors.
2. Passive infrared, Ultrasonic, Dual technology.
3. Separate power pack.
4. Hardwired connection to switch and BAS.
5. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
6. Operation:
 - a. Occupancy Sensor: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn them off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
 - b. Vacancy Sensor: Unless otherwise indicated, lights are manually turned on and sensor turns lights off when the room is unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
 - c. Combination Sensor: Unless otherwise indicated, sensor shall be programmed to turn lights on when coverage area is occupied and turn them off when unoccupied, or to turn off lights that have been manually turned on; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
7. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor is powered from the power pack.
8. Power: Line voltage.
9. Power Pack: Dry contacts rated for 20-A ballast or LED load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Sensor has 24-V dc, 150-mA, Class 2 power source, as defined by NFPA 70.
10. Mounting:
 - a. Sensor: Suitable for mounting in any position on a standard outlet box.
 - b. Relay: Externally mounted through a 1/2-inch knockout in a standard electrical enclosure.
 - c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.
11. Indicator: Digital display, to show when motion is detected during testing and normal operation of sensor.
12. Bypass Switch: Override the "on" function in case of sensor failure.

13. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc; turn lights off when selected lighting level is present.
- C. PIR Type: Wall or Ceiling mounted; detect occupants in coverage area by their heat and movement.
1. Detector Sensitivity: Detect occurrences of 6-inch-minimum movement of any portion of a human body that presents a target of not less than 36 sq. in.
 2. Detection Coverage (Room, Ceiling Mounted): Detect occupancy anywhere in a circular area of 1000 sq. ft. when mounted on a 96-inch-high ceiling.
 3. Detection Coverage (Corridor, Ceiling Mounted): Detect occupancy within 90 feet when mounted on a 10-foot-high ceiling.
 4. Detection Coverage (Room, Wall Mounted): Detect occupancy anywhere within a 180-degree pattern centered on the sensor over an area of 1000 square feet when mounted 48 inches above finished floor.
- D. Ultrasonic Type: Wall or Ceiling mounted; detect occupants in coverage area through pattern changes of reflected ultrasonic energy.
1. Detector Sensitivity: Detect a person of average size and weight moving not less than 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.
 2. Detection Coverage (Small Room): Detect occupancy anywhere within a circular area of 600 sq. ft. when mounted on a 96-inch-high ceiling.
 3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch-high ceiling.
 4. Detection Coverage (Large Room): Detect occupancy anywhere within a circular area of 2000 sq. ft. when mounted on a 96-inch-high ceiling.
 5. Detection Coverage (Corridor): Detect occupancy anywhere within 90 feet when mounted on a 10-foot-high ceiling in a corridor not wider than 14 feet.
 6. Detection Coverage (Room, Wall Mounted): Detect occupancy anywhere within a 180-degree pattern centered on the sensor over an area of 2000 square feet when mounted 84 inches above finished floor.
- E. Dual-Technology Type: Wall or Ceiling mounted; detect occupants in coverage area using PIR and ultrasonic detection methods. The particular technology or combination of technologies that control on-off functions is selectable in the field by operating controls on unit.
1. Sensitivity Adjustment: Separate for each sensing technology.
 2. Detector Sensitivity: Detect occurrences of 6-inch-minimum movement of any portion of a human body that presents a target of not less than 36 sq. in., and detect a person of average size and weight moving not less than 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.
 3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch-high ceiling.
 4. Detection Coverage (Room, Wall Mounted): Detect occupancy anywhere within a 180-degree pattern centered on the sensor over an area of 1000 square feet when mounted 48 inches above finished floor.

2.3 SWITCHBOX-MOUNTED OCCUPANCY SENSORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Sensor Switch, Inc.
 2. Hubbell Building Automation, Inc.

3. Leviton Manufacturing Co., Inc.
 4. Lutron Electronics Co., Inc.
 5. Watt Stopper.
- B. General Requirements for Sensors: Automatic-wall-switch occupancy sensor with manual on-off switch, suitable for mounting in a single gang switchbox.
1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 2. Occupancy Sensor Operation: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn lights off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
 3. Operating Ambient Conditions: Dry interior conditions, 32 to 120 deg F.
 4. Switch Rating: Not less than 800-VA ballast or LED load at 120 V, 1200-VA ballast or LED load at 277 V, and 800-W incandescent.
- C. Wall-Switch Sensor, WS1:
1. Standard Range: 180-degree field of view, field adjustable from 180 to 40 degrees; with a minimum coverage area of 2100 sq. ft.
 2. Sensing Technology: Dual technology - PIR and ultrasonic.
 3. Switch Type: SP, field-selectable automatic "on," or manual "on," automatic "off."
 4. Capable of controlling load in three-way application.
 5. Voltage: Dual voltage - 120 and 277 V.
 6. Ambient-Light Override: Concealed, field-adjustable, light-level sensor from 10 to 150 fc. The switch prevents the lights from turning on when the light level is higher than the set point of the sensor.
 7. Concealed, field-adjustable, "off" time-delay selector at up to 30 minutes.
 8. Concealed, "off" time-delay selector at 30 seconds and 5, 10, and 20 minutes.
 9. Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space and helps eliminate false "off" switching.
 10. Color: White.
 11. Faceplate: Color matched to switch.
- D. Wall-Switch Sensor, WS2:
1. Standard Range: 210-degree field of view, with a minimum coverage area of 900 sq. ft.
 2. Sensing Technology: PIR.
 3. Switch Type: SP, field-selectable automatic "on," or manual "on," automatic "off."
 4. Capable of controlling load in three-way application.
 5. Voltage: Dual voltage, 120 and 277 V.
 6. Ambient-Light Override: Concealed, field-adjustable, light-level sensor from 10 to 150 fc. The switch prevents the lights from turning on when the light level is higher than the set point of the sensor.
 7. Concealed, field-adjustable, "off" time-delay selector at up to 30 minutes.
 8. Concealed, "off" time-delay selector at 30 seconds and 5, 10, and 20 minutes.
 9. Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space and helps eliminate false "off" switching.
 10. Color: White.
 11. Faceplate: Color matched to switch.

2.4 DIGITAL TIMER LIGHT SWITCH

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Intermatic, Inc.
 - 2. Watt Stopper.
 - 3. Leviton Manufacturing Co., Inc.
 - 4. NSi Industries LLC.
- B. Description: Combination digital timer and conventional switch lighting control unit. Switchbox-mounted, backlit LCD display, with selectable time interval in 10 minute increments.
 - 1. Rated 960 W at 120-V ac for tungsten lighting, 10 A at 120-V ac or 10 amps at 277-V ac for ballast or LED, and 1/4 horsepower at 120-V ac.
 - 2. Integral relay for connection to BAS.
 - 3. Voltage: Dual voltage - 120 and 277 V.
 - 4. Color: White.
 - 5. Faceplate: Color matched to switch.
- C. Description: NC, electrically held relay, arranged for wiring in parallel with manual or automatic switching contacts; complying with UL 924.
 - 1. Coil Rating: 120 V.

2.5 CONDUCTORS AND CABLES

- A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 14 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine lighting control devices before installation. Reject lighting control devices that are wet, moisture damaged, or mold damaged.
- B. Examine walls and ceilings for suitable conditions where lighting control devices will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SENSOR INSTALLATION

- A. Comply with NECA 1.
- B. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.
- C. Install and aim sensors in locations to achieve not less than 90-percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

3.3 CONTACTOR INSTALLATION

- A. Comply with NECA 1.
- B. Mount electrically held lighting contactors with elastomeric isolator pads to eliminate structure-borne vibration unless contactors are installed in an enclosure with factory-installed vibration isolators.

3.4 WIRING INSTALLATION

- A. Comply with NECA 1.
- B. Wiring Method: Comply with Section 260519 "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size is 1/2 inch.
- C. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.
- D. Size conductors according to lighting control device manufacturer's written instructions unless otherwise indicated.
- E. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.5 IDENTIFICATION

- A. Identify components and power and control wiring according to Section 260553 "Identification for Electrical Systems."
 - 1. Identify controlled circuits in lighting contactors.
 - 2. Identify circuits or luminaires controlled by photoelectric and occupancy sensors at each sensor.
- B. Label time switches and contactors with a unique designation.

3.6 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Lighting control devices will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

3.7 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting lighting control devices to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.
1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.
 2. For daylighting controls, adjust set points and deadband controls to suit Owner's operations.
 3. Align high-bay occupancy sensors using manufacturer's laser aiming tool.

3.8 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain lighting control devices.

END OF SECTION 260923

SECTION 262416 - PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Lighting and appliance branch-circuit panelboards.

1.3 DEFINITIONS

- A. ATS: Acceptance testing specification.
- B. GFCI: Ground-fault circuit interrupter.
- C. GFEP: Ground-fault equipment protection.
- D. HID: High-intensity discharge.
- E. MCCB: Molded-case circuit breaker.
- F. SPD: Surge protective device.
- G. VPR: Voltage protection rating.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of panelboard.
 - 1. Include materials, switching and overcurrent protective devices, SPDs, accessories, and components indicated.
 - 2. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
- B. Shop Drawings: For each panelboard and related equipment.
 - 1. Include dimensioned plans, elevations, sections, and details.
 - 2. Show tabulations of installed devices with nameplates, conductor termination sizes, equipment features, and ratings.
 - 3. Detail enclosure types including mounting and anchorage, environmental protection, knockouts, corner treatments, covers and doors, gaskets, hinges, and locks.
 - 4. Detail bus configuration, current, and voltage ratings.

5. Short-circuit current rating of panelboards and overcurrent protective devices.
6. Include evidence of NRTL listing for series rating of installed devices.
7. Include evidence of NRTL listing for SPD as installed in panelboard.
8. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
9. Include wiring diagrams for power, signal, and control wiring.
10. Key interlock scheme drawing and sequence of operations.
11. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards. Submit on translucent log-log graph paper; include selectable ranges for each type of overcurrent protective device. Include an Internet link for electronic access to downloadable PDF of the coordination curves.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
 1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
 2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Keys: Two spares for each type of panelboard cabinet lock.
 2. Circuit Breakers Including GFCI and GFEP Types: Include quantity of spares for each panelboard per panelboard schedules on drawings.
 3. Fuses for Fused Switches: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
 4. Fuses for Fused Power-Circuit Devices: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.

1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications: ISO 9001 or 9002 certified.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.

- B. Handle and prepare panelboards for installation according to NECA 407.

1.10 FIELD CONDITIONS

- A. Environmental Limitations:

- 1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
- 2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:
 - a. Ambient Temperature: Not exceeding 23 deg F to plus 104 deg F.
 - b. Altitude: Not exceeding 6600 feet.

- B. Service Conditions: NEMA PB 1, usual service conditions, as follows:

- 1. Ambient temperatures within limits specified.
- 2. Altitude not exceeding 6600 feet.

1.11 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace panelboards that fail in materials or workmanship within specified warranty period.

- 1. Panelboard Warranty Period: 18 months from date of Substantial Completion.

- B. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace SPD that fails in materials or workmanship within specified warranty period.

- 1. SPD Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PANELBOARDS COMMON REQUIREMENTS

- A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Section 260548 "Vibration and Seismic Controls for Electrical Systems."
- B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. Comply with NEMA PB 1.
- E. Comply with NFPA 70.

- F. Enclosures: Flush and Surface-mounted, dead-front cabinets.
1. Rated for environmental conditions at installed location.
 - a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
 - b. Outdoor Locations: NEMA 250, Type 3R.
 - c. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
 - d. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.
 2. Height: 84 inches maximum.
 3. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box. Trims shall cover all live parts and shall have no exposed hardware.
 4. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Trims shall cover all live parts and shall have no exposed hardware.
 5. Skirt for Surface-Mounted Panelboards: Same gage and finish as panelboard front with flanges for attachment to panelboard, wall, and ceiling or floor.
 6. Gutter Extension and Barrier: Same gage and finish as panelboard enclosure; integral with enclosure body. Arrange to isolate individual panel sections.
 7. Finishes:
 - a. Panels and Trim: galvanized steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
 - b. Back Boxes: Galvanized steel, same finish as panels and trim.
- G. Incoming Mains:
1. Location: Convertible between top and bottom.
 2. Main Breaker: Main lug interiors up to 400 amperes shall be field convertible to main breaker.
- H. Phase, Neutral, and Ground Buses:
1. Material: Hard-drawn copper, 98 percent conductivity.
 - a. Plating shall run entire length of bus.
 - b. Bus shall be fully rated the entire length.
 2. Interiors shall be factory assembled into a unit. Replacing switching and protective devices shall not disturb adjacent units or require removing the main bus connectors.
 3. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
 4. Isolated Ground Bus: Adequate for branch-circuit isolated ground conductors; insulated from box.
 5. Full-Sized Neutral: Equipped with full-capacity bonding strap for service entrance applications. Mount electrically isolated from enclosure. Do not mount neutral bus in gutter.
 6. Extra-Capacity Neutral Bus: Neutral bus rated 200 percent of phase bus and listed and labeled by an NRTL acceptable to authority having jurisdiction, as suitable for nonlinear loads in electronic-grade panelboards and others designated on Drawings. Connectors shall be sized for double-sized or parallel conductors as indicated on Drawings. Do not mount neutral bus in gutter.
 7. Split Bus: Vertical buses divided into individual vertical sections.
- I. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Hard-drawn copper, 98 percent conductivity.
 2. Terminations shall allow use of 75 deg C rated conductors without derating.
 3. Size: Lugs suitable for indicated conductor sizes, with additional gutter space, if required, for larger conductors.
 4. Main and Neutral Lugs: Mechanical type, with a lug on the neutral bar for each pole in the panelboard.
 5. Ground Lugs and Bus-Configured Terminators: Mechanical type, with a lug on the bar for each pole in the panelboard.
 6. Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
 7. Subfeed (Double) Lugs: Mechanical type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
 8. Gutter-Tap Lugs: Mechanical type suitable for use with conductor material and with matching insulating covers. Locate at same end of bus as incoming lugs or main device.
 9. Extra-Capacity Neutral Lugs: Rated 200 percent of phase lugs mounted on extra-capacity neutral bus.
- J. NRTL Label: Panelboards or load centers shall be labeled by an NRTL acceptable to authority having jurisdiction for use as service equipment with one or more main service disconnecting and overcurrent protective devices. Panelboards or load centers shall have meter enclosures, wiring, connections, and other provisions for utility metering. Coordinate with utility company for exact requirements.
- K. Future Devices: Panelboards shall have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.
1. Percentage of Future Space Capacity: 20 percent.
- L. Panelboard Short-Circuit Current Rating: Rated for series-connected system with integral or remote upstream overcurrent protective devices and labeled by an NRTL. Include label or manual with size and type of allowable upstream and branch devices listed and labeled by an NRTL for series-connected short-circuit rating.
1. Panelboards rated 240 V or less shall have short-circuit ratings as shown on Drawings, but not less than 10,000 A rms symmetrical.
 2. Panelboards rated above 240 V and less than 600 V shall have short-circuit ratings as shown on Drawings, but not less than 14,000 A rms symmetrical.
- M. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed by an NRTL for 100 percent interrupting capacity.
1. Panelboards and overcurrent protective devices rated 240 V or less shall have short-circuit ratings as shown on Drawings, but not less than 10,000 A rms symmetrical.
 2. Panelboards and overcurrent protective devices rated above 240 V and less than 600 V shall have short-circuit ratings as shown on Drawings, but not less than 14,000 A rms symmetrical.

2.2 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Panelboards shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

- B. Surge Suppression: Factory installed as an integral part of indicated panelboards, complying with UL 1449 SPD Type 2.

2.3 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. General Electric Company; GE Energy Management - Electrical Distribution.
 - 2. Siemens Energy.
 - 3. Square D; by Schneider Electric.
- B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.
- C. Mains: Circuit breaker or lugs only.
- D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
- E. Contactors in Main Bus: NEMA ICS 2, Class A, mechanically held, general-purpose controller, with same short-circuit interrupting rating as panelboard.
 - 1. Internal Control-Power Source: Control-power transformer, with fused primary and secondary terminals, connected to main bus ahead of contactor connection.
 - 2. External Control-Power Source: 120-V branch circuit.
- F. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.
- G. Doors: Door-in-door construction with concealed hinges; secured with multipoint latch with tumbler lock; keyed alike. Outer door shall permit full access to the panel interior. Inner door shall permit access to breaker operating handles and labeling, but current carrying terminals and bus shall remain concealed.

2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. General Electric Company; GE Energy Management - Electrical Distribution.
 - 2. Siemens Energy.
 - 3. Square D; by Schneider Electric.
- B. MCCB: Comply with UL 489, with interrupting capacity to meet available fault currents.
 - 1. Thermal-Magnetic Circuit Breakers:
 - a. Inverse time-current element for low-level overloads.
 - b. Instantaneous magnetic trip element for short circuits.
 - c. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
 - 2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
 - 3. Electronic Trip Circuit Breakers:
 - a. RMS sensing.

- b. Field-replaceable rating plug or electronic trip.
- c. Digital display of settings, trip targets, and indicated metering displays.
- d. Multi-button keypad to access programmable functions and monitored data.
- e. Ten-event, trip-history log. Each trip event shall be recorded with type, phase, and magnitude of fault that caused the trip.
- f. Integral test jack for connection to portable test set or laptop computer.
- g. Field-Adjustable Settings:
 - 1) Instantaneous trip.
 - 2) Long- and short-time pickup levels.
 - 3) Long and short time adjustments.
 - 4) Ground-fault pickup level, time delay, and I squared T response.
- 4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
- 5. GFCI Circuit Breakers: Single- and double-pole configurations with Class A ground-fault protection (6-mA trip).
- 6. GFEP Circuit Breakers: Class B ground-fault protection (30-mA trip).
- 7. Arc-Fault Circuit Interrupter Circuit Breakers: Comply with UL 1699; 120/240-V, single-pole configuration.
- 8. Subfeed Circuit Breakers: Vertically mounted.
- 9. MCCB Features and Accessories:
 - a. Standard frame sizes, trip ratings, and number of poles.
 - b. Breaker handle indicates tripped status.
 - c. UL listed for reverse connection without restrictive line or load ratings.
 - d. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
 - e. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and HID lighting circuits.
 - f. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
 - g. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 75 percent of rated voltage.
 - h. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage with field-adjustable 0.1- to 0.6-second time delay.
 - i. Rating Plugs: Three-pole breakers with ampere ratings greater than 150 amperes shall have interchangeable rating plugs or electronic adjustable trip units.
 - j. Auxiliary Contacts: Two, SPDT switches with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts and "b" contacts operate in reverse of circuit-breaker contacts.
 - k. Alarm Switch: Single-pole, normally open contact that actuates only when circuit breaker trips.
 - l. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
 - m. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function with other upstream or downstream devices.
 - n. Multipole units enclosed in a single housing with a single handle or factory assembled to operate as a single unit.
 - o. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in "on" or "off" position.
 - p. Handle Clamp: Loose attachment, for holding circuit-breaker handle in on position.

2.5 IDENTIFICATION

- A. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles shall be located on the interior of the panelboard door.
- B. Breaker Labels: Faceplate shall list current rating, UL and IEC certification standards, and AIC rating.
- C. Circuit Directory: Directory card inside panelboard door, mounted in transparent card holder.
 - 1. Circuit directory shall identify specific purpose with detail sufficient to distinguish it from all other circuits.
- D. Circuit Directory: Computer-generated circuit directory mounted inside panelboard door with transparent plastic protective cover.
 - 1. Circuit directory shall identify specific purpose with detail sufficient to distinguish it from all other circuits.

2.6 ACCESSORY COMPONENTS AND FEATURES

- A. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.
- B. Portable Test Set: For testing functions of solid-state trip devices without removing from panelboard. Include relay and meter test plugs suitable for testing panelboard meters and switchboard class relays.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify actual conditions with field measurements prior to ordering panelboards to verify that equipment fits in allocated space in, and comply with, minimum required clearances specified in NFPA 70.
- B. Receive, inspect, handle, and store panelboards according to NECA 407.
- C. Examine panelboards before installation. Reject panelboards that are damaged, rusted, or have been subjected to water saturation.
- D. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

- B. Comply with NECA 1.
- C. Install panelboards and accessories according to NECA 407.
- D. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.
- E. Comply with mounting and anchoring requirements specified in Section 260548.16 "Seismic Controls for Electrical Systems."
- F. Mount top of trim 90 inches above finished floor unless otherwise indicated.
- G. Mount panelboard cabinet plumb and rigid without distortion of box.
- H. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
- I. Mount surface-mounted panelboards to steel slotted supports 1 1/4 inch in depth. Orient steel slotted supports vertically.
- J. Install overcurrent protective devices and controllers not already factory installed.
 - 1. Set field-adjustable, circuit-breaker trip ranges.
 - 2. Tighten bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver per manufacturer's written instructions.
- K. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.
- L. Install filler plates in unused spaces.
- M. Stub four 1-inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch empty conduits into raised floor space or below slab not on grade.
- N. Arrange conductors in gutters into groups and bundle and wrap with wire ties after completing load balancing.
- O. Mount spare fuse cabinet in accessible location.

3.3 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems."
- B. Create a directory to indicate installed circuit loads after balancing panelboard loads; incorporate Owner's final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.
- C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

- D. Device Nameplates: Label each branch circuit device in power panelboards with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- E. Install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems" identifying source of remote circuit.

3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- B. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- C. Acceptance Testing Preparation:
 - 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- D. Tests and Inspections:
 - 1. Perform each visual and mechanical inspection and electrical test for low-voltage air circuit breakers stated in NETA ATS, Paragraph 7.6 Circuit Breakers. Certify compliance with test parameters.
 - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
 - 3. Perform the following infrared scan tests and inspections and prepare reports:
 - a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each panelboard. Remove front panels so joints and connections are accessible to portable scanner.
 - b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each panelboard 11 months after date of Substantial Completion.
 - c. Instruments and Equipment:
 - 1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
- E. Panelboards will be considered defective if they do not pass tests and inspections.
- F. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results, with comparisons of the two scans. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

- A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

- B. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes. Prior to making circuit changes to achieve load balancing, inform Architect of effect on phase color coding.
1. Measure loads during period of normal facility operations.
 2. Perform circuit changes to achieve load balancing outside normal facility operation schedule or at times directed by the Architect. Avoid disrupting services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
 3. After changing circuits to achieve load balancing, recheck loads during normal facility operations. Record load readings before and after changing circuits to achieve load balancing.
 4. Tolerance: Maximum difference between phase loads, within a panelboard, shall not exceed 20 percent.

3.6 PROTECTION

- A. Temporary Heating: Prior to energizing panelboards, apply temporary heat to maintain temperature according to manufacturer's written instructions.

END OF SECTION 262416

SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Straight-blade convenience, isolated-ground, and tamper-resistant receptacles.
 - 2. GFCI receptacles.
 - 3. Toggle switches.
 - 4. Wall switch sensor light switches with dual technology sensors.
 - 5. Wall switch sensor light switches with passive infrared sensors.
 - 6. Digital timer light switches.
 - 7. Wall-box dimmers.
 - 8. Wall plates.
 - 9. Prefabricated multioutlet assemblies.

1.3 DEFINITIONS

- A. Abbreviations of Manufacturers' Names:
 - 1. Cooper: Cooper Wiring Devices; Division of Cooper Industries, Inc.
 - 2. Hubbell: Hubbell Incorporated: Wiring Devices-Kellems.
 - 3. Leviton: Leviton Mfg. Company, Inc.
 - 4. Pass & Seymour: Pass& Seymour/Legrand.
- B. BAS: Building automation system.
- C. EMI: Electromagnetic interference.
- D. GFCI: Ground-fault circuit interrupter.
- E. Pigtail: Short lead used to connect a device to a branch-circuit conductor.
- F. RFI: Radio-frequency interference.
- G. UTP: Unshielded twisted pair.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.

- B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

1.5 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

PART 2 - PRODUCTS

2.1 GENERAL WIRING-DEVICE REQUIREMENTS

- A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.
- C. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:
 - 1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
 - 2. Devices shall comply with the requirements in this Section.
- D. Devices for Owner-Furnished Equipment:
 - 1. Receptacles: Match plug configurations.
 - 2. Cord and Plug Sets: Match equipment requirements.
- E. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 STRAIGHT-BLADE RECEPTACLES

- A. Duplex Convenience Receptacles: 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Hubbell Incorporated; Wiring Device-Kellems.
 - b. Leviton Manufacturing Co., Inc.
 - c. Pass & Seymour/Legrand (Pass & Seymour).
- B. Isolated-Ground, Duplex Convenience Receptacles: 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Hubbell Incorporated; Wiring Device-Kellems.
 - b. Leviton Manufacturing Co., Inc.
 - c. Pass & Seymour/Legrand (Pass & Seymour).
 2. Description: Straight blade; equipment grounding contacts shall be connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.
- C. Tamper-Resistant Convenience Receptacles: 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Hubbell Incorporated; Wiring Device-Kellems.
 - b. Leviton Manufacturing Co., Inc.
 - c. Pass & Seymour/Legrand (Pass & Seymour).

2.3 GFCI RECEPTACLES

- A. General Description:
1. 125 V, 20 A, straight blade, feed-through type.
 2. Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, UL 943 Class A, and FS W-C-596.
 3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.
- B. Duplex GFCI Convenience Receptacles:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Hubbell Incorporated; Wiring Device-Kellems.
 - b. Leviton Manufacturing Co., Inc.
 - c. Pass & Seymour/Legrand (Pass & Seymour).
- C. Tamper-Resistant, Duplex GFCI Convenience Receptacles:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Hubbell Incorporated; Wiring Device-Kellems.
 - b. Pass & Seymour/Legrand (Pass & Seymour).

2.4 TOGGLE SWITCHES

- A. Comply with NEMA WD 1, UL 20, and FS W-S-896.

B. Switches, 120/277 V, 20 A:

1. Single Pole:

- a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- 1) Hubbell Incorporated; Wiring Device-Kellems.
- 2) Leviton Manufacturing Co., Inc.
- 3) Pass & Seymour/Legrand (Pass & Seymour).

2. Two Pole:

- a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- 1) Hubbell Incorporated; Wiring Device-Kellems.
- 2) Leviton Manufacturing Co., Inc.
- 3) Pass & Seymour/Legrand (Pass & Seymour).

3. Three Way:

- a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- 1) Hubbell Incorporated; Wiring Device-Kellems.
- 2) Leviton Manufacturing Co., Inc.
- 3) Pass & Seymour/Legrand (Pass & Seymour).

4. Four Way:

- a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- 1) Hubbell Incorporated; Wiring Device-Kellems.
- 2) Leviton Manufacturing Co., Inc.
- 3) Pass & Seymour/Legrand (Pass & Seymour).

C. Pilot-Light Switches: 120/277 V, 20 A.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

- a. Hubbell Incorporated; Wiring Device-Kellems.
- b. Leviton Manufacturing Co., Inc.
- c. Pass & Seymour/Legrand (Pass & Seymour).

2. Description: Single pole, with LED-lighted handle, illuminated when switch is off.

D. Key-Operated Switches: 120/277 V, 20 A.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

- a. Hubbell Incorporated; Wiring Device-Kellems.
 - b. Leviton Manufacturing Co., Inc.
 - c. Pass & Seymour/Legrand (Pass & Seymour).
 2. Description: Single pole, with factory-supplied key in lieu of switch handle.
- E. Single-Pole, Double-Throw, Momentary-Contact, Center-off Switches: 120/277 V, 20 A; for use with mechanically held lighting contactors.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Hubbell Incorporated; Wiring Device-Kellems.
 - b. Leviton Manufacturing Co., Inc.
 - c. Pass & Seymour/Legrand (Pass & Seymour).
- F. Key-Operated, Single-Pole, Double-Throw, Momentary-Contact, Center-off Switches: 120/277 V, 20 A; for use with mechanically held lighting contactors, with factory-supplied key in lieu of switch handle.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Hubbell Incorporated; Wiring Device-Kellems.
 - b. Leviton Manufacturing Co., Inc.
 - c. Pass & Seymour/Legrand (Pass & Seymour).

2.5 WALL SWITCH SENSOR LIGHT SWITCH, DUAL TECHNOLOGY

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Hubbell Incorporated; Wiring Device-Kellems.
 2. Leviton Manufacturing Co., Inc.
 3. Pass & Seymour/Legrand (Pass & Seymour).
- B. Description: Switchbox-mounted, combination lighting-control sensor and conventional switch lighting-control unit using dual technology.
1. Connections: Provisions for connection to BAS.
 2. Connections: Hard wired.
 3. Connections: Wireless.
 4. Rated 960 W at 120-V ac for tungsten lighting, 10 A at 120-V ac or 10 A at 277-V ac for fluorescent or LED lighting, and 1/4 HP at 120-V ac.
 5. Integral relay for connection to BAS.
 6. Adjustable time delay of 20 minutes.
 7. Able to be locked to Automatic-On, Manual-On mode.
 8. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc.
 9. Comply with NEMA WD 1, UL 20, and FS W-S-896.

2.6 WALL SWITCH SENSOR LIGHT SWITCH, PASSIVE INFRARED

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Hubbell Premise Wiring.
 2. Leviton Manufacturing Co., Inc.
 3. Pass & Seymour/Legrand (Pass & Seymour).
- B. Description: Switchbox-mounted, combination, lighting-control sensor and conventional switch lighting-control unit using passive infrared technology.
1. Connections: Provisions for connection to BAS.
 2. Connections: Hard wired.
 3. Connections: Wireless.
 4. Rated 960 W at 120-V ac for tungsten lighting, 10 A at 120-V ac or 10 A at 277-V ac for fluorescent or LED lighting, and 1/4 HP at 120-V ac.
 5. Integral relay for connection to BAS.
 6. Adjustable time delay of 20 minutes.
 7. Able to be locked to Automatic-On or Manual-On mode.
 8. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc.
 9. Comply with NEMA WD 1, UL 20, and FS W-S-896.

2.7 DIGITAL TIMER LIGHT SWITCH

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Hubbell Incorporated; Wiring Device-Kellems.
 2. Watt Stopper.
 3. Leviton Manufacturing Co., Inc.
 4. Pass & Seymour/Legrand (Pass & Seymour).
- B. Description: Switchbox-mounted, combination digital timer and conventional switch lighting-control unit, with backlit digital display, with selectable time interval in 10-minute increments.
1. Rated 960 W at 120-V ac for tungsten lighting, 10 A at 120-V ac or 10 A at 277-V ac for fluorescent or LED lighting, and 1/4 HP at 120-V ac.
 2. Integral relay for connection to BAS.

2.8 WALL-BOX DIMMERS

- A. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on-off switches, with audible frequency and EMI/RFI suppression filters.
- B. Control: Continuously adjustable slider; with single-pole or three-way switching. Comply with UL 1472.
- C. Incandescent Lamp Dimmers: 120 V; control shall follow square-law dimming curve. On-off switch positions shall bypass dimmer module.
1. 600 W; dimmers shall require no derating when ganged with other devices.
- D. Fluorescent Lamp Dimmer Switches: Modular; compatible with dimmer ballasts; trim potentiometer to adjust low-end dimming; dimmer-ballast combination capable of consistent dimming with low end not greater than 20 percent of full brightness.
- E. LED Lamp Dimmer Switches: Modular; compatible with LED lamps; trim potentiometer to adjust low-end dimming; capable of consistent dimming with low end not greater than 20 percent of full brightness.

2.9 WALL PLATES

- A. Single and combination types shall match corresponding wiring devices.
 - 1. Plate-Securing Screws: Metal with head color to match plate finish.
 - 2. Material for Finished Spaces: wall plates shall be stainless steel 302/304 or steel with white baked enamel, suitable for field painting. Nylon plates are not acceptable.
 - 3. Material for Unfinished Spaces: Galvanized steel.
 - 4. Material for Damp Locations: Thermoplastic with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.
- B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, thermoplastic with lockable cover.

2.10 PREFABRICATED MULTIOUTLET ASSEMBLIES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Hubbell Incorporated; Wiring Device-Kellems.
 - 2. Wiremold / Legrand.
- B. Description:
 - 1. Two-piece surface metal raceway, with factory-wired multioutlet harness.
 - 2. Components shall be products from single manufacturer designed for use as a complete, matching assembly of raceways and receptacles.
- C. Raceway Material: Metal, with manufacturer's standard finish.
- D. Multioutlet Harness:
 - 1. Receptacles: 15-A, 125-V, NEMA WD 6 Configuration 5-15R receptacles complying with NEMA WD 1, UL 498, and FS W-C-596.
 - 2. Receptacle Spacing: 12 inches.
 - 3. Wiring: No. 12 AWG solid, Type THHN copper, two circuit, connecting alternating receptacles.

2.11 FINISHES

- A. Device Color:
 - 1. Wiring Devices Connected to Normal Power System: As selected by Architect unless otherwise indicated or required by NFPA 70 or device listing.
- B. Wall Plate Color: For plastic covers, match device color.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:

1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
4. Existing Conductors:
 - a. Cut back and pigtail, or replace all damaged conductors.
 - b. Straighten conductors that remain and remove corrosion and foreign matter.
 - c. Pigtailling existing conductors is permitted, provided the outlet box is large enough.

D. Device Installation:

1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles up, and on horizontally mounted receptacles to the right.
2. Install hospital-grade receptacles in patient-care areas with the ground pin or neutral blade at the top.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Dimmers:

1. Install dimmers within terms of their listing.
2. Verify that dimmers used for fan-speed control are listed for that application.
3. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device listing conditions in the written instructions.

- H. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.
- I. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.2 GFCI RECEPTACLES

- A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

3.3 IDENTIFICATION

- A. Comply with Section 260553 "Identification for Electrical Systems."
- B. Identify each receptacle with panelboard identification and circuit number. Use hot, stamped, or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.4 FIELD QUALITY CONTROL

- A. Test Instruments: Use instruments that comply with UL 1436.
- B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
1. In healthcare facilities, prepare reports that comply with recommendations in NFPA 99.
 2. Test Instruments: Use instruments that comply with UL 1436.
 3. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.
- C. Tests for Convenience Receptacles:
1. Line Voltage: Acceptable range is 105 to 132 V.
 2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
 3. Ground Impedance: Values of up to 2 ohms are acceptable.
 4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
 5. Using the test plug, verify that the device and its outlet box are securely mounted.
 6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.
- D. Test straight-blade hospital-grade convenience outlets for the retention force of the grounding blade according to NFPA 99. Retention force shall be not less than 4 oz.

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- E. Wiring device will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports.

END OF SECTION 262726

SECTION 262813 - FUSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Cartridge fuses rated 600 V ac and less for use in the following:
 - a. Control circuits.
 - b. Enclosed controllers.
 - c. Enclosed switches.
 - 2. Spare-fuse cabinets.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for spare-fuse cabinets. Include the following for each fuse type indicated:
 - 1. Ambient Temperature Adjustment Information: If ratings of fuses have been adjusted to accommodate ambient temperatures, provide list of fuses with adjusted ratings.
 - a. For each fuse having adjusted ratings, include location of fuse, original fuse rating, local ambient temperature, and adjusted fuse rating.
 - b. Provide manufacturer's technical data on which ambient temperature adjustment calculations are based.
 - 2. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
 - 3. Current-limitation curves for fuses with current-limiting characteristics.
 - 4. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse. Submit in electronic format suitable for use in coordination software and in PDF format.
 - 5. Coordination charts and tables and related data.
 - 6. Fuse sizes for elevator feeders and elevator disconnect switches.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fuses to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 01 "Closeout Procedures," and "Operation and Maintenance Data," include the following:
1. Ambient temperature adjustment information.
 2. Current-limitation curves for fuses with current-limiting characteristics.
 3. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse used on the Project. Submit in electronic format suitable for use in coordination software and in PDF format.
 4. Coordination charts and tables and related data.

1.5 FIELD CONDITIONS

- A. Where ambient temperature to which fuses are directly exposed is less than 40 deg F or more than 100 deg F, apply manufacturer's ambient temperature adjustment factors to fuse ratings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Bussmann, an Eaton business.
 2. Edison; a brand of Bussmann by Eaton.
 3. Littelfuse, Inc.
- B. Source Limitations: Obtain fuses, for use within a specific product or circuit, from single source from single manufacturer.

2.2 CARTRIDGE FUSES

- A. Characteristics: NEMA FU 1, current-limiting, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.
1. Type RK-1: 600-V, zero- to 600-A rating, 200 kAIC, time delay.
 2. Type RK-5: 600-V, zero- to 600-A rating, 200 kAIC, time delay.
 3. Type J: 600-V, zero- to 600-A rating, 200 kAIC, time delay.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Comply with NEMA FU 1 for cartridge fuses.
- D. Comply with NFPA 70.
- E. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

2.3 SPARE-FUSE CABINET

- A. Characteristics: Wall-mounted steel unit with full-length, recessed piano-hinged door and key-coded cam lock and pull.
 - 1. Size: Adequate for storage of spare fuses specified with 15 percent spare capacity minimum.
 - 2. Finish: Gray, baked enamel.
 - 3. Identification: "SPARE FUSES" in 1-1/2-inch-high letters on exterior of door.
 - 4. Fuse Pullers: For each size of fuse, where applicable and available, from fuse manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine fuses before installation. Reject fuses that are moisture damaged or physically damaged.
- B. Examine holders to receive fuses for compliance with installation tolerances and other conditions affecting performance, such as rejection features.
- C. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.
- D. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FUSE APPLICATIONS

- A. Cartridge Fuses:
 - 1. Feeders: Class RK1, time delay.
 - 2. Motor Branch Circuits: Class RK1, time delay.
 - 3. Power Electronics Circuits: Class J, high speed.
 - 4. Other Branch Circuits: Class RK5, time delay.

3.3 INSTALLATION

- A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.
- B. Install spare-fuse cabinet(s) as indicated in the field by Owner.

3.4 IDENTIFICATION

- A. Install labels complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems" and indicating fuse replacement information inside of door of each fused switch and adjacent to each fuse block, socket, and holder.

END OF SECTION 262813

SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Fusible switches.
 - 2. Nonfusible switches.
 - 3. Molded-case circuit breakers (MCCBs).
 - 4. Enclosures.

1.3 DEFINITIONS

- A. NC: Normally closed.
- B. NO: Normally open.
- C. SPDT: Single pole, double throw.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include nameplate ratings, dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
 - 1. Enclosure types and details for types other than NEMA 250, Type 1.
 - 2. Current and voltage ratings.
 - 3. Short-circuit current ratings (interrupting and withstand, as appropriate).
 - 4. Include evidence of a nationally recognized testing laboratory (NRTL) listing for series rating of installed devices.
 - 5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
 - 6. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device. Provide in PDF electronic format.
- B. Shop Drawings: For enclosed switches and circuit breakers.
 - 1. Include plans, elevations, sections, details, and attachments to other work.
 - 2. Include wiring diagrams for power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency.
- B. Seismic Qualification Certificates: For enclosed switches and circuit breakers, accessories, and components, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- C. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals.
 - 1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
 - a. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
 - b. Time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device. Provide in PDF electronic format.

1.7 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Accredited by NETA.
 - 1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:
 - 1. Ambient Temperature: Not less than minus 22 deg F and not exceeding 104 deg F.
 - 2. Altitude: Not exceeding 6600 feet.

1.9 WARRANTY

- A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace components that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: One year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Enclosed switches and circuit breakers shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 - 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2.2 GENERAL REQUIREMENTS

- A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single manufacturer.
- B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
- D. Comply with NFPA 70.

2.3 FUSIBLE SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton.
 - 2. General Electric Company.
 - 3. Siemens Industry, Inc.
 - 4. Square D; by Schneider Electric.
- B. Type HD, Heavy Duty:
 - 1. Single throw.
 - 2. Two pole.
 - 3. 240-V ac.
 - 4. 200 A and smaller.
 - 5. UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate fuses.
 - 6. Lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- C. Accessories:
 - 1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
 - 2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.

3. Isolated Ground Kit: Internally mounted; insulated, labeled for copper and aluminum neutral conductors.
4. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
5. Auxiliary Contact Kit: One NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open. Contact rating - 120-V ac.
6. Hookstick Handle: Allows use of a hookstick to operate the handle.
7. Lugs: Mechanical type, suitable for number, size, and conductor material.
8. Service-Rated Switches: Labeled for use as service equipment.

2.4 NONFUSIBLE SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton.
 2. General Electric Company.
 3. Siemens Industry, Inc.
 4. Square D; by Schneider Electric.
- B. Type HD, Heavy Duty, Two Pole, Single Throw, 240-V ac, 200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- C. Accessories:
1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
 2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
 3. Isolated Ground Kit: Internally mounted; insulated, labeled for copper and aluminum neutral conductors.
 4. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
 5. Auxiliary Contact Kit: One NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open. Contact rating - 120-V ac.
 6. Hookstick Handle: Allows use of a hookstick to operate the handle.
 7. Lugs: Mechanical type, suitable for number, size, and conductor material.
 8. Service-Rated Switches: Labeled for use as service equipment.

2.5 MOLDED-CASE CIRCUIT BREAKERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton.
 2. General Electric Company.
 3. Siemens Industry, Inc.
 4. Square D; by Schneider Electric.
- B. Circuit breakers shall be constructed using glass-reinforced insulating material. Current carrying components shall be completely isolated from the handle and the accessory mounting area.
- C. Circuit breakers shall have a toggle operating mechanism with common tripping of all poles, which provides quick-make, quick-break contact action. The circuit-breaker handle shall be over center, be trip free, and reside in a tripped position between on and off to provide local trip indication. Circuit-breaker

escutcheon shall be clearly marked on and off in addition to providing international I/O markings. Equip circuit breaker with a push-to-trip button, located on the face of the circuit breaker to mechanically operate the circuit-breaker tripping mechanism for maintenance and testing purposes.

- D. The maximum ampere rating and UL, IEC, or other certification standards with applicable voltage systems and corresponding interrupting ratings shall be clearly marked on face of circuit breaker. Circuit breakers shall be 100 percent rated or series rated as indicated on the Drawings. Circuit breaker/circuit breaker or Fuse/circuit breaker combinations for series connected interrupting ratings shall be listed by UL as recognized component combinations. Any series rated combination used shall be marked on the end-use equipment along with the statement "Caution - Series Rated System. _____ Amps Available. Identical Replacement Component Required."
- E. MCCBs shall be equipped with a device for locking in the isolated position.
- F. Lugs shall be suitable for 167 deg F rated wire.
- G. Standards: Comply with UL 489 and NEMA AB 3, with interrupting capacity to comply with available fault currents.
- H. Thermal-Magnetic Circuit Breakers: Inverse time-current thermal element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
- I. Adjustable, Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
- J. Electronic Trip Circuit Breakers: Field-replaceable rating plug, rms sensing, with the following field-adjustable settings:
 - 1. Instantaneous trip.
 - 2. Long- and short-time pickup levels.
 - 3. Long- and short-time time adjustments.
 - 4. Ground-fault pickup level, time delay, and I-squared t response.
- K. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller, and let-through ratings less than NEMA FU 1, RK-5.
- L. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker and trip activation on fuse opening or on opening of fuse compartment door.
- M. Ground-Fault Circuit-Interrupter (GFCI) Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
- N. Ground-Fault Equipment-Protection (GFEP) Circuit Breakers: With Class B ground-fault protection (30-mA trip).
- O. Features and Accessories:
 - 1. Standard frame sizes, trip ratings, and number of poles.
 - 2. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.
 - 3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.
 - 4. Ground-Fault Protection: Comply with UL 1053; integrally mounted, self-powered type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-

- test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.
5. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.
 6. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
 7. Auxiliary Contacts: One SPDT switch with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.
 8. Alarm Switch: One contact that operates only when circuit breaker has tripped.
 9. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
 10. Zone-Selective Interlocking: Integral with ground-fault trip unit; for interlocking ground-fault protection function.
 11. Electrical Operator: Provide remote control for on, off, and reset operations.
 12. Accessory Control Power Voltage: Integrally mounted, self-powered 120-V ac.

2.6 ENCLOSURES

- A. Enclosed Switches and Circuit Breakers: UL 489, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
- B. Enclosure Finish: The enclosure shall be finished with gray baked enamel paint, electrodeposited on cleaned, phosphatized galvanized steel (NEMA 250 Types 3R, 12 or a brush finish on Type 304 stainless steel (NEMA 250 Type 4-4X stainless steel).
- C. Conduit Entry: NEMA 250 Types 4, 4X, and 12 enclosures shall contain no knockouts.
- D. Operating Mechanism: The circuit-breaker operating handle shall be externally operable with the operating mechanism being an integral part of the box, not the cover. The cover interlock mechanism shall have an externally operated override. The override shall not permanently disable the interlock mechanism, which shall return to the locked position once the override is released. The tool used to override the cover interlock mechanism shall not be required to enter the enclosure in order to override the interlock.
- E. Enclosures designated as NEMA 250 Type 4, 4X stainless steel, 12, or 12K shall have a dual cover interlock mechanism to prevent unintentional opening of the enclosure cover when the circuit breaker is ON and to prevent turning the circuit breaker ON when the enclosure cover is open.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
 1. Commencement of work shall indicate Installer's acceptance of the areas and conditions as satisfactory.

3.2 PREPARATION

- A. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
 - 1. Notify Construction Manager and Owner no fewer than seven days in advance of proposed interruption of electric service.
 - 2. Indicate method of providing temporary electric service.
 - 3. Do not proceed with interruption of electric service without Construction Manager's or Owner's written permission.
 - 4. Comply with NFPA 70E.
 - 5.

3.3 ENCLOSURE ENVIRONMENTAL RATING APPLICATIONS

- A. Enclosed Switches and Circuit Breakers: Provide enclosures at installed locations with the following environmental ratings.
 - 1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
 - 2. Outdoor Locations: NEMA 250, Type 3R.
 - 3. Wet or Damp, Indoor Locations: NEMA 250, Type 4.
 - 4. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.

3.4 INSTALLATION

- A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- B. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
- C. Comply with mounting and anchoring requirements specified in Section 260548 "Vibration and Seismic Controls for Electrical Systems."
- D. Temporary Lifting Provisions: Remove temporary lifting of eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- E. Install fuses in fusible devices.
- F. Comply with NFPA 70 and NECA 1.

3.5 IDENTIFICATION

- A. Comply with requirements in Section 260553 "Identification for Electrical Systems."
 - 1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
 - 2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- C. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- D. Perform tests and inspections with the assistance of a factory-authorized service representative.
- E. Tests and Inspections for Switches:
 - 1. Visual and Mechanical Inspection:
 - a. Inspect physical and mechanical condition.
 - b. Inspect anchorage, alignment, grounding, and clearances.
 - c. Verify that the unit is clean.
 - d. Verify blade alignment, blade penetration, travel stops, and mechanical operation.
 - e. Verify that fuse sizes and types match the Specifications and Drawings.
 - f. Verify that each fuse has adequate mechanical support and contact integrity.
 - g. Inspect bolted electrical connections for high resistance using one of the two following methods:
 - 1) Use a low-resistance ohmmeter.
 - a) Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.
 - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12.
 - a) Bolt-torque levels shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.12.
 - h. Verify that operation and sequencing of interlocking systems is as described in the Specifications and shown on the Drawings.
 - i. Verify correct phase barrier installation.
 - j. Verify lubrication of moving current-carrying parts and moving and sliding surfaces.
 - 2. Electrical Tests:
 - a. Perform resistance measurements through bolted connections with a low-resistance ohmmeter. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
 - b. Measure contact resistance across each switchblade fuseholder. Drop values shall not exceed the high level of the manufacturer's published data. If manufacturer's published data are not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.

- c. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with switch closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In the absence of manufacturer's published data, use Table 100.1 from the NETA ATS. Investigate values of insulation resistance less than those published in Table 100.1 or as recommended in manufacturer's published data.
- d. Measure fuse resistance. Investigate fuse-resistance values that deviate from each other by more than 15 percent.
- e. Perform ground fault test according to NETA ATS 7.14 "Ground Fault Protection Systems, Low-Voltage."

F. Tests and Inspections for Molded Case Circuit Breakers:

1. Visual and Mechanical Inspection:

- a. Verify that equipment nameplate data are as described in the Specifications and shown on the Drawings.
- b. Inspect physical and mechanical condition.
- c. Inspect anchorage, alignment, grounding, and clearances.
- d. Verify that the unit is clean.
- e. Operate the circuit breaker to ensure smooth operation.
- f. Inspect bolted electrical connections for high resistance using one of the two following methods:
 - 1) Use a low-resistance ohmmeter.
 - a) Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.
 - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12.
 - a) Bolt-torque levels shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.12.
- g. Inspect operating mechanism, contacts, and chutes in unsealed units.
- h. Perform adjustments for final protective device settings in accordance with the coordination study.

2. Electrical Tests:

- a. Perform resistance measurements through bolted connections with a low-resistance ohmmeter. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
- b. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with circuit breaker closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In the absence of manufacturer's published data, use Table 100.1 from the NETA ATS. Investigate values of insulation resistance less than those published in Table 100.1 or as recommended in manufacturer's published data.
- c. Perform a contact/pole resistance test. Drop values shall not exceed the high level of the manufacturer's published data. If manufacturer's published data are not available,

- investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
- d. Perform insulation resistance tests on all control wiring with respect to ground. Applied potential shall be 500-V dc for 300-V rated cable and 1000-V dc for 600-V rated cable. Test duration shall be one minute. For units with solid state components, follow manufacturer's recommendation. Insulation resistance values shall be no less than two megohms.
 - e. Determine the following by primary current injection:
 - 1) Long-time pickup and delay. Pickup values shall be as specified. Trip characteristics shall not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
 - 2) Short-time pickup and delay. Short-time pickup values shall be as specified. Trip characteristics shall not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
 - 3) Ground-fault pickup and time delay. Ground-fault pickup values shall be as specified. Trip characteristics shall not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
 - 4) Instantaneous pickup. Instantaneous pickup values shall be as specified and within manufacturer's published tolerances.
 - f. Test functionality of the trip unit by means of primary current injection. Pickup values and trip characteristics shall be as specified and within manufacturer's published tolerances.
 - g. Perform minimum pickup voltage tests on shunt trip and close coils in accordance with manufacturer's published data. Minimum pickup voltage of the shunt trip and close coils shall be as indicated by manufacturer.
 - h. Verify correct operation of auxiliary features such as trip and pickup indicators; zone interlocking; electrical close and trip operation; trip-free, anti-pump function; and trip unit battery condition. Reset all trip logs and indicators. Investigate units that do not function as designed.
 - i. Verify operation of charging mechanism. Investigate units that do not function as designed.
- 3. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
 - 4. Perform the following infrared scan tests and inspections and prepare reports:
 - a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each enclosed switch and circuit breaker. Remove front panels so joints and connections are accessible to portable scanner.
 - b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each enclosed switch and circuit breaker 11 months after date of Substantial Completion.
 - c. Instruments and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
 - 5. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.
- G. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.
- H. Prepare test and inspection reports.
- 1. Test procedures used.
 - 2. Include identification of each enclosed switch and circuit breaker tested and describe test results.

3. List deficiencies detected, remedial action taken, and observations after remedial action.

3.7 ADJUSTING

- A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer. Retain first option in paragraph below if the indicated Section is included in the Contract Documents. Retain second option and include settings on the Drawings or in a schedule attached to this Section if indicated Section is not included in the Contract Documents.

END OF SECTION 262816

SECTION 262913.03 - MANUAL AND MAGNETIC MOTOR CONTROLLERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Manual motor controllers.
 - 2. Enclosed full-voltage magnetic motor controllers.
 - 3. Combination full-voltage magnetic motor controllers.
 - 4. Enclosed reduced-voltage magnetic motor controllers.
 - 5. Combination reduced-voltage magnetic motor controllers.
 - 6. Multispeed magnetic motor controllers.
 - 7. Combination multispeed magnetic motor controllers.
 - 8. Enclosures.
 - 9. Accessories.
 - 10. Identification.

1.3 DEFINITIONS

- A. CPT: Control power transformer.
- B. MCCB: Molded-case circuit breaker.
- C. MCP: Motor circuit protector.
- D. NC: Normally closed.
- E. OCPD: Overcurrent protective device.
- F. SCCR: Short-circuit current rating.
- G. SCPD: Short-circuit protective device.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Shop Drawings: For each type of magnetic controller.
 - 1. Include plans, elevations, sections, and mounting details.
 - 2. Indicate dimensions, weights, required clearances, and location and size of each field connection.

3. Wire Termination Diagrams and Schedules: Include diagrams for signal, and control wiring. Identify terminals and wiring designations and color-codes to facilitate installation, operation, and maintenance. Indicate recommended types, wire sizes, and circuiting arrangements for field-installed wiring, and show circuit protection features. Differentiate between manufacturer-installed and field-installed wiring.
 4. Include features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
- C. Product Schedule: List the following for each enclosed controller:
1. Each installed magnetic controller type.
 2. NRTL listing.
 3. Factory-installed accessories.
 4. Nameplate legends.
 5. SCCR of integrated unit.
 6. For each combination magnetic controller include features, characteristics, ratings, and factory setting of the SCPD and OCPD.
 - a. Listing document proving Type 2 coordination.
 7. For each series-rated combination state the listed integrated short-circuit current (withstand) rating of SCPD and OCPDs by an NRTL acceptable to authorities having jurisdiction.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Seismic Qualification Data: Certificates, for magnetic controllers, from manufacturer.
1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- C. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For magnetic controllers to include in operation and maintenance manuals.
1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
 - a. Routine maintenance requirements for magnetic controllers and installed components.
 - b. Manufacturer's written instructions for testing and adjusting circuit breaker and MCP trip settings.
 - c. Manufacturer's written instructions for setting field-adjustable overload relays.
 - d. Load-Current and Overload-Relay Heater List: Compile after motors have been installed, and arrange to demonstrate that selection of heaters suits actual motor nameplate full-load currents.
 - e. Load-Current and List of Settings of Adjustable Overload Relays: Compile after motors have been installed, and arrange to demonstrate that switch settings for motor-running overload protection suit actual motors to be protected.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Fuses for Fused Switches: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
 - 2. Control Power Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than two of each size and type.
 - 3. Indicating Lights: Two of each type and color installed.
 - 4. Auxiliary Contacts: Furnish one spare(s) for each size and type of magnetic controller installed.
 - 5. Power Contacts: Furnish three spares for each size and type of magnetic contactor installed.

1.8 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Accredited by NETA.
 - 1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Store controllers indoors in clean, dry space with uniform temperature to prevent condensation. Protect controllers from exposure to dirt, fumes, water, corrosive substances, and physical damage.
- B. If stored in areas subject to weather, cover controllers to protect them from weather, dirt, dust, corrosive substances, and physical damage. Remove loose packing and flammable materials from inside controllers; install temporary electric heating, with at least 50 W per controller.

1.10 FIELD CONDITIONS

- A. Ambient Environment Ratings: Rate equipment for continuous operation under the following conditions unless otherwise indicated:
 - 1. Ambient Temperature: Not less than 23 deg F and not exceeding 104 deg F.
 - 2. Altitude: Not exceeding 6600 feet for electromagnetic and manual devices.
 - 3. The effect of solar radiation is not significant.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
- B. UL Compliance: Fabricate and label magnetic motor controllers to comply with UL 508 and UL 60947-4-1.
- C. NEMA Compliance: Fabricate motor controllers to comply with ICS 2.
- D. Seismic Performance: Magnetic controllers shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the controller will remain in place without separation of any parts when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
2. Component Importance Factor: 1.5.

2.2 MANUAL MOTOR CONTROLLERS

- A. Motor-Starting Switches (MSS): "Quick-make, quick-break" toggle or push-button action; marked to show whether unit is off or on.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Eaton.
 - b. General Electric Company.
 - c. SIEMENS Industry, Inc.; Energy Management Division.
 - d. Square D; by Schneider Electric.
 2. Standard: Comply with NEMA ICS 2, general purpose, Class A.
 3. Configuration: Non-reversing.
 4. Surface mounting.
 5. Red pilot light.
- B. Fractional Horsepower Manual Controllers (FHPMC): "Quick-make, quick-break" toggle or push-button action; marked to show whether unit is off, on, or tripped.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Eaton.
 - b. General Electric Company.
 - c. SIEMENS Industry, Inc.; Energy Management Division.
 - d. Square D; by Schneider Electric.
 2. Configuration: Non-reversing.
 3. Overload Relays: Inverse-time-current characteristics; NEMA ICS 2, Class 10 tripping characteristics; heaters matched to nameplate full-load current of actual protected motor; external reset push button; bimetallic type.
 4. Overload Relays: NEMA ICS 2, bimetallic class as schedule on Drawings.
 5. Pilot Light: Red.
- C. Integral Horsepower Manual Controllers (IHPMC): "Quick-make, quick-break" toggle or push-button action; marked to show whether unit is off, on, or tripped.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Eaton.
 - b. General Electric Company.
 - c. SIEMENS Industry, Inc.; Energy Management Division.
 - d. Square D; by Schneider Electric.
 2. Configuration: Non-reversing.
 3. Overload Relays: Inverse-time-current characteristics; NEMA ICS 2, Class 10 class tripping characteristics; heaters matched to nameplate full-load current of actual protected motor; external reset push button; bimetallic type.
 4. Overload Relays: NEMA ICS 2, bimetallic class as scheduled on Drawings.

2.3 ENCLOSED FULL-VOLTAGE MAGNETIC MOTOR CONTROLLERS

- A. Description: Across-the-line start, electrically held, for nominal system voltage of 600-V ac and less.

- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton.
 - 2. General Electric Company.
 - 3. SIEMENS Industry, Inc.; Energy Management Division.
 - 4. Square D; by Schneider Electric.
- C. Standard: Comply with NEMA ICS 2, general purpose, Class A.
- D. Configuration: Nonreversing.
- E. Contactor Coils: Pressure-encapsulated type with coil transient suppressors when indicated.
 - 1. Operating Voltage: Manufacturer's standard, unless indicated.
- F. Control Power:
 - 1. For on-board control power, obtain from line circuit or from integral CPT. The CPT shall have capacity to operate integral devices and remotely located pilot, indicating, and control devices.
- G. Overload Relays:
 - 1. Thermal Overload Relays:
 - a. Inverse-time-current characteristic.
 - b. Class 10 tripping characteristic.
 - c. Heaters in each phase shall be matched to nameplate full-load current of actual protected motor and with appropriate adjustment for duty cycle.
 - d. Ambient compensated.
 - e. Automatic resetting.
 - 2. Solid-State Overload Relay:
 - a. Switch or dial selectable for motor-running overload protection.
 - b. Sensors in each phase.
 - c. Class 10/20 selectable tripping characteristic selected to protect motor against voltage and current unbalance and single phasing.
 - d. Class II ground-fault protection shall comply with UL 1053 to interrupt low-level ground faults. The ground-fault detection system shall include circuitry that will prevent the motor controller from tripping when the fault current exceeds the interrupting capacity of the controller. Equip with start and run delays to prevent nuisance trip on starting, and a trip indicator.
- H. Digital communication module, using RS-485 Modbus, RTU protocol, 4-wire connection to host devices with a compatible port to transmit the following to the LAN:
 - 1. Instantaneous RMS current each phase, and 3-phase average.
 - 2. Voltage: L-L for each phase, L-L 3-phase average, L-N each phase and L-N 3-phase average - rms.
 - 3. Active Energy (kWh): 3-phase total.
 - 4. Power Factor: Each phase and 3-phase total.

2.4 COMBINATION FULL-VOLTAGE MAGNETIC MOTOR CONTROLLER

- A. Description: Factory-assembled, combination full-voltage magnetic motor controller consisting of the controller described in this article, indicated disconnecting means, SCPD and OCPD, in a single enclosure.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton.
 - 2. General Electric Company.
 - 3. SIEMENS Industry, Inc.; Energy Management Division.

4. Square D; by Schneider Electric.
- C. Standard: Comply with NEMA ICS 2, general purpose, Class A.
- D. Configuration: Non-reversing.
- E. Contactor Coils: Pressure-encapsulated type with coil transient suppressors when indicated.
 1. Operating Voltage: Manufacturer's standard, unless indicated.
- F. Control Power:
 1. For on-board control power, obtain from line circuit or from integral CPT. The CPT shall have capacity to operate integral devices and remotely located pilot, indicating, and control devices.
- G. Overload Relays:
 1. Thermal Overload Relays:
 - a. Inverse-time-current characteristic.
 - b. Class 10 tripping characteristic.
 - c. Heaters in each phase shall be matched to nameplate full-load current of actual protected motor and with appropriate adjustment for duty cycle.
 - d. Ambient compensated.
 - e. Automatic resetting.
 2. Solid-State Overload Relay:
 - a. Switch or dial selectable for motor-running overload protection.
 - b. Sensors in each phase.
 - c. Class 10/20 selectable tripping characteristic selected to protect motor against voltage and current unbalance and single phasing.
- H. Class II ground-fault protection shall comply with UL 1053 to interrupt low-level ground faults. The ground-fault detection system shall include circuitry that will prevent the motor controller from tripping when the fault current exceeds the interrupting capacity of the controller. Equip with start and run delays to prevent nuisance trip on starting, and a trip indicator.
- I. Digital communication module, using RS-485 Modbus, RTU protocol, 4-wire connection to host devices with a compatible port to transmit the following to the LAN:
 1. Instantaneous RMS current each phase, and 3-phase average.
 2. Voltage: L-L for each phase, L-L 3-phase average, L-N each phase and L-N 3-phase average - rms.
 3. Active Energy (kWh): 3-phase total.
 4. Power Factor: Each phase and 3-phase total.
- J. Fusible Disconnecting Means:
 1. NEMA KS 1, heavy-duty, horsepower-rated, fusible switch with clips or bolt pads to accommodate indicated fuses.
 2. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.
- K. Non-fusible Disconnecting Means:
 1. NEMA KS 1, heavy-duty, horsepower-rated, non-fusible switch.
 2. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.
- L. MCP Disconnecting Means:
 1. UL 489 and NEMA AB 3, with interrupting capacity to comply with available fault currents, instantaneous-only circuit breaker with front-mounted, field-adjustable, short-circuit trip coordinated with motor locked-rotor amperes.
 2. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.

- M. MCCB Disconnecting Means:
1. UL 489 and NEMA AB 3, with interrupting capacity to comply with available fault currents; thermal-magnetic MCCB, with inverse-time-current element for low-level overloads and instantaneous magnetic trip element for short circuits.
 2. Front-mounted, adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
 3. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.

2.5 ENCLOSED REDUCED-VOLTAGE MAGNETIC MOTOR CONTROLLERS

- A. Description: Electrically held; closed-transition; adjustable time delay on transition, 600-V ac or less.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton.
 2. General Electric Company.
 3. SIEMENS Industry, Inc.; Energy Management Division.
 4. Square D; by Schneider Electric.
- C. Standard: Comply with NEMA ICS 2, general purpose, Class A.
- D. Configuration:
1. Wye-Delta Controller: Four contactors, with a three-phase starting resistor/reactor bank.
 2. Part-Winding Controller: Separate START and RUN contactors, field-selectable for 1/2- or 2/3-winding start mode, with either six- or nine-lead motors; with separate overload relays for starting and running sequences.
 3. Autotransformer Reduced-Voltage Controller: Medium-duty service, with integral overtemperature protection; taps for starting at 50, 65, and 80 percent of line voltage; two START and one RUN contactors.
- E. Contactor Coils: Pressure-encapsulated type with coil transient suppressors when indicated.
1. Operating Voltage: Manufacturer's standard, unless indicated.
- F. Control Power: 120-V ac; obtained from integral CPT, with primary and secondary fuses, with CPT of sufficient capacity to operate integral devices and remotely located pilot, indicating, and control devices.
- G. Overload Relays:
1. Thermal Overload Relays: Bimetallic type.
 - a. Inverse-time-current characteristic.
 - b. Class 10 tripping characteristic.
 - c. Heaters in each phase matched to nameplate full-load current of actual protected motor and with appropriate adjustment for duty cycle.
 - d. Ambient compensated.
 - e. Automatic resetting.
 2. Solid-State Overload Relay:
 - a. Switch or dial selectable for motor-running overload protection.
 - b. Sensors in each phase.
 - c. Class 10/20 selectable tripping characteristic selected to protect motor against voltage and current unbalance and single phasing.
 - d. Class II Ground-Fault Protection: Comply with UL 1053 to interrupt low-level ground faults. The ground-fault detection system shall include circuitry that will prevent the motor controller from tripping when the fault current exceeds the interrupting capacity of the controller. Equip with start and run delays to prevent nuisance trip on starting, and a trip indicator.

- H. Digital Communication Module: RS-485 Modbus, RTU protocol, 4-wire connection to host devices with a compatible port to transmit the following to the LAN:
1. Instantaneous RMS current each phase, and 3-phase average.
 2. Voltage: L-L for each phase, L-L 3-phase average, L-N each phase and L-N 3-phase average - rms.
 3. Active Energy (kWh): 3-phase total.
 4. Power Factor: Each phase and 3-phase total.

2.6 COMBINATION REDUCED-VOLTAGE MOTOR CONTROLLERS

- A. Description: Factory-assembled, combination reduced-voltage magnetic motor controller consisting of the controller described in this article, indicated disconnecting means, and SCPD and OCPD, in a single enclosure.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton.
 2. General Electric Company.
 3. SIEMENS Industry, Inc.; Energy Management Division.
 4. Square D; by Schneider Electric.
- C. Configuration:
1. Wye-Delta Controller: Four contactors, with a three-phase starting resistor/reactor bank.
 2. Part-Winding Controller: Separate START and RUN contactors, field-selectable for 1/2- or 2/3-winding start mode, with either six- or nine-lead motors; with separate overload relays for starting and running sequences.
 3. Autotransformer Reduced-Voltage Controller: Medium-duty service, with integral overtemperature protection; taps for starting at 50, 65, and 80 percent of line voltage; two START and one RUN contactors.
- D. Contactor Coils: Pressure-encapsulated type with coil transient suppressors when indicated.
1. Operating Voltage: Manufacturer's standard, unless indicated.
- E. Control Power: 120-V ac; obtained from integral CPT, with primary and secondary fuses, with CPT of sufficient capacity to operate integral devices and remotely located pilot, indicating, and control devices.
- F. Overload Relays:
1. Thermal Overload Relays: Bimetallic type.
 - a. Inverse-time-current characteristic.
 - b. Class 10 tripping characteristic.
 - c. Heaters in each phase matched to nameplate full-load current of actual protected motor and with appropriate adjustment for duty cycle.
 - d. Ambient compensated.
 - e. Automatic resetting.
 2. Solid-State Overload Relay:
 - a. Switch or dial selectable for motor-running overload protection.
 - b. Sensors in each phase.
 - c. Class 10/20 selectable tripping characteristic selected to protect motor against voltage and current unbalance and single phasing.
- G. Class II Ground-Fault Protection: Comply with UL 1053 to interrupt low-level ground faults. The ground-fault detection system shall include circuitry that will prevent the motor controller from tripping when the fault current exceeds the interrupting capacity of the controller. Equip with start and run delays to prevent nuisance trip on starting, and a trip indicator.

- H. Digital Communication Module: RS-485 Modbus, RTU protocol, 4-wire connection to host devices with a compatible port to transmit the following to the LAN:
 - 1. Instantaneous RMS current each phase, and 3-phase average.
 - 2. Voltage: L-L for each phase, L-L 3-phase average, L-N each phase and L-N 3-phase average - rms.
 - 3. Active Energy (kWh): 3-phase total.
 - 4. Power Factor: Each phase and 3-phase total.
- I. Fusible Disconnecting Means:
 - 1. NEMA KS 1, heavy-duty, horsepower-rated, fusible switch with clips or bolt pads to accommodate indicated fuses.
 - 2. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.
- J. Non-fusible Disconnecting Means:
 - 1. NEMA KS 1, heavy-duty, horsepower-rated, non-fusible switch.
 - 2. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.
- K. MCP Disconnecting Means:
 - 1. UL 489 and NEMA AB 3, with interrupting capacity to comply with available fault currents, instantaneous-only circuit breaker with front-mounted, field-adjustable, short-circuit trip coordinated with motor locked-rotor amperes.
 - 2. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.
- L. MCCB Disconnecting Means:
 - 1. UL 489 and NEMA AB 3, with interrupting capacity to comply with available fault currents; thermal-magnetic MCCB, with inverse-time-current element for low-level overloads and instantaneous magnetic trip element for short circuits.
 - 2. Front-mounted, adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
 - 3. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.

2.7 MULTISPEED MAGNETIC CONTROLLERS

- A. Description: Two speed, full voltage, across the line, electrically held.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton.
 - 2. General Electric Company.
 - 3. SIEMENS Industry, Inc.; Energy Management Division.
 - 4. Square D; by Schneider Electric.
- C. Standard: Comply with NEMA ICS 2, general purpose, Class A.
 - 1. Configuration: Non-reversing, multispeed.
 - 2. Contactor Coils: Pressure-encapsulated type with coil transient suppressors.
 - a. Operating Voltage: Manufacturer's standard, unless indicated.
 - 3. Power Contacts: Totally enclosed, double break, silver-cadmium oxide; assembled to allow inspection and replacement without disturbing line or load wiring.
 - 4. Control Power: 120-V ac; obtained from integral CPT, with primary and secondary fuses, with CPT of sufficient capacity to operate integral devices and remotely located pilot, indicating, and control devices.
 - 5. Compelling relays shall ensure that motor will start only at low speed.
 - 6. Accelerating timer relays shall ensure properly timed acceleration through speeds lower than that selected.
 - 7. Decelerating timer relays shall ensure automatically timed deceleration through each speed.

8. Anti-plugging timer relays shall ensure a time delay when transferring from FORWARD to REVERSE and back.
 - D. Overload Relays:
 1. Thermal Overload Relays: Bimetallic type.
 - a. Inverse-time-current characteristic.
 - b. Class 10 tripping characteristic.
 - c. Heaters in each phase matched to nameplate full-load current of actual protected motor and with appropriate adjustment for duty cycle.
 - d. Ambient compensated.
 - e. Automatic resetting.
 2. Solid-State Overload Relay:
 - a. Switch or dial selectable for motor-running overload protection.
 - b. Sensors in each phase.
 - c. Class 10/20 selectable tripping characteristic selected to protect motor against voltage and current unbalance and single phasing.
 - E. Class II ground-fault protection shall comply with UL 1053 to interrupt low-level ground faults. The ground-fault detection system shall include circuitry that will prevent the motor controller from tripping when the fault current exceeds the interrupting capacity of the controller. Equip with start and run delays to prevent nuisance trip on starting, and a trip indicator.
 - F. Digital communication module, using RS-485 Modbus, RTU protocol, 4-wire connection to host devices with a compatible port to transmit the following to the LAN:
 1. Instantaneous rms current each phase, and 3-phase average.
 2. Voltage: L-L for each phase, L-L 3-phase average, L-N each phase and L-N 3-phase average - rms.
 3. Active Energy (kWh): 3-phase total.
 4. Power Factor: Each phase and 3-phase total.
 - 5.
- 2.8 Combination Multispeed Magnetic Motor Controller
- A. Description: Factory-assembled, combination of multispeed magnetic motor controller, consisting of the controller, indicated disconnecting means, and SCPD and OCPD, in a single enclosure.
 - B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Eaton.
 2. General Electric Company.
 3. SIEMENS Industry, Inc.; Energy Management Division.
 4. Square D; by Schneider Electric.
 - C. Standard: Comply with NEMA ICS 2, general purpose, Class A.
 1. Configuration: Non-reversing.
 2. Contactor Coils: Pressure-encapsulated type with coil transient suppressors.
 - a. Operating Voltage: Manufacturer's standard, unless indicated.
 3. Power Contacts: Totally enclosed, double break, silver-cadmium oxide; assembled to allow inspection and replacement without disturbing line or load wiring.
 4. Control Power: 120-V ac; obtained from integral CPT, with primary and secondary fuses, with CPT of sufficient capacity to operate integral devices and remotely located pilot, indicating, and control devices.
 5. Compelling relays shall ensure that motor will start only at low speed.
 6. Accelerating timer relays shall ensure properly timed acceleration through speeds lower than that selected.
 7. Decelerating timer relays shall ensure automatically timed deceleration through each speed.

8. Anti-plugging timer relays shall ensure a time delay when transferring from FORWARD to REVERSE and back.
 - D. Overload Relays:
 1. Thermal Overload Relays: Bimetallic type.
 - a. Inverse-time-current characteristic.
 - b. Class 10 tripping characteristic.
 - c. Heaters in each phase matched to nameplate full-load current of actual protected motor and with appropriate adjustment for duty cycle.
 - d. Ambient compensated.
 - e. Automatic resetting.
 2. Solid-State Overload Relay:
 - a. Switch or dial selectable for motor-running overload protection.
 - b. Sensors in each phase.
 - c. Class 10/20 selectable tripping characteristic selected to protect motor against voltage and current unbalance and single phasing.
 - E. Class II ground-fault protection shall comply with UL 1053 to interrupt low-level ground faults. The ground-fault detection system shall include circuitry that will prevent the motor controller from tripping when the fault current exceeds the interrupting capacity of the controller. Equip with start and run delays to prevent nuisance trip on starting, and a trip indicator.
 - F. Digital communication module, using RS-485 Modbus, RTU protocol, 4-wire connection to host devices with a compatible port to transmit the following to the LAN:
 1. Instantaneous RMS current each phase, and 3-phase average.
 2. Voltage: L-L for each phase, L-L 3-phase average, L-N each phase and L-N 3-phase average - rms.
 3. Active Energy (kWh): 3-phase total.
 4. Power Factor: Each phase and 3-phase total.
 - G. Fusible Disconnecting Means:
 1. NEMA KS 1, heavy-duty, horsepower-rated, fusible switch with clips or bolt pads to accommodate indicated fuses.
 2. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.
 3. NEMA KS 1, heavy-duty, horsepower-rated, nonfusible switch.
 4. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.
 - H. MCP Disconnecting Means:
 1. UL 489 and NEMA AB 3, with interrupting capacity to comply with available fault currents, instantaneous-only circuit breaker with front-mounted, field-adjustable, short-circuit trip coordinated with motor locked-rotor amperes.
 2. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.
 - I. MCCB Disconnecting Means:
 1. UL 489 and NEMA AB 3, with interrupting capacity to comply with available fault currents; thermal-magnetic MCCB, with inverse-time-current element for low-level overloads and instantaneous magnetic trip element for short circuits.
 2. Front-mounted, adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
 3. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.
- 2.9 ENCLOSURES
- A. Comply with NEMA 250, type designations as indicated on Drawings, complying with environmental conditions at installed location.

- B. The construction of the enclosures shall comply with NEMA ICS 6.
- C. Controllers in hazardous (classified) locations shall comply with UL 1203.

2.10 ACCESSORIES

- A. General Requirements for Control Circuit and Pilot Devices: NEMA ICS 5; factory installed in controller enclosure cover unless otherwise indicated.
 - 1. Push Buttons, Pilot Lights, and Selector Switches: Standard-duty, except as needed to match enclosure type. Heavy-duty or oil-tight where indicated in the controller schedule.
 - a. Push Buttons: As indicated in the controller schedule.
 - b. Pilot Lights: As indicated in the controller schedule.
 - 2. Elapsed Time Meters: Heavy duty with digital readout in hours.
 - 3. Meters: Panel type, 2-1/2-inch minimum size with 90- or 120-degree scale and plus or minus two percent accuracy. Where indicated, provide selector switches with an off position.
- B. Motor protection relays shall be with solid-state sensing circuit and isolated output contacts for hardwired connections.
 - 1. Phase-failure.
 - 2. Phase-reversal, with bicolor LED to indicate normal and fault conditions. Automatic reset when phase reversal is corrected.
 - 3. Under/overvoltage, operate when the circuit voltage reaches a preset value, and drop out when the operating voltage drops to a level below the preset value. Include adjustable time-delay setting.
- C. Breather assemblies, to maintain interior pressure and release condensation in Type 4 enclosures installed outdoors or in unconditioned interior spaces subject to humidity and temperature swings.
- D. Space heaters, with NC auxiliary contacts, to mitigate condensation in Type 12 enclosures installed outdoors or in unconditioned interior spaces subject to humidity and temperature swings.
- E. Sun shields installed on fronts, sides, and tops of enclosures installed outdoors and subject to direct and extended sun exposure.

2.11 IDENTIFICATION

- A. Controller Nameplates: Laminated acrylic or melamine plastic signs, as described in Section 260553 "Identification for Electrical Systems," for each compartment, mounted with corrosion-resistant screws.
- B. Arc-Flash Warning Labels:
 - 1. Comply with requirements in Section 260573.19 "Arc-Flash Hazard Analysis." Produce a 3.5-by-5-inch self-adhesive equipment label for each work location included in the analysis.
 - 2. Comply with requirements in Section 260553 "Identification for Electrical Systems." Produce a 3.5-by-5-inch self-adhesive equipment label for each work location included in the analysis. Labels shall be machine printed, with no field-applied markings.
 - a. The label shall have an orange header with the wording, "WARNING, ARC-FLASH HAZARD," and shall include the following information taken directly from the arc-flash hazard analysis:
 - 1) Location designation.
 - 2) Nominal voltage.
 - 3) Flash protection boundary.
 - 4) Hazard risk category.
 - 5) Incident energy.
 - 6) Working distance.

- 7) Engineering report number, revision number, and issue date.
- b. Labels shall be machine printed, with no field-applied markings.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and space conditions for compliance with requirements for motor controllers, their relationship with the motors, and other conditions affecting performance of the Work.

3.2 INSTALLATION

- A. Comply with NECA 1.
- B. Wall-Mounted Controllers: Install magnetic controllers on walls with tops at uniform height indicated, and by bolting units to wall or mounting on lightweight structural-steel channels bolted to wall. For controllers not at walls, provide freestanding racks complying with Section 260529 "Hangers and Supports for Electrical Systems" unless otherwise indicated.
- C. Comply with requirements for seismic control devices specified in Section 260548.16 "Seismic Controls for Electrical Systems."
- D. Maintain minimum clearances and workspace at equipment according to manufacturer's written instructions and NFPA 70.
- E. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.
- F. Setting of Overload Relays: Select and set overloads on the basis of full-load current rating as shown on motor nameplate. Adjust setting value for special motors as required by NFPA 70 for motors that are high-torque, high-efficiency, and so on.

3.3 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

- A. Perform tests and inspections with the assistance of a factory-authorized service representative.
- B. Tests and Inspections:
 - 1. Comply with the provisions of NFPA 70B, "Testing and Test Methods" Chapter.
 - 2. Visual and Mechanical Inspection:
 - a. Compare equipment nameplate data with drawings and specifications.
 - b. Inspect physical and mechanical condition.
 - c. Inspect anchorage, alignment, and grounding.
 - d. Verify the unit is clean.
 - e. Inspect contactors:
 - 1) Verify mechanical operation.

- 2) Verify contact gap, wipe, alignment, and pressure are according to manufacturer's published data.
 - f. Motor-Running Protection:
 - 1) Verify overload element rating is correct for its application.
 - 2) If motor-running protection is provided by fuses, verify correct fuse rating.
 - g. Inspect bolted electrical connections for high resistance using one of the two following methods:
 - 1) Use a low-resistance ohmmeter. Compare bolted connection resistance values with values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.
 - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method according to manufacturer's published data or NETA ATS Table 100.12. Bolt-torque levels shall be according to manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.12.
 - h. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
 3. Electrical Tests:
 - a. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with switch closed, and across each open pole. Insulation-resistance values shall be according to manufacturer's published data or NETA ATS Table 100.1. In the absence of manufacturer's published data, use Table 100.5. Values of insulation resistance less than those of this table or manufacturer's recommendations shall be investigated and corrected.
 - b. Measure fuse resistance. Investigate fuse-resistance values that deviate from each other by more than 15 percent.
 - c. Test motor protection devices according to manufacturer's published data.
 - d. Test circuit breakers as follows:
 - 1) Operate the circuit breaker to ensure smooth operation.
 - 2) For adjustable circuit breakers, adjust protective device settings according to the coordination study. Comply with coordination study recommendations.
 - e. Perform operational tests by initiating control devices.
 4. Infrared Inspection: Perform the survey during periods of maximum possible loading. Remove all necessary covers prior to the inspection.
 - a. Comply with the recommendations of NFPA 70B, "Testing and Test Methods" Chapter, "Infrared Inspection" Article.
 - b. After Substantial Completion, but not more than 60 days after Final Acceptance, perform infrared inspection of the electrical power connections of each motor controller.
 - c. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each motor controller 11 months after date of Substantial Completion.
 - d. Report of Infrared Inspection: Prepare a certified report that identifies the testing technician and equipment used, and lists the following results:
 - 1) Description of equipment to be tested.
 - 2) Discrepancies.
 - 3) Temperature difference between the area of concern and the reference area.
 - 4) Probable cause of temperature difference.
 - 5) Areas inspected. Identify inaccessible and unobservable areas and equipment.
 - 6) Load conditions at time of inspection.
 - 7) Photographs and thermograms of the deficient area.
 - 8) Recommended action.
 - e. Equipment: Inspect distribution systems with imaging equipment capable of detecting a minimum temperature difference of 1 degree C at 30 degrees C. The equipment shall detect emitted radiation and convert detected radiation to a visual signal.
 - f. Act on inspection results and recommended action, and considering the recommendations of NETA ATS, Table 100.18. Correct possible and probable deficiencies as soon as Owner's operations permit. Retest until deficiencies are corrected.
- C. Motor controller will be considered defective if it does not pass tests and inspections.

- D. Prepare test and inspection reports.

3.5 SYSTEM FUNCTION TESTS

- A. System function tests shall prove the correct interaction of sensing, processing, and action devices. Perform system function tests after field quality control tests have been completed and all components have passed specified tests.
 - 1. Develop test parameters and perform tests for the purpose of evaluating performance of integral components and their functioning as a complete unit within design requirements and manufacturer's published data.
 - 2. Verify the correct operation of interlock safety devices for fail-safe functions in addition to design function.
 - 3. Verify the correct operation of sensing devices, alarms, and indicating devices.
- B. Motor controller will be considered defective if it does not pass the system function tests and inspections.
- C. Prepare test and inspection reports.

3.6 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain switchgear.

END OF SECTION 262913.03

SECTION 263600 - TRANSFER SWITCHES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes transfer switches rated 600 V and less, including the following:
 - 1. Non-automatic transfer switches.
 - 2. Remote annunciation and control systems.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, weights, operating characteristics, furnished specialties, and accessories.
- B. Shop Drawings: Dimensioned plans, elevations, sections, and details showing minimum clearances, conductor entry provisions, gutter space, installed features and devices, and material lists for each switch specified.
- C. Manufacturer Seismic Qualification Certification: Submit certification that transfer switches accessories, and components will withstand seismic forces defined in Division 26 Section "Vibration and Seismic Controls for Electrical Systems." Include the following:
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- D. Qualification Data: For testing agency.
- E. Field quality-control test reports.
- F. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
 - 1. Features and operating sequences, both automatic and manual.

2. List of all factory settings of relays; provide relay-setting and calibration instructions, including software, where applicable.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Maintain a service center capable of providing training, parts, and emergency maintenance repairs within a response period of less than eight hours from time of notification.
- B. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.
 1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.
- C. Source Limitations: Obtain automatic transfer switches, remote annunciator and control panels through one source from a single manufacturer.
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- E. Comply with NEMA ICS 1.
- F. Comply with NFPA 70.
- G. Comply with NFPA 110.
- H. Comply with UL 1008 unless requirements of these Specifications are stricter.

1.5 COORDINATION

- A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

PART 2 - PRODUCTS

2.1 GENERAL TRANSFER-SWITCH PRODUCT REQUIREMENTS

- A. Indicated Current Ratings: Apply as defined in UL 1008 for continuous loading and total system transfer, including tungsten filament lamp loads not exceeding 30 percent of switch ampere rating, unless otherwise indicated.
- B. Tested Fault-Current Closing and Withstand Ratings: Adequate for duty imposed by protective devices at installation locations in Project under the fault conditions indicated, based on testing according to UL 1008.

1. Where transfer switch includes internal fault-current protection, rating of switch and trip unit combination shall exceed indicated fault-current value at installation location.
- C. Solid-State Controls: Repetitive accuracy of all settings shall be plus or minus 2 percent or better over an operating temperature range of minus 20 to plus 70 deg C.
- D. Resistance to Damage by Voltage Transients: Components shall meet or exceed voltage-surge withstand capability requirements when tested according to IEEE C62.41. Components shall meet or exceed voltage-impulse withstand test of NEMA ICS 1.
- E. Electrical Operation: Accomplish by a nonfused, momentarily energized solenoid or electric-motor-operated mechanism, mechanically and electrically interlocked in both directions.
- F. Switch Characteristics: Designed for continuous-duty repetitive transfer of full-rated current between active power sources.
 1. Switch Action: Double throw; mechanically held in both directions.
 2. Contacts: Silver composition or silver alloy for load-current switching. Conventional automatic transfer-switch units, rated 225 A and higher, shall have separate arcing contacts.
- G. Neutral Terminal: Solid and fully rated, unless otherwise indicated.
- H. Battery Charger: For generator starting batteries.
 1. Float type rated 10 A.
 2. Fused ac inputs and dc outputs.
- I. Annunciation, Control, and Programming Interface Components: Devices at transfer switches for communicating with remote programming devices, annunciators, or annunciator and control panels shall have communication capability matched with remote device.
- J. Factory Wiring: Train and bundle factory wiring and label, consistent with Shop Drawings, either by color-code or by numbered or lettered wire and cable tape markers at terminations. Color-coding and wire and cable tape markers are specified in Division 26 Section "Identification for Electrical Systems."
 1. Designated Terminals: Pressure type, suitable for types and sizes of field wiring indicated.
 2. Power-Terminal Arrangement and Field-Wiring Space: Suitable for top, side, or bottom entrance of feeder conductors as indicated.
 3. Control Wiring: Equipped with lugs suitable for connection to terminal strips.
- K. Enclosures: General-purpose NEMA 250, Type 1, complying with NEMA ICS 6 and UL 508, unless otherwise indicated.

2.2 NON-AUTOMATIC TRANSFER SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. ASCO: a brand of Vertiv.
 2. ESL Power Systems, Inc.
 3. Russelectric, Inc.

- B. Electrically Operated: Electrically actuated by push buttons designated "Normal Source" and "Alternative Source." Switch shall be capable of transferring load in either direction with either or both sources energized.
- C. Manual and Electrically Operated: Electrically actuated by push buttons designated "Normal Source" and "Alternative Source." Manual handle provides quick-make, quick-break manual-switching action. Switch shall be capable of electrically or manually transferring load in either direction with either or both sources energized. Control circuit disconnects from electrical operator during manual operation.
- D. Double-Throw Switching Arrangement: Incapable of pauses or intermediate position stops during switching sequence.
- E. Pilot Lights: Indicate source to which load is connected.
- F. Source-Available Indicating Lights: Supervise sources via transfer-switch normal- and alternative-source sensing circuits.
 - 1. Normal Power Supervision: Green light with nameplate engraved "Normal Source Available."
 - 2. Emergency Power Supervision: Red light with nameplate engraved "Alternative Source Available."
- G. Unassigned Auxiliary Contacts: Switch shall have one set of normally closed contacts for each switch position, rated 10 A at 240-V ac.
- H. Switch Characteristics: Designed for continuous-duty repetitive transfer of full-rated current between active power sources.
 - 1. Switch Action: Double throw; mechanically held in both directions.
 - 2. Contacts: Silver composition or silver alloy for load-current switching.
 - 3. Conductor Connectors: Suitable for use with conductor material and sizes.
 - 4. Material: Hard-drawn copper, 98 percent conductivity.
 - 5. Main and Neutral Lugs: Mechanical type.
 - 6. Ground Lugs and Bus-Configured Terminators: Mechanical type.
 - 7. Ground bar.
 - 8. Connectors shall be marked for conductor size and type according to UL 1008.

2.3 REMOTE ANNUNCIATOR AND CONTROL SYSTEM

- A. Functional Description: Include the following functions for indicated transfer switches:
 - 1. Indication of sources available.
 - 2. Indication of switch position.
 - 3. Indication of switch in test mode.
 - 4. Indication of failure of digital communication link.
 - 5. Key-switch or user-code access to control functions of panel.
 - 6. Control of switch-test initiation.
 - 7. Control of switch operation in either direction.

- B. Malfunction of annunciator, annunciation and control panel, or communication link shall not affect functions of transfer switch. In the event of failure of communication link, automatic transfer switch automatically reverts to stand-alone, self-contained operation. Automatic transfer-switch sensing, controlling, or operating function shall not depend on remote panel for proper operation.
- C. Remote Annunciation and Control Panel: Solid-state components. Include the following features:
 - 1. Controls and indicating lights grouped together for each transfer switch.
 - 2. Label each indicating light control group. Indicate transfer switch it controls, location of switch, and load it serves.
 - 3. Digital Communication Capability: Matched to that of transfer switches supervised.
 - 4. Mounting: Flush, modular, steel cabinet, unless otherwise indicated.

2.4 SOURCE QUALITY CONTROL

- A. Factory test and inspect components, assembled switches, and associated equipment. Ensure proper operation. Check transfer time and voltage, frequency, and time-delay settings for compliance with specified requirements. Perform dielectric strength test complying with NEMA ICS 1.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Design each fastener and support to carry load indicated by seismic requirements and according to seismic-restraint details. See Division 26 Section "Vibration and Seismic Controls for Electrical Systems."
- B. Annunciator and Control Panel Mounting: Flush in wall, unless otherwise indicated.
- C. Identify components according to Division 26 Section "Identification for Electrical Systems."
- D. Set field-adjustable intervals and delays, relays, and engine exerciser clock.

3.2 CONNECTIONS

- A. Wiring to Remote Components: Match type and number of cables and conductors to control and communication requirements of transfer switches as recommended by manufacturer. Increase raceway sizes at no additional cost to Owner if necessary to accommodate required wiring.
- B. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- C. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing.

- B. Perform tests and inspections and prepare test reports.
1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installation, including connections, and to assist in testing.
 2. After installing equipment and after electrical circuitry has been energized, test for compliance with requirements.
 3. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 4. Measure insulation resistance phase-to-phase and phase-to-ground with insulation-resistance tester. Include external annunciation and control circuits. Use test voltages and procedure recommended by manufacturer. Comply with manufacturer's specified minimum resistance.
 - a. Check for electrical continuity of circuits and for short circuits.
 - b. Inspect for physical damage, proper installation and connection, and integrity of barriers, covers, and safety features.
 - c. Verify that manual transfer warnings are properly placed.
 - d. Perform manual transfer operation.
 5. After energizing circuits, demonstrate interlocking sequence and operational function for each switch at least three times.
 - a. Simulate power failures of normal source to automatic transfer switches and of emergency source with normal source available.
 - b. Simulate loss of phase-to-ground voltage for each phase of normal source.
 - c. Verify time-delay settings.
 - d. Verify pickup and dropout voltages by data readout or inspection of control settings.
 - e. Test bypass/isolation unit functional modes and related automatic transfer-switch operations.
 - f. Verify proper sequence and correct timing of automatic engine starting, transfer time delay, retransfer time delay on restoration of normal power, and engine cool-down and shutdown.
- C. Coordinate tests with tests of generator and run them concurrently.
- D. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation and contact resistances and time delays. Attach a label or tag to each tested component indicating satisfactory completion of tests.
- E. Remove and replace malfunctioning units and retest as specified above.
- F. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each switch. Remove all access panels so joints and connections are accessible to portable scanner.
1. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
 2. Record of Infrared Scanning: Prepare a certified report that identifies switches checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.4 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain transfer switches and related equipment as specified below. Refer to Division 01 Section "Demonstration and Training."
- B. Coordinate this training with that for generator equipment.

END OF SECTION 263600

SECTION 265119 - LED INTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Interior solid-state luminaires that use LED technology.
 - 2. Lighting fixture supports.
- B. Related Requirements:
 - 1. Section 260923"Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.

1.3 DEFINITIONS

- A. CCT: Correlated color temperature.
- B. CRI: Color Rendering Index.
- C. Fixture: See "Luminaire."
- D. IP: International Protection or Ingress Protection Rating.
- E. LED: Light-emitting diode.
- F. Lumen: Measured output of lamp and luminaire, or both.
- G. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Arrange in order of luminaire designation.
 - 2. Include data on features, accessories, and finishes.
 - 3. Include physical description and dimensions of luminaires.
 - 4. Include emergency lighting units, including batteries and chargers.
 - 5. Include life, output (lumens, CCT, and CRI), and energy efficiency data.
 - 6. Photometric data and adjustment factors based on laboratory tests, complying with IESNA Lighting Measurements Testing and Calculation Guides, of each lighting fixture type. The

adjustment factors shall be for lamps and accessories identical to those indicated for the lighting fixture as applied in this Project IES LM-79 and IES LM-80.

- a. Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.
 - b. Testing Agency Certified Data: For indicated luminaires, photometric data certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.
- B. Shop Drawings: For nonstandard or custom luminaires.
1. Include plans, elevations, sections, and mounting and attachment details.
 2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 3. Include diagrams for power, signal, and control wiring.
- C. Samples: For each luminaire and for each color and texture with standard factory-applied finish.
- D. Samples for Initial Selection: For each type of luminaire with custom factory-applied finishes.
1. Include Samples of luminaires and accessories involving color and finish selection.
- E. Samples for Verification: For each type of luminaire.
1. Include Samples of luminaires and accessories to verify finish selection.
- F. Product Schedule: For luminaires and lamps. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
1. Lighting luminaires.
 2. Partitions and millwork that penetrate the ceiling or extend to within 12 inches of the plane of the luminaires.
 3. Structural members to which equipment and or luminaires will be attached.
 4. Initial access modules for acoustical tile, including size and locations.
 5. Items penetrating finished ceiling, including the following:
 - a. Other luminaires.
 - b. Air outlets and inlets.
 - c. Access panels.
 6. Moldings.
- B. Qualification Data: For testing laboratory providing photometric data for luminaires.
- C. Seismic Qualification Certificates: For luminaires, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
- D. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- E. Product Certificates: For each type of luminaire.
- F. Product Test Reports: For each luminaire, for tests performed by a qualified testing agency.
- G. Sample warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For luminaires and lighting systems to include in operation and maintenance manuals.
1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

1.7 QUALITY ASSURANCE

- A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturer's laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.
- B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7, accredited under the NVLAP for Energy Efficient Lighting Products, and complying with the applicable IES testing standards.
- C. Provide luminaires from a single manufacturer for each luminaire type.
- D. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.9 WARRANTY

- A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
- B. Warranty Period: Five year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Luminaires shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
- B. Seismic Performance: Luminaires and lamps shall be labeled vibration and shock resistant.
 - 1. The term "withstand" means "the luminaire will remain in place without separation of any parts when subjected to the seismic forces specified and the luminaire will be fully operational during and after the seismic event."

2.2 LUMINAIRE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. NRTL Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by an NRTL.
- C. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.
- D. Recessed Fixtures: Comply with NEMA LE 4.
- E. Bulb shape complying with ANSI C79.1.
- F. Lamp base complying with ANSI C81.61 or IEC 60061-1.
- G. CRI of minimum 80. CCT of 3000 K.
- H. Rated lamp life of 50,000 hours.
- I. Lamps dimmable from 100 percent to 0 percent of maximum light output.
- J. Internal driver.
- K. Nominal Operating Voltages: 120 V ac, 12 V dc, 24 V dc.
 - 1. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.

2.3 MATERIALS

- A. Metal Parts:
 - 1. Free of burrs and sharp corners and edges.
 - 2. Sheet metal components shall be steel unless otherwise indicated.
 - 3. Form and support to prevent warping and sagging.

- B. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.
- C. Diffusers and Globes:
 - 1. Acrylic Diffusers: One hundred percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
 - 2. Glass: Annealed crystal glass unless otherwise indicated.
 - 3. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.
- D. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Locate labels where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.
 - 1. Label shall include the following lamp characteristics:
 - a. "USE ONLY" and include specific lamp type.
 - b. Lamp diameter, shape, size, wattage, and coating.
 - c. CCT and CRI for all luminaires.

2.4 METAL FINISHES

- A. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

2.5 LUMINAIRE FIXTURE SUPPORT COMPONENTS

- A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.
- B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.
- C. Wires: ASTM A 641/A 641 M, Class 3, soft temper, zinc-coated steel, 12 gage.
- D. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.
- E. Hook Hangers: Integrated assembly matched to luminaire, line voltage, and equipment with threaded attachment, cord, and locking-type plug.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

- B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before fixture installation. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 TEMPORARY LIGHTING

- A. If approved by the Architect, use selected permanent luminaires for temporary lighting. When construction is sufficiently complete, clean luminaires used for temporary lighting and install new lamps.

3.3 INSTALLATION

- A. Comply with NECA 1.
- B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.
- C. Install lamps in each luminaire.
- D. Supports:
 - 1. Sized and rated for luminaire weight.
 - 2. Able to maintain luminaire position after cleaning and relamping.
 - 3. Provide support for luminaire without causing deflection of ceiling or wall.
 - 4. Luminaire mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and vertical force of 400 percent of luminaire weight.
- E. Flush-Mounted Luminaire Support:
 - 1. Secured to outlet box.
 - 2. Attached to ceiling structural members at four points equally spaced around circumference of luminaire.
 - 3. Trim ring flush with finished surface.
- F. Wall-Mounted Luminaire Support:
 - 1. Attached to a minimum 20 gauge backing plate attached to wall structural members.
 - 2. Do not attach luminaires directly to gypsum board.
- G. Ceiling-Mounted Luminaire Support:
 - 1. Ceiling mount with two 5/32-inch diameter aircraft cable supports adjustable to 120 inches in length.
 - 2. Ceiling mount with four-point pendant mount with 5/32-inch-diameter aircraft cable supports adjustable to 120 inches in length.
 - 3. Ceiling mount with hook mount.
- H. Ceiling-Grid-Mounted Luminaires:
 - 1. Secure to any required outlet box.
 - 2. Secure luminaire to the luminaire opening using approved fasteners in a minimum of four locations, spaced near corners of luminaire.
 - 3. Use approved devices and support components to connect luminaire to ceiling grid and building structure in a minimum of four locations, spaced near corners of luminaire.

- I. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.

3.4 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
 - 2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.
- B. Luminaire will be considered defective if it does not pass operation tests and inspections.
- C. Prepare test and inspection reports.

3.6 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to two visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.
 - 1. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.
 - 2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
 - 3. Adjust the aim of luminaires in the presence of the Architect.

END OF SECTION 265119

SECTION 265219 - EMERGENCY AND EXIT LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Emergency lighting units.
 - 2. Exit signs.
 - 3. Luminaire supports.

1.3 DEFINITIONS

- A. CCT: Correlated color temperature.
- B. CRI: Color Rendering Index.
- C. Emergency Lighting Unit: A lighting unit with internal or external emergency battery powered supply and the means for controlling and charging the battery and unit operation.
- D. Fixture: See "Luminaire" Paragraph.
- E. Lumen: Measured output of lamp and luminaire, or both.
- F. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of emergency lighting unit, exit sign, and emergency lighting support.
 - 1. Include data on features, accessories, and finishes.
 - 2. Include physical description of the unit and dimensions.
 - 3. Battery and charger for light units.
 - 4. Include life, output of luminaire (lumens, CCT, and CRI), and energy-efficiency data.
 - 5. Include photometric data and adjustment factors based on laboratory tests, complying with IES LM-45, for each luminaire type.
 - a. Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.
- B. Shop Drawings: For nonstandard or custom luminaires.
 - 1. Include plans, elevations, sections, and mounting and attachment details.
 - 2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 3. Include diagrams for power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Luminaires.
 - 2. Suspended ceiling components.
 - 3. Partitions and millwork that penetrate the ceiling or extend to within 12 inches of the plane of the luminaires.
 - 4. Structural members to which equipment will be attached.
 - 5. Size and location of initial access modules for acoustical tile.
 - 6. Items penetrating finished ceiling including the following:
 - a. Other luminaires.
 - b. Air outlets and inlets.
 - c. Speakers.
 - d. Ceiling-mounted projectors.
 - e. Sprinklers.
 - f. Access panels.
 - 7. Moldings.
- B. Qualification Data: For testing laboratory providing photometric data for luminaires.
- C. Product Certificates: For each type of luminaire.
- D. Seismic Qualification Data: For luminaires, accessories, and components, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
 - 4. Provide seismic qualification certificate for each piece of equipment.
- E. Product Test Reports: For each luminaire for tests performed by a qualified testing agency.
- F. Sample Warranty: For manufacturer's special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For luminaires and lighting systems to include in emergency, operation, and maintenance manuals.
 - 1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

1.7 QUALITY ASSURANCE

- A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturer's laboratory that is accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.
- B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7, accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products, and complying with the applicable IES testing standards.

- C. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.
- D. Mockups: For interior luminaires in room or module mockups, complete with power and control connections.
 - 1. Obtain Architect's approval of luminaires and signs in mockups before starting installations.
 - 2. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.9 WARRANTY

- A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Two year(s) from date of Substantial Completion.
- B. Special Warranty for Emergency Lighting Batteries: Manufacturer's standard form in which manufacturer of battery-powered emergency lighting unit agrees to repair or replace components of rechargeable batteries that fail in materials or workmanship within specified warranty period.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Luminaires shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 - 1. The term "withstand" means "the luminaire will remain in place without separation of any parts when subjected to the seismic forces specified and the luminaire will be fully operational during and after the seismic event."

2.2 GENERAL REQUIREMENTS FOR EMERGENCY LIGHTING

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. NRTL Compliance: Fabricate and label emergency lighting units, exit signs, and batteries to comply with UL 924.
- C. Comply with NFPA 70.
- D. Comply with NEMA LE 4 for recessed luminaires.
- E. Comply with UL 1598 for fluorescent luminaires.
- F. Lamp Base: Comply with ANSI C81.61.

- G. Bulb Shape: Complying with ANSI C79.1.
- H. Internal Type Emergency Power Unit: Self-contained, modular, battery-inverter unit, factory mounted within luminaire body and compatible with ballast.
1. Emergency Connection: Operate one lamp continuously at an output of 1100 lumens each upon loss of normal power. Connect unswitched circuit to battery-inverter unit and switched circuit to luminaire ballast.
 2. Operation: Relay automatically turns lamp on when power-supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
 3. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:
 - a. Ambient Temperature: Less than 0 deg F or exceeding 104 deg F, with an average value exceeding 95 deg F over a 24-hour period.
 - b. Ambient Storage Temperature: Not less than minus 4 deg F and not exceeding 140 deg F.
 - c. Humidity: More than 95 percent (condensing).
 - d. Altitude: Exceeding 3300 feet.
 4. Test Push-Button and Indicator Light: Visible and accessible without opening luminaire or entering ceiling space.
 - a. Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
 - b. Indicator Light: LED indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
 5. Battery: Sealed, maintenance-free, nickel-cadmium type.
 6. Charger: Fully automatic, solid-state, constant-current type with sealed power transfer relay.
 7. Remote Test: Switch in handheld remote device aimed in direction of tested unit initiates coded infrared signal. Signal reception by factory-installed infrared receiver in tested unit triggers simulation of loss of its normal power supply, providing visual confirmation of either proper or failed emergency response.
 8. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.
- I. External Type: Self-contained, modular, battery-inverter unit, suitable for powering one or more lamps, remote mounted from luminaire.
1. Emergency Connection: Operate one fluorescent, incandescent, or multiple LED lamps continuously. Connect unswitched circuit to battery-inverter unit and switched circuit to luminaire and/or ballast.
 2. Operation: Relay automatically turns lamp on when power-supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
 3. Nightlight Connection: Operate lamp in a remote luminaire continuously.
 4. Battery: Sealed, maintenance-free, nickel-cadmium type.
 5. Charger: Fully automatic, solid-state, constant-current type.
 6. Housing: NEMA 250, Type 1 enclosure listed for installation inside, on top of, or remote from luminaire. Remote assembly shall be located no less than half the distance recommended by the ballast or emergency power unit manufacturer, whichever is less.
 7. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
 8. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
 9. Remote Test: Switch in handheld remote device aimed in direction of tested unit initiates coded infrared signal. Signal reception by factory-installed infrared receiver in tested unit triggers simulation of loss of its normal power supply, providing visual confirmation of either proper or failed emergency response.
 10. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

2.3 EMERGENCY LIGHTING

- A. General Requirements for Emergency Lighting Units: Self-contained units.
- B. Emergency Luminaires:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Cooper Lighting, an Eaton business.
 - b. Dual-Lite.
 - c. Lithonia Lighting; Acuity Brands Lighting, Inc.
 - 2. Emergency Luminaires: as indicated on Lighting Fixture Schedule with the following additional features:
 - a. Operating at nominal voltage of 120 V ac, 277 V ac, 6 V dc, 12 V dc, 24 V dc.
 - b. Internal or external emergency power unit.
 - c. Rated for installation in damp locations, and for sealed and gasketed luminaires in wet locations.
 - d. UL 94 flame rating.
- C. Emergency Lighting Unit:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Cooper Lighting, an Eaton business.
 - b. Dual-Lite.
 - c. Lithonia Lighting; Acuity Brands Lighting, Inc.
 - 2. Emergency Lighting Unit: as indicated on Lighting Fixture Schedule.
 - 3. Operating at nominal voltage of 120 V ac, 277 V ac, 6 V dc, 12 V dc, 24 V dc.
 - 4. Universal mount with universal junction box adaptor.
 - 5. UV stable thermoplastic housing, rated for damp locations.
 - 6. Two LED lamp heads.
 - 7. Internal or External emergency power unit.

2.4 EXIT SIGNS

- A. General Requirements for Exit Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.
- B. Internally Lighted Signs:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Exitronix, Emergency Lighting
 - b. Cooper Lighting, an Eaton business.
 - c. Hubbell Industrial Lighting; Hubbell Incorporated.
 - d. Lithonia Lighting; Acuity Brands Lighting, Inc.
 - 2. Operating at nominal voltage of 120 V ac, 277 V ac, 6 V dc, 12 V dc, 24 V dc.
 - 3. Lamps for AC Operation: Fluorescent, two for each luminaire; 20,000 hours of rated lamp life.
 - 4. Lamps for AC Operation: LEDs; 50,000 hours minimum rated lamp life.
 - 5. Self-Powered Exit Signs (Battery Type): Internal emergency power unit.
 - 6. Master/Remote Sign Configurations:
 - a. Master Unit: Comply with requirements above for self-powered exit signs, and provide additional capacity in LED power supply, ballast, or battery for power connection to remote unit.
 - b. Remote Unit: Comply with requirements above for self-powered exit signs, except omit power supply, battery, and test features. Arrange to receive full power requirements from master unit. Connect for testing concurrently with master unit as a unified system.
- C. Self-Luminous Signs:
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Exitronix, Emergency Lighting
 - b. Cooper Lighting, an Eaton business.
 - c. Dual-Lite.

- d. Isolite Corporation.
2. Powered by tritium gas, with universal bracket for flush-ceiling, wall, or end mounting. Signs shall be guaranteed by manufacturer to maintain the minimum brightness requirements in UL 924 for 20 years.
3. Use strontium oxide aluminate compound to store ambient light and release the stored energy when the light is removed. Include universal bracket for flush-ceiling, wall, or end mounting.

2.5 MATERIALS

- A. Metal Parts:
 1. Free of burrs and sharp corners and edges.
 2. Sheet metal components shall be steel unless otherwise indicated.
 3. Form and support to prevent warping and sagging.
- B. Doors, Frames, and Other Internal Access:
 1. Smooth operating, free of light leakage under operating conditions.
 2. Designed to permit relamping without use of tools.
 3. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.
- C. Diffusers and Globes:
 1. Glass: Annealed crystal glass unless otherwise indicated.
 2. Acrylic: 100 percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
 3. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.
- D. Housings:
 1. As indicated in the Lighting Fixture Schedule indicated on drawings.

2.6 METAL FINISHES

- A. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.7 LUMINAIRE SUPPORT COMPONENTS

- A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for conditions affecting performance of luminaires.
- B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before luminaire installation.

- C. Examine walls, floors, roofs, and ceilings for suitable conditions where emergency lighting luminaires will be installed.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with NECA 1.
- B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.
- C. Install lamps in each luminaire.
- D. Supports:
 - 1. Sized and rated for luminaire and emergency power unit weight.
 - 2. Able to maintain luminaire position when testing emergency power unit.
 - 3. Provide support for luminaire and emergency power unit without causing deflection of ceiling or wall.
 - 4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire and emergency power unit weight and vertical force of 400 percent of luminaire weight.
- E. Wall-Mounted Luminaire Support:
 - 1. Attached to structural members in walls.
 - 2. Do not attach luminaires directly to gypsum board.
- F. Suspended Luminaire Support:
 - 1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
 - 2. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
 - 3. Continuous Rows of Luminaires: Use tubing or stem for wiring at one point and rod or wire support for suspension for each unit length of luminaire chassis, including one at each end.
 - 4. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.
- G. Ceiling Grid Mounted Luminaires:
 - 1. Secure to any required outlet box.
 - 2. Secure emergency power unit using approved fasteners in a minimum of four locations, spaced near corners of emergency power unit.
 - 3. Use approved devices and support components to connect luminaire to ceiling grid and building structure in a minimum of four locations, spaced near corners of luminaire.

3.3 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.

- B. Luminaire will be considered defective if it does not pass operation tests and inspections.
- C. Prepare test and inspection reports.

3.5 STARTUP SERVICE

- A. Perform startup service:
 - 1. Charge emergency power units and batteries minimum of 24 hours and conduct one-hour discharge test.

3.6 ADJUSTING

- A. Adjustments: Within 12 months of date of Substantial Completion, provide on-site visit to do the following:
 - 1. Inspect all luminaires. Replace lamps, emergency power units, batteries, signs, or luminaires that are defective.
 - a. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
 - 2. Conduct short-duration tests on all emergency lighting.

END OF SECTION 265219

SECTION 270528 - PATHWAYS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Metal conduits and fittings.
 - 2. Optical-fiber-cable pathways and fittings.
 - 3. Metal wireways and auxiliary gutters.
 - 4. Metallic surface pathways.
 - 5. Tele-power poles
 - 6. Hooks.
 - 7. Boxes, enclosures, and cabinets.

1.3 DEFINITIONS

- A. ARC: Aluminum rigid conduit.
- B. GRC: Galvanized rigid conduit.
- C. IMC: Intermediate metal conduit.
- D. RTRC: Reinforced thermosetting resin conduit.

1.4 ACTION SUBMITTALS

- A. Product data for the following:
 - 1. Surface pathways
 - 2. Wireways and fittings.
 - 3. Boxes, enclosures, and cabinets.
- B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Pathway routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:
 - 1. Structural members in paths of pathway groups with common supports.
 - 2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.
 - 3. Underground ducts, piping, and structures in location of underground enclosures and handholes.

- B. Qualification Data: For professional engineer.
- C. Seismic Qualification Data: Provide seismic bracing for all pathway racks, enclosures, cabinets, equipment racks, and their mounting provisions, including those for internal components, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 3. Detailed description of equipment anchorage devices on which certification is based and their installation requirements.
 - 4. Detailed description of conduit support devices and interconnections on which certification is based and their installation requirements.
- D. Source quality-control reports.

PART 2 - PRODUCTS

2.1 METAL CONDUITS AND FITTINGS

- A. Description: Metal raceway of circular cross section with manufacturer-fabricated fittings.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Allied Tube & Conduit; a part of Atkore International.
 - 2. O-Z/Gedney; a brand of Emerson Industrial Automation.
 - 3. Western Tube and Conduit Corporation.
 - 4. Wheatland Tube Company.
- C. General Requirements for Metal Conduits and Fittings:
 - 1. Listed and labeled as defined in NFPA 70, by a nationally recognized testing laboratory, and marked for intended location and application.
 - 2. Comply with TIA-569-C.
- D. GRC: Comply with ANSI C80.1 and UL 6.
- E. ARC: Comply with ANSI C80.5 and UL 6A.
- F. IMC: Comply with ANSI C80.6 and UL 1242.
- G. EMT: Comply with ANSI C80.3 and UL 797.
- H. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
 - 1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 1203 and NFPA 70.
 - 2. Fittings for EMT:
 - a. Material: Steel.
 - b. Type: Compression.
 - 3. Expansion Fittings: PVC or steel to match conduit type, complying with UL-467, rated for environmental conditions where installed, and including flexible external bonding jumper.
 - 4. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch, with overlapping sleeves protecting threaded joints.

- I. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 OPTICAL-FIBER-CABLE PATHWAYS AND FITTINGS

- A. Description: Comply with UL 2024; flexible-type pathway with a circular cross section, approved for plenum, riser or general-use installation unless otherwise indicated.
- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Alpha Wire.
 - 2. Dura-Line.
 - 3. IPEX USA LLC.
- C. Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
- D. Comply with TIA-569-C.

2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

- A. Description: Sheet metal trough of rectangular cross section fabricated to required size and shape, without holes or knockouts, and with hinged or removable covers.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. B-line, an Eaton business.
 - 2. Hoffman; a brand of Pentair Equipment Protection.
 - 3. Square D; by Schneider Electric.
- C. General Requirements for Metal Wireways and Auxiliary Gutters:
 - 1. Comply with UL 870 and NEMA 250, Type 1, Type 3R, Type 12 unless otherwise indicated, and sized according to NFPA 70.
 - 2. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
 - 3. Comply with TIA-569-C.
- D. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- E. Wireway Covers: Screw-cover type unless otherwise indicated.
- F. Finish: Manufacturer's standard enamel finish.

2.4 SURFACE METAL PATHWAYS

- A. Description: Galvanized steel with snap-on covers, complying with UL 5.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Panduit Corp.
 - 2. Wiremold / Legrand.

- C. Finish: Manufacturer's standard enamel finish in color selected by Architect.
- D. Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
- E. Comply with TIA-569-C.

2.5 TELE-POWER POLES:

- A. Description: Prefabricated, finished metal pole with prewired power and communications outlets.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Panduit Corp.
 - 2. Wiremold / Legrand.
- C. Material: Aluminum with clear anodized finish.
- D. Fittings and Accessories: Dividers, end caps, covers, cutouts, wiring harnesses, devices, mounting materials, and other fittings shall match and mate with tele-power pole as required for complete system.
- E. Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
- F. Comply with TIA-569-C.

2.6 HOOKS

- A. Description: Prefabricated sheet metal cable supports for telecommunications cable.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Panduit Corp.
 - 2. Wiremold / Legrand.
- C. Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
- D. Comply with TIA-569-C.
- E. Stainless steel.
- F. "J" shape.

2.7 BOXES, ENCLOSURES, AND CABINETS

- A. Description: Enclosures for communications.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Crouse-Hinds, an Eaton business.
 - 2. Hoffman; a brand of Pentair Equipment Protection.
 - 3. O-Z/Gedney; a brand of Emerson Industrial Automation.
- C. General Requirements for Boxes, Enclosures, and Cabinets:

1. Comply with TIA-569-C.
 2. Boxes, enclosures, and cabinets installed in wet locations shall be listed and labeled as defined in NFPA 70, by an NRTL, and marked for use in wet locations.
 3. Box extensions used to accommodate new building finishes shall be of same material as recessed box.
 4. Device Box Dimensions: 4 inches square by 2-1/8 inches deep.
 5. Gangable boxes are prohibited.
- D. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.
- E. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.
- F. Metal Floor Boxes:
1. Material: Cast metal or sheet metal.
 2. Type: Fully adjustable.
 3. Shape: Rectangular.
 4. Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- G. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- H. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, galvanized, cast iron with gasketed cover.
- I. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.
- J. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1, Type 3R, Type 12, with continuous-hinge cover with flush latch unless otherwise indicated.
1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
 2. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.
- K. Cabinets:
1. NEMA 250, Type 1, Type 3R, Type 12 galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
 2. Hinged door in front cover with flush latch and concealed hinge.
 3. Key latch to match panelboards.
 4. Metal barriers to separate wiring of different systems and voltage.
 5. Accessory feet where required for freestanding equipment.

PART 3 - EXECUTION

3.1 PATHWAY APPLICATION

- A. Outdoors: Apply pathway products as specified below unless otherwise indicated:
1. Exposed Conduit: GRC, IMC, RNC.
 2. Concealed Conduit, Aboveground: GRC, IMC, EMT, RNC.
 3. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R, Type 4.
- B. Indoors: Apply pathway products as specified below unless otherwise indicated:
1. Exposed, Not Subject to Physical Damage: EMT or RNC.
 2. Exposed, Not Subject to Severe Physical Damage: EMT, RNC identified for such use.
 3. Exposed and Subject to Severe Physical Damage: GRC, IMC. Pathway locations include the following:

- a. Corridors used for traffic of mechanized carts and pallet-handling units.
 - b. Mechanical rooms.
 4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
 5. Damp or Wet Locations: GRC, IMC.
 6. Pathways for Optical-Fiber or Communications Cable in Spaces Used for Environmental Air: Plenum-type, optical-fiber-cable pathway, Plenum-type, communications-cable pathway or EMT.
 7. Pathways for Optical-Fiber or Communications-Cable Risers in Vertical Shafts: EMT.
 8. Pathways for Concealed General-Purpose Distribution of Optical-Fiber or Communications Cable: General-use, optical-fiber-cable pathway, Plenum-type, optical-fiber-cable pathway, General-use, communications-cable pathway, Plenum-type, communications-cable pathway or EMT.
 9. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel units in institutional and damp or wet locations.
- C. Minimum Pathway Size: 1-1/4-inch trade size.
- D. Pathway Fittings: Compatible with pathways and suitable for use and location.
1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
 2. EMT: Use compression, steel fittings. Comply with NEMA FB 2.10.
- E. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.
- F. Install surface pathways only where indicated on Drawings.

3.2 INSTALLATION

- A. Comply with the following standards for installation requirements except where requirements on Drawings or in this Section are stricter:
1. NECA 1.
 2. NECA/BICSI 568.
 3. TIA-569-C.
 4. NECA 101
 5. NECA 102.
 6. NECA 105.
 7. NECA 111.
- B. Comply with NFPA 70 limitations for types of pathways allowed in specific occupancies and number of floors.
- C. Comply with requirements in Section 07 84 13 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.
- D. Comply with requirements in Section 26 05 29 "Hangers and Supports for Electrical Systems" for hangers and supports.
- E. Keep pathways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal pathway runs above water and steam piping.
- F. Complete pathway installation before starting conductor installation.
- G. Arrange stub-ups so curved portions of bends are not visible above finished slab.
- H. Install no more than the equivalent of two 90-degree bends in any pathway run. Support within 12 inches of changes in direction. Utilize long radius ells for all optical-fiber cables.

- I. Conceal rigid conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
- J. Support conduit within 12 inches of enclosures to which attached.
- K. Pathways Embedded in Slabs:
 - 1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure pathways to reinforcement at maximum 10-foot intervals.
 - 2. Arrange pathways to cross building expansion joints at right angles with expansion fittings. Comply with requirements for expansion joints specified in this article.
 - 3. Arrange pathways to keep a minimum of 2 inches of concrete cover in all directions.
 - 4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
- L. Stub-ups to Above Recessed Ceilings:
 - 1. Use EMT, IMC, or RMC for pathways.
 - 2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.
- M. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of pathway and fittings before making up joints. Follow compound manufacturer's written instructions.
- N. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install insulated bushings on conduits terminated with locknuts.
- O. Install pathways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus one additional quarter-turn.
- P. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure, to assure a continuous ground path.
- Q. Cut conduit perpendicular to the length. For conduits of 2-inch trade size and larger, use roll cutter or a guide to ensure cut is straight and perpendicular to the length.
- R. Install pull wires in empty pathways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Secure pull wire, so it cannot fall into conduit. Cap pathways designated as spare alongside pathways in use.
- S. Surface Pathways:
 - 1. Install surface pathway for surface telecommunications outlet boxes only where indicated on Drawings.
 - 2. Install surface pathway with a minimum 2-inch radius control at bend points.
 - 3. Secure surface pathway with screws or other anchor-type devices at intervals not exceeding 48 inches and with no less than two supports per straight pathway section. Support surface pathway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.
- T. Pathways for Optical-Fiber and Communications Cable: Install pathways, metal and nonmetallic, rigid and flexible, as follows:
 - 1. 1-Inch Trade Size and Larger: Install pathways in maximum lengths of 75 feet.
 - 2. Install with a maximum of two 90-degree bends or equivalent for each length of pathway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes or terminations at distribution frames or cabinets where necessary to comply with these requirements.

- U. Install pathway-sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed pathways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install pathway-sealing fittings according to NFPA 70.
- V. Install devices to seal pathway interiors at accessible locations. Locate seals, so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all pathways at the following points:
 - 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 - 2. Where an underground service pathway enters a building or structure.
 - 3. Where otherwise required by NFPA 70.
- W. Comply with manufacturer's written instructions for solvent welding PVC conduit and fittings.
- X. Expansion-Joint Fittings:
 - 1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F, and that has straight-run length that exceeds 25 feet. Install in each run of aboveground RMC and EMT that is located where environmental temperature change may exceed 100 deg F, and that has straight-run length that exceeds 100 feet.
 - 2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:
 - a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
 - b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
 - c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.
 - d. Attics: 135 deg F temperature change.
 - 3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.
 - 4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
 - 5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.
- Y. Hooks:
 - 1. Size to allow a minimum of 25 percent future capacity without exceeding design capacity limits.
 - 2. Shall be supported by dedicated support wires. Do not use ceiling grid support wire or support rods.
 - 3. Hook spacing shall allow no more than 6 inches of slack. The lowest point of the cables shall be no less than 6 inches adjacent to ceilings, mechanical ductwork and fittings, luminaires, power conduits, power and telecommunications outlets, and other electrical and communications equipment.
 - 4. Space hooks no more than 5 feet o.c.
 - 5. Provide a hook at each change in direction.
- Z. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.
- AA. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surface to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.

- BB. Horizontally separate boxes mounted on opposite sides of walls, so they are not in the same vertical channel.
- CC. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.
- DD. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.
- EE. Set metal floor boxes level and flush with finished floor surface.
- FF. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.3 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR COMMUNICATIONS PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of floor and wall assemblies. Comply with requirements in Section 26 05 44 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.4 FIRESTOPPING

- A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 07 84 13 "Penetration Firestopping."

3.5 PROTECTION

- A. Protect coatings, finishes, and cabinets from damage or deterioration.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 270528

CHARTWELLS
735 ANDERSON HILL RD, PURCHASE, NY

SUNY PURCHASE HUB ADDITION AND RENOVATION
PHASE ZERO DESIGN PROJECT #1517347

APPENDIX
FOOD SERVICE EQUIPMENT CUT SHEETS



12/20/2017

FINAL
12/20/2017

Project:
CW-0205.4 - SUNY
PURCHASE - NORTH
CAMPUS

From:

To:

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Submittal Sheet

12/20/2017

ITEM# 01 - DUNNAGE RACK (6 EA REQ'D)

Metro HP2248PD

Metro Bow-Tie™ Dunnage Rack, 22" x 48" x 12"H, slotted, with separate polymer tie for joining racks, corrosion proof polymer construction, NSF

Job _____



METRO BOW TIE™ DUNNAGE RACKS



Racks joined in "end-to-end" and "back-to-back" configuration.

SPECIFICATIONS:

- Rotationally molded grey polyethylene construction
- Slotted top for air circulation
- Slots run front to back for easy loading and unloading
- All rack edges have generous radius to prevent product snagging or marking
- Weight capacity: 30" and 36" racks - 1,500 lbs.
48" and 60" racks - 3,000 lbs.
- Each rack provided with separate polymer tie for joining racks in "end-to-end" and "back-to-back" configurations. Rack has a recess centered each side of top surface to accept polymer tie.
- Joining system tie drops in and is removed from top without the use of tools.

Cat. No.	Width		Length		Height		Approx. Pkg. Wt.	
	(in.)	(mm)	(in.)	(mm)	(in.)	(mm)	(lb.)	(kg)
HP2230PD	22	550	30	760	12	305	24	10.8
HP2236PD	22	550	36	910	12	305	26	11.7
HP2248PD	22	550	48	1220	12	305	34	15.3
HP2260PD	22	550	60	1525	12	305	42	19

Manufactured by:



InterMetro Industries Corporation

North Washington Street, Wilkes-Barre, PA 18705

Phone: 570-825-2741 • Fax: 570-825-2852

For Product Information Call: 1-800-433-2232

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L03-105
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Item# _____

Job _____



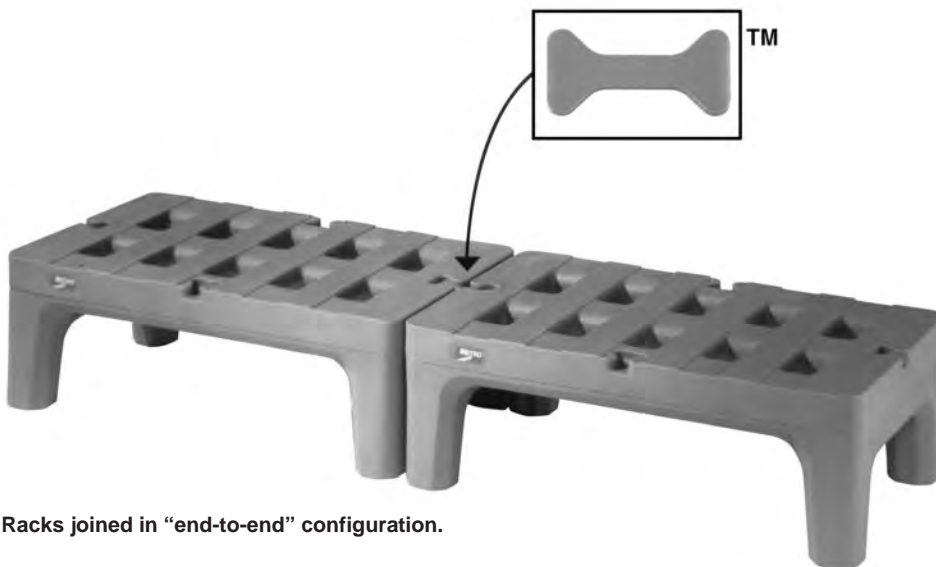
Metro Bow Tie™ Dunnage Racks

9.09

METRO BOW TIE™ DUNNAGE RACKS



- **Versatile:** Racks join together easily without tools in “end-to-end” and “back-to-back” configurations with the exclusive bow-tie™ feature.
- **Durable:** Rust and corrosion proof polymer construction.
- **Strong:** Heavy-duty construction gives racks the strength to hold up to 3,000 lbs. per unit.
- **Unique Design:** Racks have front to back slots for easier loading and unloading and superior air flow which promotes longer shelf life.
- **Easy to Clean:** Smooth rotomolded polymer offers snag-free surfaces and promotes easy cleaning.
- **NSF Approved**
- **UPS Shippable**
- **No Assembly required.**



Racks joined in “end-to-end” configuration.



InterMetro Industries Corporation
North Washington Street
Wilkes-Barre, PA 18705
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Submittal Sheet

12/20/2017

ITEM# 02 - WIRE SHELVING (56 EA REQ'D)

Metro 2448BR

Super Erecta® Shelf, wire, 48"W x 24"D, Bright (zinc) finish, plastic split sleeves are included in each carton, NSF ACCESSORIES

Mfr	Qty	Model	Spec
Metro	56	63UP	Super Erecta® Post, 61-13/16"H, for use with stem casters, chrome plated finish
Metro	28	5MDA	Super Erecta® Stem Caster, swivel, 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity
Metro	28	5MDBA	Super Erecta® Stem Caster, brake (foot operated), 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity, brakes are foot operated



Item # _____

Job _____

SUPER ERECTA SHELF® WIRE SHELVING

- **Unique Design:** The open wire design of these shelves minimizes dust accumulation and allows free circulation of air, greater visibility of stored items and greater light penetration.
- **Durable Construction:** Super Erecta shelves and posts are constructed of heavy-gauge carbon steel or Type 304 stainless steel.
- **Choice of Finishes:** Super Erecta Brite™ and chrome-plated for dry storage; Metroseal 3™ with Microban® antimicrobial product protection and stainless steel for corrosive environments; and attractive epoxy color options for merchandising applications.
- **Versatile:** Super Erecta Shelf® wire shelving can adapt to your changing needs. By using various accessories, hundreds of shelving configurations become possible.
- **Fast, Secure Assembly:** SiteSelect™ Posts have a double groove visual guide feature every 8" (203mm), circular grooves at 1" (25mm) increments, and are numbered at 2" (50mm) intervals. A patented, tapered split sleeve snaps together around each post. Tapered openings in the shelf corners slide over the tapered split sleeves providing a positive lock. Shelf is assembled in minutes without the use of any special tools.
- **Adjustability:** Shelves can be adjusted at 1" (25mm) intervals along the entire length of the post.
- **Shelf Ribs:** Run front to back, allowing you to slide items on and off shelves smoothly.
- **Shelf Accessibility:** Shelves can be loaded/unloaded easily from all sides. This open construction allows maximum use of storage cube.
- **Adjustable Feet:** Bolt levelers compensate for surface irregularities.

Note: Stainless stationary posts are equipped with stainless steel leveling feet.



*MICROBAN® and the MICROBAN® symbol are registered trademarks of the Microban Products Company, Huntersville, NC.



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Wilkes-Barre, PA 18705
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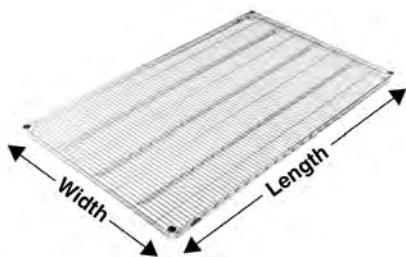
Wire Shelving

10.01



SUPER ERECTA SHELF® WIRE SHELVING

Wire Shelves



Split Sleeve



**Aluminum
Split Sleeve**

- **Metroseal 3:** Metro's proprietary epoxy coating contains Microban® antimicrobial product protection. Microban antimicrobial protects the epoxy coating from bacteria, mold, mildew, and fungus that cause odors, stains, and product degradation.
- See spec sheet 10.14 for epoxy color options.
- Plastic split sleeves are included with each shelf
Replacements are available: Cat. No. 9985 (bag of 4)
- Aluminum split sleeves are recommended for abusive mobile applications and autoclave applications.
Cat. No. 9986Z (bag of 4 with zinc C-rings)
Cat. No. 9986S (bag of 4 with stainless steel C-rings)
- Load capacity (evenly distributed) per shelf
Depths: 14" to 24" (355 to 610mm)
800 lbs. (363kg) for lengths of 18" to 48" (457 to 1219mm)
600 lbs. (272kg) for lengths of 54" (1370mm) or longer
- Load capacity (evenly distributed) per unit.
Stationary shelving units have a maximum load capacity (evenly distributed) of 2,000 lbs. (907kg)
Mobile units have a maximum capacity of three times the caster load rating up to but not exceeding 1,000 lbs. (453kg) total. Consult the Metro catalog for caster load ratings
- SUPER ERECTA SHELF meets Government Specifications MIL-S-40144E.

Model No. Super Erecta Brite	Model No. Chrome	Model No. Metroseal 3 with Microban®	Model No. Stainless	Nominal Width/Length (in.) (mm)		Approx. Pkd. Wt. (lbs.) (kg)	
1424BR	1424NC	1424NK3	1424NS	14x24	355x610	6	2.7
1430 BR	1430NC	1430NK3	1430NS	14x30	355x760	7	3.2
1436BR	1436NC	1436NK3	1436NS	14x36	355x914	8	3.6
1442BR	1442NC	1442NK3	1442NS	14x42	355x1066	9½	4.3
1448BR	1448NC	1448NK3	1448NS	14x48	355x1219	10½	4.7
1460BR	1460NC	1460NK3	1460NS	14x60	355x1524	14	6.3
1472BR	1472NC	1472NK3	1472NS	14x72	355x1829	17	7.7
1824BR	1824NC	1824NK3	1824NS	18x24	457x610	7	3.2
1830BR	1830NC	1830NK3	1830NS	18x30	457x760	8	3.6
1836BR	1836NC	1836NK3	1836NS	18x36	457x914	9½	4.3
1842BR	1842NC	1842NK3	1842NS	18x42	457x1066	11	5.0
1848BR	1848NC	1848NK3	1848NS	18x48	457x1219	12	5.4
1854BR	1854NC	1854NK3	1854NS	18x54	457x1370	14½	6.6
1860BR	1860NC	1860NK3	1860NS	18x60	457x1524	17	7.7
1872BR	1872NC	1872NK3	1872NS	18x72	457x1829	20	9.1
2124BR	2124NC	2124NK3	2124NS	21x24	530x610	8	3.6
2130BR	2130NC	2130NK3	2130NS	21x30	530x760	9	4.1
2136BR	2136NC	2136NK3	2136NS	21x36	530x914	11	5.0
2142BR	2142NC	2142NK3	2142NS	21x42	530x1066	12	5.4
2148BR	2148NC	2148NK3	2148NS	21x48	530x1219	14	6.4
2154BR	2154NC	2154NK3	2154NS	21x54	530x1370	16	7.3
2160BR	2160NC	2160NK3	2160NS	21x60	530x1524	18	8.2
2172BR	2172NC	2172NK3	2172NS	21x72	530x1829	24	10.9
2424BR	2424NC	2424NK3	2424NS	24x24	610x610	9	4.1
2430BR	2430NC	2430NK3	2430NS	24x30	610x760	11	5.0
2436BR	2436NC	2436NK3	2436NS	24x36	610x914	13	5.9
2442BR	2442NC	2442NK3	2442NS	24x42	610x1066	15	6.8
2448BR	2448NC	2448NK3	2448NS	24x48	610x1219	16	7.3
2454BR	2454NC	2454NK3	2454NS	24x54	610x1370	19	8.6
2460BR	2460NC	2460NK3	2460NS	24x60	610x1524	21	9.5
2472BR	2472NC	2472NK3	2472NS	24x72	610x1829	26	11.8

Note: 14" (355mm) deep units.

Free-standing units: Foot plates should be used and secured to the floor.

Mobile units: maximum allowable post height is 54" (1370mm).

SUPER ERECTA SHELF® WIRE SHELVING

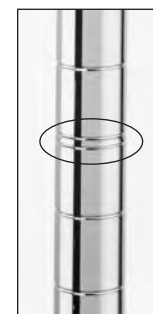


SiteSelect™ Posts

Stationary Posts

Stationary posts are equipped with a leveling bolt to account for uneven floors.

- Height includes leveling bolt (completely tightened) and post cap. Leveling bolt can be adjusted 1/2" (13mm).
- Foot plates may be ordered separately and installed in place of leveling foot.
- Replacement leveling bolts
Zinc Cat. No. RPF04-004 Stainless Steel Cat. No. RPF04-004C
- Replacement post cap for standard posts
Black Cat. No. RPC06-035



SiteSelect Posts feature double grooves every 8" (203mm) to aid assembly.

Model No. Chrome	Model No. Metroseal 3 with Microban	Model No. Stainless Steel	Height		Approx. Pkd. Wt.	
			(in.)	(mm)	(lbs.)	(kg)
7P			7 ³ / ₈	187	1/2	0.3
13P	13PK3	13PS	14 ³ / ₈	365	1	0.5
27P		27PS	28 ³ / ₈	720	1 ³ / ₄	0.75
33P	33PK3	33PS	34 ³ / ₈	873	2	0.9
54P	54PK3	54PS	54 ⁷ / ₁₆	1382	3	1.4
63P	63PK3	63PS	62 ⁷ / ₁₆	1585	3 ¹ / ₂	1.6
74P	74PK3	74PS	74 ¹ / ₂	1892	4	1.8
86P	86PK3	86PS	86 ¹ / ₂	2197	5	2.3
*96P			96 ¹ / ₂	2450	5 ¹ / ₂	2.5

*96P should not be used on units less than 24" (610mm) deep. Consult Metro Engineering for alternate recommendations.

Mobile Posts (For use with Stem Casters)

- Height includes post cap.

Model No. Chrome	Model No. Metroseal 3 with Microban	Model No. Stainless Steel	Height		Approx. Pkd. Wt.	
			(in.)	(mm)	(lbs.)	(kg)
27UP		27UPS	27 ³ / ₄	704	1 ³ / ₄	0.75
33UP	33UPK3	33UPS	33 ³ / ₄	857	2	0.9
54UP	54UPK3	54UPS	53 ¹³ / ₁₆	1366	3	1.4
63UP	63UPK3	63UPS	61 ¹³ / ₁₆	1570	3 ¹ / ₂	1.6
	70UPK3		69 ³ / ₄	1771	3 ³ / ₄	1.7
74UP	74UPK3	74UPS	73 ⁷ / ₈	1876	4	1.8
86UP	86UPK3	86UPS	85 ⁷ / ₈	2181	4 ¹ / ₂	2.0

Staked Posts (For use with Truck Dollies)

- Each post connects to the truck dolly through the stem receptacle. The stem receptacle is staked into the bottom of the post to ensure a durable connection in abusive mobile applications.
- Each includes a leveling/connecting bolt.

Model No. Chrome	Model No. Stainless Steel	Height		Approx. Pkd. Wt.	
		(in.)	(mm)	(lbs.)	(kg)
54P-STKD	54PS-STKD	54 ⁷ / ₁₆	1382	3	1.4
63P-STKD	63PS-STKD	62 ⁷ / ₁₆	1585	3 ¹ / ₂	1.6
74P-STKD	74PS-STKD	74 ¹ / ₂	1892	4	1.8

Swedged Posts (For use with Stem Casters in Cart Wash Applications)

- Each post has an aluminum cap swedged into the top of the post.

Model No. Stainless Steel	Height		Approx. Pkd. Wt.	
	(in.)	(mm)	(lbs.)	(kg)
33UPS-SW	33 ³ / ₄	857	2	0.9
54UPS-SW	53 ¹³ / ₁₆	1366	3	1.4
63UPS-SW	61 ¹³ / ₁₆	1570	3 ¹ / ₂	1.6

Special Length Posts

Special length cut posts are available. Consult your Metro representative for more information.

Job _____

SUPER ERECTA SHELF® WIRE SHELVING



Super Wide Shelving

- **High-density Storage:** Super Wide™ shelves have a greater storage area for holding large quantities of supplies, especially large, bulky objects, providing maximum storage in minimum space.
- **Load Capacity** (evenly distributed) per shelf:
Depths: 30" and 36" (760 and 914mm)
600 lbs. (272kg) for lengths 48" (1219mm) or shorter.
400 lbs. (181kg) for lengths 54" (1370mm) or longer.

Model No. Chrome	Model No. Metroseal 3 with Microban	Model No. Stainless Steel	Nominal Width/Length (in.) (mm)		Approx. Pkd. Wt. (lbs.) (kg)	
3036NC	3036NK3	3036NS	30x36	760x914	15	6.8
3048NC	3048NK3	3048NS	30x48	760x1219	21	9.5
3060NC	3060NK3	3060NS	30x60	760x1524	26 1/2	11.8
3072NC	3072NK3	3072NS	30x72	760x1829	31	14.0
3636NC	3636NK3	3636NS	36x36	910x914	18	8.2
3648NC	3648NK3	3648NS	36x48	910x1219	23	10.4
3660NC	3660NK3	3660NS	36x60	910x1524	29	13.1
3672NC	3672NK3	3672NS	36x72	910x1829	34 1/2	15.4



Foot Plates

- Use to bolt units to the floor, or when a broader, more stable foot is desired. Foot plates also help to protect floors by distributing the point load of the shelving unit across a larger contact point.
- Foot plates (completely tightened) add 1/8" (3mm) to the specified heights of each stationary post on the table.
Zinc Cat. No. 9993Z
Stainless Steel Cat. No. 9993S



"S" Hook

- Used to add on shelving units with only two posts required. Order two per shelf level.
Cat. No. 9995Z



All Metro Catalog Sheets are available on our Web Site: www.metro.com



InterMetro Industries Corporation

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Europe: +31.76.587.7550

Asia/Pacific: +65.6567.8003
Middle East/Africa: +971.4.811.8286



Item # _____

Job _____

METRO® STEM CASTERS

- **Metro Stem-Type Casters** are designed to fit Super Erecta Shelf® posts to form shelf carts and other mobile units.
- **Stainless Steel, Cart-Washable Casters** offer grease seals and zerk fittings. Can withstand high-pressure washings.
- **Polymer Horn Casters:** Innovative polymer stem casters offer corrosion resistance and enhanced durability. For all medium-duty applications.
- **Resilient Rubber Tread:** A molded, soft tread that provides good floor protection along with quiet operation. Non-marking.
- **Polyurethane Tread:** Long-wearing; resists abrasion. Non-marking, shock absorbing.
- **Wheel Brakes:** Foot-operated. Available on all caster models.
- **Caster Load Ratings:** From 125 lbs. to 300 lbs. (57 to 136kg) See chart.
- **Donut Bumpers:** Furnished standard on all Metro stem casters.
- **Additional Caster Types Available.**

Note: SPECIAL WHEELS — V-groove, Conductive, Steel and Phenolic — are available on request. For additional information, contact InterMetro Industries Corporation or your InterMetro representative.

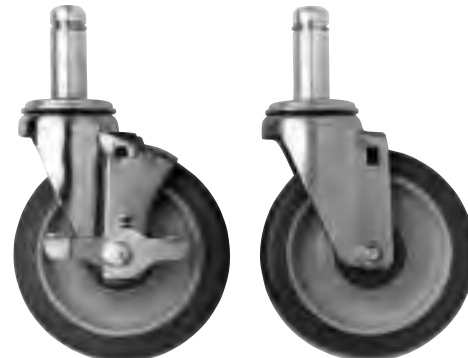
Resilient Rubber



5MB Wheel Brake
Includes Donut Bumper
(not shown)

5M Resilient
Includes Donut Bumper
(not shown)

Stainless Steel, Cart Washable



5MDBGSA

5MDGSA

Polymer Horn Casters



5PCB

5PC



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Wilkes-Barre, PA 18705
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Casters (Stem Type)

11.20

Job _____



METRO® STEM CASTERS

Dimensions

Standard Casters — Stem Type

Cat. No.	Wheel Diameter (in.) (mm)		Face (in.) (mm)		Load Rating (lbs.) (kg)		Type	Wheel Tread	Approx. Pkd. Wt. (lbs.) (kg)	
4LD	4	102	1/2	12	125	56	Stem/Swivel	Resilient	1 1/2	.6
5LD	5	127	1/2	12	125	56	Stem/Swivel	Resilient	2	.9
5M	5	127	1 1/4	32	200	90	Stem/Swivel	Resilient	2 1/2	1.1
5MB	5	127	1 1/4	32	200	90	Stem/Brake	Resilient	2 3/4	1.2
5MR	5	127	1 1/4	32	200	90	Stem/Rigid	Resilient	3 1/2	1.5
5MDA	5	127	1 1/4	32	250	111	Stem/Swivel	High Modulus Donut	2 1/2	1.1
5MDBA	5	127	1 1/4	32	250	111	Stem/Brake	High Modulus Donut	2 5/8	1.17
5MDRA	5	127	1 1/4	32	250	111	Stem/Rigid	High Modulus Donut	2 3/8	1.08
5MP	5	127	1 1/4	32	300	135	Stem/Swivel	Polyurethane	2 1/8	.94
5MPB	5	127	1 1/4	32	300	135	Stem/Brake	Polyurethane	2 1/4	1
5MPR	5	127	1 1/4	32	300	135	Stem/Rigid	Polyurethane	2	.9

NOTE 1: Stem casters are shipped with donut bumper **at no additional charge.**

NOTE 2: Rigid casters are held in position by a connecting channel. When ordering rigid casters, shelf width **must be** known.

NOTE 3: Load Height for all 5M, 5MD and 5MP casters — $6\frac{3}{32}'' \pm \frac{1}{16}''$ (155 \pm 1.5mm).

NOTE 4: Load Height for 4LD caster — $4\frac{5}{8}'' \pm \frac{1}{16}''$ (118 \pm 1.5mm).

NOTE 5: Load Height for 5LD caster — $5\frac{1}{8}'' \pm \frac{1}{16}''$ (143 \pm 1.5mm).

NOTE 6: Brakes are foot-operated.

Stainless Steel Cart-Washable Casters — Stem Type

Cat. No.	Wheel Diameter (in.) (mm)		Face (in.) (mm)		Load Rating (lbs.) (kg)		Type	Wheel Tread	Approx. Pkd. Wt. (lbs.) (kg)	
5MDGSA	5	122	1 1/4	32	150	68	Swivel	High Modulus Donut	2 1/2	1.1
5MDBGSA	5	122	1 1/4	32	150	68	Brake	High Modulus Donut	2 5/8	1.17
5MDRGSA	5	122	1 1/4	32	150	68	Rigid	High Modulus Donut	2 3/8	1.08
5MPGSA	5	127	1 1/4	32	300	135	Swivel	Polyurethane	2 1/8	.94
5MPBGSA	5	127	1 1/4	32	300	135	Brake	Polyurethane	2 1/4	1
5MPRGSA	5	127	1 1/4	32	300	135	Rigid	Polyurethane	2	.9

NOTE 1: Stem casters are shipped with donut bumper **at no additional charge.**

NOTE 2: Rigid casters are held in position by a connecting channel. When ordering rigid casters, shelf width **must be** known.

NOTE 3: Load Height for all 5MD and 5MP casters — $6\frac{3}{32}'' \pm \frac{1}{16}''$ (155 \pm 1.5mm).

NOTE 4: All casters are grease sealed with zerk fittings in swivel and axle.

NOTE 5: Brakes are foot-operated.

NOTE 6: "D" in model number designates donut wheel made of high-modulus rubber.

Polymer Casters — Stem Type

Cat. No.	Wheel Diameter (in.) (mm)		Face (in.) (mm)		Load Rating (lbs.) (kg)		Type	Wheel Tread	Approx. Pkd. Wt. (lbs.) (kg)	
5PC	5	127	1 1/4	32	300	135	Swivel	Polyurethane	2	.9
5PCB	5	127	1 1/4	32	300	135	Brake	Polyurethane	2	.9
5PCR	5	127	1 1/4	32	300	135	Rigid	Polyurethane	2	.9

NOTE 1: Optional thread guards (blue) may be ordered by adding "-TG" to the desired model number (eg. 5PC-TG, 5PCB-TG, 5PCR-TG).

NOTE 2: Stem casters are shipped with donut bumper **at no additional charge.**

NOTE 3: Rigid casters are held in place by a connecting channel. When ordering, shelf depth **must be** provided.

Manufactured by:



InterMetro Industries Corporation

North Washington Street, Wilkes-Barre, PA 18705

Phone: 570-825-2741 • Fax: 570-825-2852

For Product Information Call: 1-800-433-2232

Visit Our Web Site: www.metro.com

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Submittal Sheet

12/20/2017

ITEM# 03 - WIRE SHELVING (8 EA REQ'D)

Metro 2460BR

Super Erecta® Shelf, wire, 60"W x 24"D, Bright (zinc) finish, plastic split sleeves are included in each carton, NSF
The spec sheet for this item can be viewed on item 02)

ACCESSORIES

Mfr	Qty	Model	Spec
Metro	8	63UP	Super Erecta® Post, 61-13/16"H, for use with stem casters, chrome plated finish
Metro	4	5MDA	Super Erecta® Stem Caster, swivel, 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity
Metro	4	5MDBA	Super Erecta® Stem Caster, brake (foot operated), 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity, brakes are foot operated

Submittal Sheet

12/20/2017

ITEM# 04 - WIRE SHELVING (4 EA REQ'D)

Metro 2442BR

Super Erecta® Shelf, wire, 42"W x 24"D, Bright (zinc) finish, plastic split sleeves are included in each carton, NSF
The spec sheet for this item can be viewed on item 02)

ACCESSORIES

Mfr	Qty	Model	Spec
Metro	4	63UP	Super Erecta® Post, 61-13/16"H, for use with stem casters, chrome plated finish
Metro	2	5MDA	Super Erecta® Stem Caster, swivel, 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity
Metro	2	5MDBA	Super Erecta® Stem Caster, brake (foot operated), 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity, brakes are foot operated

Submittal Sheet

12/20/2017

ITEM# 05 - WIRE SHELVING (4 EA REQ'D)

Metro 1860BR

Super Erecta® Shelf, wire, 60"W x 18"D, Bright (zinc) finish, plastic split sleeves are included in each carton, NSF
The spec sheet for this item can be viewed on item 02)

ACCESSORIES

Mfr	Qty	Model	Spec
Metro	4	63UP	Super Erecta® Post, 61-13/16"H, for use with stem casters, chrome plated finish
Metro	2	5MDA	Super Erecta® Stem Caster, swivel, 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity
Metro	2	5MDBA	Super Erecta® Stem Caster, brake (foot operated), 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity, brakes are foot operated

Submittal Sheet

12/20/2017

ITEM# 06 - WIRE SHELVING (8 EA REQ'D)

Metro 2148BR

Super Erecta® Shelf, wire, 48"W x 21"D, Bright (zinc) finish, plastic split sleeves are included in each carton, NSF
The spec sheet for this item can be viewed on item 02)

ACCESSORIES

Mfr	Qty	Model	Spec
Metro	8	63UP	Super Erecta® Post, 61-13/16"H, for use with stem casters, chrome plated finish
Metro	4	5MDA	Super Erecta® Stem Caster, swivel, 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity
Metro	4	5MDBA	Super Erecta® Stem Caster, brake (foot operated), 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity, brakes are foot operated

Submittal Sheet

12/20/2017

ITEM# 07 - WIRE SHELVING (24 EA REQ'D)

Metro 2160BR

Super Erecta® Shelf, wire, 60"W x 21"D, Bright (zinc) finish, plastic split sleeves are included in each carton, NSF
The spec sheet for this item can be viewed on item 02)

ACCESSORIES

Mfr	Qty	Model	Spec
Metro	24	63UP	Super Erecta® Post, 61-13/16"H, for use with stem casters, chrome plated finish
Metro	12	5MDA	Super Erecta® Stem Caster, swivel, 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity
Metro	12	5MDBA	Super Erecta® Stem Caster, brake (foot operated), 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity, brakes are foot operated

Submittal Sheet

12/20/2017

ITEM# 08 - WIRE SHELVING (12 EA REQ'D)

Metro 1836BR

Super Erecta® Shelf, wire, 36"W x 18"D, Bright (zinc) finish, plastic split sleeves are included in each carton, NSF
The spec sheet for this item can be viewed on item 02)

ACCESSORIES

Mfr	Qty	Model	Spec
Metro	12	63UP	Super Erecta® Post, 61-13/16"H, for use with stem casters, chrome plated finish
Metro	6	5MDA	Super Erecta® Stem Caster, swivel, 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity
Metro	6	5MDBA	Super Erecta® Stem Caster, brake (foot operated), 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity, brakes are foot operated

Submittal Sheet

12/20/2017

ITEM# 09 - WIRE SHELVING (16 EA REQ'D)

Metro 2460BR

Super Erecta® Shelf, wire, 60"W x 24"D, Bright (zinc) finish, plastic split sleeves are included in each carton, NSF
The spec sheet for this item can be viewed on item 02)

ACCESSORIES

Mfr	Qty	Model	Spec
Metro	16	63UP	Super Erecta® Post, 61-13/16"H, for use with stem casters, chrome plated finish
Metro	8	5MDA	Super Erecta® Stem Caster, swivel, 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity
Metro	8	5MDBA	Super Erecta® Stem Caster, brake (foot operated), 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity, brakes are foot operated

Submittal Sheet

12/20/2017

ITEM# 10 - COLD STORAGE ASSEMBLY (1 REQ'D)

American Panel CUSTOM

Submittal Sheet

12/20/2017

ITEM# 10.1 - LIGHT, COOLER (1 REQ'D)

Custom CUSTOM

Submittal Sheet

12/20/2017

ITEM# 10.2 - COOLER EVAPORATOR (2 REQ'D)

Custom CUSTOM

Submittal Sheet

12/20/2017

ITEM# 10.3 - COOLER CONDENSOR (1 REQ'D)

Custom CUSTOM

Submittal Sheet

12/20/2017

ITEM# 10.4 - LIGHT AND DOOR HEAT, FREEZER (1 REQ'D)

Custom CUSTOM

Submittal Sheet

12/20/2017

ITEM# 10.5 - FREEZER EVAPORATOR (1 REQ'D)

Custom CUSTOM

Submittal Sheet

12/20/2017

ITEM# 10.6 - FREEZER CONDENSOR (1 REQ'D)

Custom CUSTOM

Submittal Sheet

12/20/2017

ITEM# 11 - WIRE SHELVING (64 EA REQ'D)

Metro 2136NK3

Super Erecta® Shelf, wire, 36"W x 21"D, plastic split sleeves are included in each carton, Metroseal 3™ epoxy-coated corrosion-resistant finish with Microban® antimicrobial protection, NSF

The spec sheet for this item can be viewed on item 02)

ACCESSORIES

Mfr	Qty	Model	Spec
Metro	64	63UPK3	Super Erecta® SiteSelect™ Post, 61-13/16"H, for use with stem casters, Metroseal 3 epoxy coated corrosion-resistant finish with Microban® antimicrobial protection
Metro	32	5MDA	Super Erecta® Stem Caster, swivel, 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity
Metro	32	5MDBA	Super Erecta® Stem Caster, brake (foot operated), 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity, brakes are foot operated

Submittal Sheet

12/20/2017

ITEM# 12 - WIRE SHELVING (16 EA REQ'D)

Metro 2160NK3

Super Erecta® Shelf, wire, 60"W x 21"D, plastic split sleeves are included in each carton, Metroseal 3™ epoxy-coated corrosion-resistant finish with Microban® antimicrobial protection, NSF

The spec sheet for this item can be viewed on item 02)

ACCESSORIES

Mfr	Qty	Model	Spec
Metro	16	63UPK3	Super Erecta® SiteSelect™ Post, 61-13/16"H, for use with stem casters, Metroseal 3 epoxy coated corrosion-resistant finish with Microban® antimicrobial protection
Metro	8	5MDA	Super Erecta® Stem Caster, swivel, 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity
Metro	8	5MDBA	Super Erecta® Stem Caster, brake (foot operated), 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity, brakes are foot operated

Submittal Sheet

12/20/2017

ITEM# 13 - WIRE SHELVING (4 EA REQ'D)

Metro 2172NK3

Super Erecta® Shelf, wire, 72"W x 21"D, plastic split sleeves are included in each carton, Metroseal 3™ epoxy-coated corrosion-resistant finish with Microban® antimicrobial protection, NSF

The spec sheet for this item can be viewed on item 02)

ACCESSORIES

Mfr	Qty	Model	Spec
Metro	4	63UPK3	Super Erecta® SiteSelect™ Post, 61-13/16"H, for use with stem casters, Metroseal 3 epoxy coated corrosion-resistant finish with Microban® antimicrobial protection
Metro	2	5MDA	Super Erecta® Stem Caster, swivel, 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity
Metro	2	5MDBA	Super Erecta® Stem Caster, brake (foot operated), 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity, brakes are foot operated

Submittal Sheet

12/20/2017

ITEM# 14 - WIRE SHELVING (8 EA REQ'D)

Metro 2460NK3

Super Erecta® Shelf, wire, 60"W x 24"D, plastic split sleeves are included in each carton, Metroseal 3™ epoxy-coated corrosion-resistant finish with Microban® antimicrobial protection, NSF

The spec sheet for this item can be viewed on item 02)

ACCESSORIES

Mfr	Qty	Model	Spec
Metro	8	63UPK3	Super Erecta® SiteSelect™ Post, 61-13/16"H, for use with stem casters, Metroseal 3 epoxy coated corrosion-resistant finish with Microban® antimicrobial protection
Metro	4	5MDA	Super Erecta® Stem Caster, swivel, 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity
Metro	4	5MDBA	Super Erecta® Stem Caster, brake (foot operated), 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity, brakes are foot operated

Submittal Sheet

12/20/2017

ITEM# 15 - WORK TABLE, STAINLESS STEEL TOP (1 EA REQ'D)

Eagle Group T3060SE

Spec-Master® Series Work Table, 60"W x 30"D, 14/300 series stainless steel top, rolled edge on front & back, adjustable 18/300 series stainless steel undershelf with marine edge, Uni-Lok® gusset system, (4) stainless steel legs & adjustable bullet feet, NSF

ACCESSORIES

Mfr	Qty	Model	Spec
Eagle Group	1	CA4-SB	Table Casters, set of (4), 4" diameter, (2) swivel & (2) swivel/brake, 115 lbs. capacity per caster, zinc with resilient tread, NSF

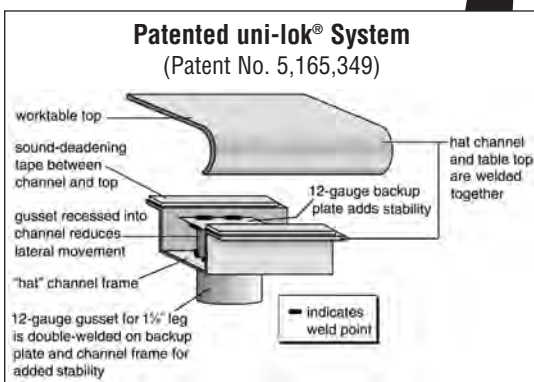


Profit from the Eagle Advantage®

Specification Sheet

Short Form Specifications

Eagle worktables, Spec-Master® series, model _____. Top constructed of 14 gauge 300 series stainless steel, with 1½" roll on front and rear, and sides turned down 90°. Undershelf is adjustable and constructed of 18 gauge 300 series stainless steel with marine edge. Top reinforced with stainless steel hat channels and sound deadened. Constructed with uni-lok® patented gusset system with the gussets recessed into the hat channels to reduce lateral movement. Legs are 1½" O.D., stainless steel, with stainless steel gussets and 1" stainless steel adjustable bullet feet.



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For custom configuration or fabrication needs, contact our SpecFAB® Division.

Phone: 302-653-3000 • Fax: 302-653-2065 • e-mail: quotes@eaglegrp.com

Spec sheets available for viewing, printing or downloading from our online literature library at www.eaglegrp.com

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Item No.: _____
Project No.: _____
S.I.S. No.: _____

Worktables with Flat Top and Stainless Steel Base with Undershelf—Spec-Master® Series

MODELS:

<input type="checkbox"/> T2424SE	<input type="checkbox"/> T24144SE	<input type="checkbox"/> T30132SE	<input type="checkbox"/> T36144SE
<input type="checkbox"/> T2430SE	<input type="checkbox"/> T3030SE	<input type="checkbox"/> T30144SE	<input type="checkbox"/> T4848SE
<input type="checkbox"/> T2436SE	<input type="checkbox"/> T3036SE	<input type="checkbox"/> T3648SE	<input type="checkbox"/> T4860SE
<input type="checkbox"/> T2448SE	<input type="checkbox"/> T3048SE	<input type="checkbox"/> T3660SE	<input type="checkbox"/> T4872SE
<input type="checkbox"/> T2460SE	<input type="checkbox"/> T3060SE	<input type="checkbox"/> T3672SE	<input type="checkbox"/> T4884SE
<input type="checkbox"/> T2472SE	<input type="checkbox"/> T3072SE	<input type="checkbox"/> T3684SE	<input type="checkbox"/> T4896SE
<input type="checkbox"/> T2484SE	<input type="checkbox"/> T3084SE	<input type="checkbox"/> T3696SE	<input type="checkbox"/> T48108SE
<input type="checkbox"/> T2496SE	<input type="checkbox"/> T3096SE	<input type="checkbox"/> T36108SE	<input type="checkbox"/> T48120SE
<input type="checkbox"/> T24108SE	<input type="checkbox"/> T30108SE	<input type="checkbox"/> T36120SE	<input type="checkbox"/> T48132SE
<input type="checkbox"/> T24120SE	<input type="checkbox"/> T30120SE	<input type="checkbox"/> T36132SE	<input type="checkbox"/> T48144SE
<input type="checkbox"/> T24132SE			

Tabletop

- Patented uni-lok® gusset system (patent #5,165,349): gussets are recessed into hat channel, reducing lateral movement.
- Top reinforced with welded-on hat channel.
- Sound-deadened between top and channels.
- 1½" (38mm)-diameter 180° rolled edges on front and rear. Ends are turned down 90° providing for flush installations when required.
- 14 gauge 300 series polished stainless steel.

Adjustable Undershelf

- 18 gauge 300 series stainless steel.
- Gusset welded to each corner.
- Heavy duty marine edge design.

Legs—1½" (41mm)-diameter

- 24" to 36" (610 to 914mm)-wide units that are 96" (2438mm) and longer come with six legs or more. 48" (1219mm)-wide units that are 72" (1829mm) and longer come with six legs or more.
- Heavy gauge stainless steel.
- 1" (25mm) adjustable stainless steel feet.

Options / Accessories

- | | |
|--|--|
| <input type="checkbox"/> Drawer | <input type="checkbox"/> Duplex receptacles |
| <input type="checkbox"/> Lock | <input type="checkbox"/> Pot rack |
| <input type="checkbox"/> Casters | <input type="checkbox"/> Sink |
| <input type="checkbox"/> Stainless steel bullet feet | <input type="checkbox"/> Additional undershelf |
| <input type="checkbox"/> Overshelves | <input type="checkbox"/> Stabilizer Bar (for 30"- and 36"-wide tables) |

Certifications / Approvals



AUTOQUOTES



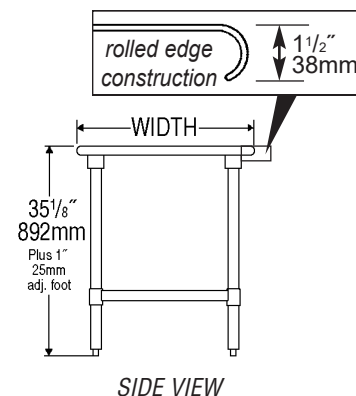
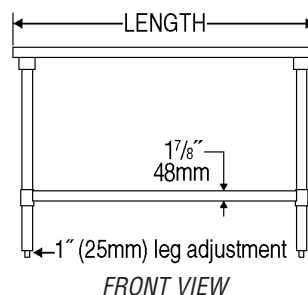
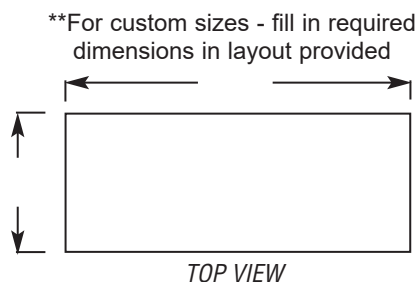
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Profit from the Eagle Advantage®

Item No.: _____
 Project No.: _____
 S.I.S. No.: _____

Worktables with Flat Top and Stainless Steel Base with Undershelf—Spec-Master® Series



model #	# of legs	width		length		weight	
		in.	mm	in.	mm	lbs.	kg
T2424SE	4	24"	610	24"	610	46	20.9
T2430SE	4	24"	610	30"	762	50	22.7
T2436SE	4	24"	610	36"	914	55	24.9
T2448SE	4	24"	610	48"	1219	67	30.4
T2460SE	4	24"	610	60"	1524	78	35.4
T2472SE	4	24"	610	72"	1829	90	40.8
T2484SE	4	24"	610	84"	2134	103	46.3
T2496SE	6	24"	610	96"	2438	125	56.7
T24108SE	6	24"	610	108"	2743	144	65.3
T24120SE	6	24"	610	120"	3048	163	73.9
T24132SE	8	24"	610	132"	3353	186	84.4
T24144SE	8	24"	610	144"	3658	200	90.7
T3030SE	4	30"	762	30"	762	54	24.5
T3036SE	4	30"	762	36"	914	57	25.9
T3048SE	4	30"	762	48"	1219	75	34.0
T3060SE	4	30"	762	60"	1524	87	39.5
T3072SE	4	30"	762	72"	1829	101	45.8
T3084SE	4	30"	762	84"	2134	116	52.6
T3096SE	6	30"	762	96"	2438	139	63.1
T30108SE	6	30"	762	108"	2743	161	73.0
T30120SE	6	30"	762	120"	3048	182	82.6
T30132SE	8	30"	762	132"	3353	204	92.5
T30144SE	8	30"	762	144"	3658	224	101.6
T3648SE	4	36"	914	48"	1219	83	37.6
T3660SE	4	36"	914	60"	1524	97	44.0
T3672SE	4	36"	914	72"	1829	114	51.7
T3684SE	4	36"	914	84"	2134	132	59.9
T3696SE	6	36"	914	96"	2438	153	69.4
T36108SE	6	36"	914	108"	2743	180	81.6
T36120SE	6	36"	914	120"	3048	207	93.9
T36132SE	8	36"	914	132"	3353	234	106.1
T36144SE	8	36"	914	144"	3658	261	118.4
T4848SE	4	48"	1219	48"	1219	136	61.7
T4860SE	4	48"	1219	60"	1524	161	73.0
T4872SE	6	48"	1219	72"	1829	188	85.3
T4884SE	6	48"	1219	84"	2134	217	98.4
T4896SE	8	48"	1219	96"	2438	265	120.2
T48108SE	8	48"	1219	108"	2743	306	138.8
T48120SE	8	48"	1219	120"	3048	348	157.9
T48132SE	8	48"	1219	132"	3353	388	176.0
T48144SE	8	48"	1219	144"	3658	430	195.0

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Profit from the Eagle Advantage®

Specification Sheet



Casters — chart on back page

- Offered in sets of four, six, and eight casters.
- Available in zinc with resilient or poly tread, or polymer cart washable with polymer tread.

Extra Undershelves** — chart on back page

- For tables with uni-lok® hat channel frame.
- Designed for storage of shorter, smaller items under worktable where only one undershelf might not suffice.
- Adjustable, available in galvanized or stainless steel.

** Stabilizer Bars and Extra Undershelves will not work together.

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Item No.: _____
 Project No.: _____
 S.I.S. No.: _____

Table Accessories

MODELS:

- | | |
|-------------------------------------|----------------------------------|
| <input type="checkbox"/> 24*GADJUS | <input type="checkbox"/> CA*-SB |
| <input type="checkbox"/> 24*SADJUS* | <input type="checkbox"/> PS* |
| <input type="checkbox"/> 30*GADJUS | <input type="checkbox"/> SB-1 |
| <input type="checkbox"/> 30*SADJUS* | <input type="checkbox"/> W TSA30 |

* See charts for complete model numbers.

Spice Bin

- Designed for either overshelf or wall shelf applications.
- 22 gauge stainless steel with fully covered deep-drawn construction.
- Complete with label holders.

model #	width		length		height*		weight	
	in.	mm	in.	mm	in.	mm	lbs.	kg
SB-1	6½"	165	5½"	140	6"	156	1.5	0.7

* Must allow 7¾" (197mm) space. Bin slides on stainless steel angle supports secured to underside of shelf.

Power Strips for Stainless Steel Tables with Backsplash

- Mounts onto backsplash via two stainless steel clips—no tools required.
- Brushed aluminum finish.
- 15' (4572mm)-long cord and plug.
- ON-OFF toggle switch and reset button.

model #	length		number of outlets
	in.	mm	
PS2408	24"	610	8
PS3612	36"	914	12
PS4816	48"	1219	16
PS6020	60"	1524	20

Stabilizer Bars (pair)**

- Fits standard 30" and 36" (762 and 914mm)-wide worktables.
- Positioned at an angle to add maximum stability to table.
- 12 gauge Valu-Master® epoxy coated gussets welded onto ends of each 12 gauge galvanized angle bar.
- Stands 19½" (495mm) when mounted to table.

model # (pair): **W TSA30**

AUTOQUOTES



EG10.59 Rev. 05/11



Profit from the Eagle Advantage®

Item No.: _____
 Project No.: _____
 S.I.S. No.: _____

Table Accessories

Casters

set of	caster diameter in. mm		ZINC WITH RESILIENT TREAD			ZINC WITH POLY TREAD			POLY CART WASHABLE WITH POLY TREAD		
			model #	wt. cap. per caster lbs. kg		model #	wt. cap. per caster lbs. kg		model #	wt. cap. per caster lbs. kg	
4 swivel (2 with brake)	4"	102	CA4-SB	115	52.2	n/a			n/a		
6 swivel (3 with brake)	4"	102	CA6-SB	115	52.2	n/a			n/a		
8 swivel (4 with brake)	4"	102	CA8-SB	115	52.2	n/a			n/a		
4 swivel (2 with brake)	5"	127	CAH4-SB	200	90.7	CAHP4-SB	250	113.4	CAHW4-SB	250	113.4
6 swivel (3 with brake)	5"	127	CAH6-SB	200	90.7	CAHP6-SB	250	113.4	CAHW6-SB	250	113.4
8 swivel (4 with brake)	5"	127	CAH8-SB	200	90.7	CAHP8-SB	250	113.4	CAHW8-SB	250	113.4

Extra Undershelves

Note: When ordering an extra or replacement undershelf, *please order per the size of your tabletop*. Please note the "for table size" column in chart below.

GALVANIZED		STAINLESS STEEL		for table size *				weight lbs. kg	
model #		model #	model #	width in. mm	length in. mm				
2424GADJUS	2424SADJUS-18/4	2424SADJUS-18/3		24"	610	24"	610	15	6.6
2430GADJUS	2430SADJUS-18/4	2430SADJUS-18/3		24"	610	30"	762	18	8.2
2436GADJUS	2436SADJUS-18/4	2436SADJUS-18/3		24"	610	36"	914	21	9.6
2448GADJUS	2448SADJUS-18/4	2448SADJUS-18/3		24"	610	48"	1219	27	12.2
2460GADJUS	2460SADJUS-18/4	2460SADJUS-18/3		24"	610	60"	1524	33	15.0
2472GADJUS	2472SADJUS-18/4	2472SADJUS-18/3		24"	610	72"	1829	39	17.6
2484GADJUS	2484SADJUS-18/4	2484SADJUS-18/3		24"	610	84"	2134	45	20.4
2496GADJUS	2496SADJUS-18/4	2496SADJUS-18/3		24"	610	96"	2438	51	23.1
24108GADJUS	24108SADJUS-18/4	24108SADJUS-18/3		24"	610	108"	2743	57	25.9
24120GADJUS	24120SADJUS-18/4	24120SADJUS-18/3		24"	610	120"	3048	63	28.6
24132GADJUS	24132SADJUS-18/4	24132SADJUS-18/3		24"	610	132"	3353	69	31.3
24144GADJUS	24144SADJUS-18/4	24144SADJUS-18/3		24"	610	144"	3658	75	34.0
3024GADJUS	3024SADJUS-18/4	3024SADJUS-18/3		30"	762	24"	610	17	7.5
3030GADJUS	3030SADJUS-18/4	3030SADJUS-18/3		30"	762	30"	762	21	9.5
3036GADJUS	3036SADJUS-18/4	3036SADJUS-18/3		30"	762	36"	914	24	10.7
3048GADJUS	3048SADJUS-18/4	3048SADJUS-18/3		30"	762	48"	1219	30	13.6
3060GADJUS	3060SADJUS-18/4	3060SADJUS-18/3		30"	762	60"	1524	36	16.3
3072GADJUS	3072SADJUS-18/4	3072SADJUS-18/3		30"	762	72"	1829	42	19.1
3084GADJUS	3084SADJUS-18/4	3084SADJUS-18/3		30"	762	84"	2134	48	21.8
3096GADJUS	3096SADJUS-18/4	3096SADJUS-18/3		30"	762	96"	2438	54	24.5
30108GADJUS	30108SADJUS-18/4	30108SADJUS-18/3		30"	762	108"	2743	60	27.2
30120GADJUS	30120SADJUS-18/4	30120SADJUS-18/3		30"	762	120"	3048	66	29.9
30132GADJUS	30132SADJUS-18/4	30132SADJUS-18/3		30"	762	132"	3353	72	32.7
30144GADJUS	30144SADJUS-18/4	30144SADJUS-18/3		30"	762	144"	3658	78	35.4

* Undershelves for 30" (762mm)-wide tables listed above also fit 36" (915mm)-wide tables.

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Rev. 05/11

Submittal Sheet

12/20/2017

ITEM# 16 - WORK TABLE, STAINLESS STEEL TOP (1 EA REQ'D)

Eagle Group T3072SE

Spec-Master® Series Work Table, 72"W x 30"D, 14/300 series stainless steel top, rolled edge on front & back, adjustable 18/300 series stainless steel undershelf with marine edge, Uni-Lok® gusset system, (4) stainless steel legs & adjustable bullet feet, NSF

The spec sheet for this item can be viewed on item 15)

ACCESSORIES

Mfr	Qty	Model	Spec
Eagle Group	1	CA4-SB	Table Casters, set of (4), 4" diameter, (2) swivel & (2) swivel/brake, 115 lbs. capacity per caster, zinc with resilient tread, NSF

Submittal Sheet

12/20/2017

ITEM# 17 - FOOD SLICER, ELECTRIC (1 EA REQ'D)

Globe 3600N

Globe Premium Slicer, 13" dia. steel alloy knife blade, manual, gear-driven knife system, start/stop touchpad controls, 2° angled drip groove on slicer table, knife ring guard with removable deflector, knife cover interlock and dual gear slice-thickness adjustment, 45° carriage angle, 12" food chute carriage, stainless steel construction, 1/2HP, 115v/60/1-ph, 7.0amps, NEMA 5-15P, cETLus, NSF/ANSI 8-2010, Made in USA

ACCESSORIES

Mfr	Qty	Model	Spec
Globe	1		1-year labor warranty from date of original installation (not to exceed 18 months from factory shipment)
Globe	1		2-year parts warranty (excludes wear/expendable parts)
Globe	1		15-year drive gears warranty (see Warranty sheet for complete details)

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1	115	60	1	Cord & Plug		5-15P	7.0		1/2		

Project Name: _____ AIA#: _____

Model #: _____ Location: _____

SIS#: _____ Item #: _____ Quantity: _____



Premium Heavy-Duty Manual Slicers

**Precise - Powerful -
Premium Construction.**

*Gear-driven, hardened steel, alloy knife
and corrosion resistant stainless steel.*

3600N



AutoQuotes

Factory Options and Accessories

To select factory installed options and accessories see back

*Special voltage slicer, non-returnable

**Special voltage slicer, non-returnable — export only, consult factory
for more information

Models

3600N 3600N-22060 special voltage*

3600N-22050 Export only, special voltage*

Consult factory for more information

Standard Features

Premium Construction

- 13" *PreciseEdge™* hardened steel alloy knife blade with maximum tip-edge-holding ability
- Stainless steel construction with superior corrosion resistance against acids found in fruit, meats & vegetables
- Best of the Best, *EZ-Glide™* slice system
- No-drip base with Marine edge — 1/2" to 3/4" wide and indented areas with 3/16" deep radiused transition and 3/16" deep internal coved corners — redirects liquid to center of base away from controls & operator
- 2° angled drip groove on slicer table directs liquid flow to base
- Precise slice-thickness adjustment, one-piece handle, gear driven and gasket-sealed
- Carriage angle: 45°, full gravity feed
- 12" long chute with 3 lb. stainless steel end weight
- Powerful 1/2 HP, 7 amp continuous use motor
- High-performance gear knife drive
- Maintenance-free drive system
- No voltage release prevents inadvertent reactivation of slicer in the event of power or interlock interruption
- Permanently attached knife blade ring guard with removable cover and deflector
- Knife cover interlock prevents slicer from operating without the knife cover in place
- Touch pad start/stop controls, power indicator light
- Ergonomic low-profile design reduces operator fatigue
- Kick-stand for cleaning and sanitizing under slicer

Standard Features

Food Zone

- Large stainless steel radii, open space base design for cleaning and simple dismantling of components
- Moisture proof, easy-to-clean direct contact start/stop touchpad controls
- Sealed splash zones for added sanitation and protection of electronics

Warranty

- 15-year warranty on knife drive gears

- Two year parts, one year labor

Warranty valid in North America, contact factory regarding warranty in other countries

Approved by: _____ Date: _____

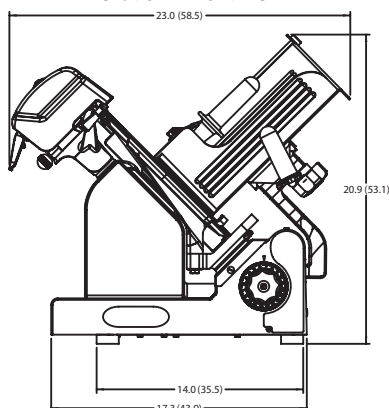
2153 Dryden Rd., Dayton, OH 45439 | 937-299-5493 | 800-347-5423 | Fax: 937-299-4147 | www.globefoodequip.com



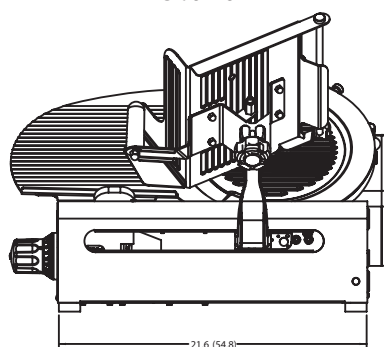
Premium Manual Slicers

3600N / 3600N-22060 / 3600N-22050

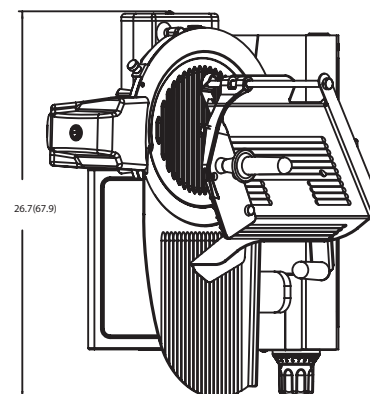
Elevation / Front View



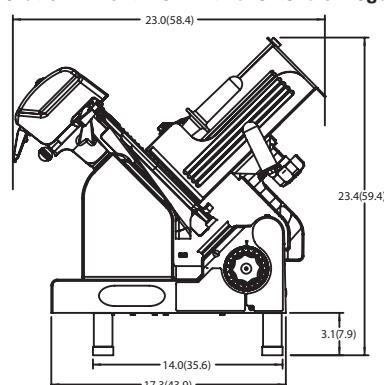
Side View



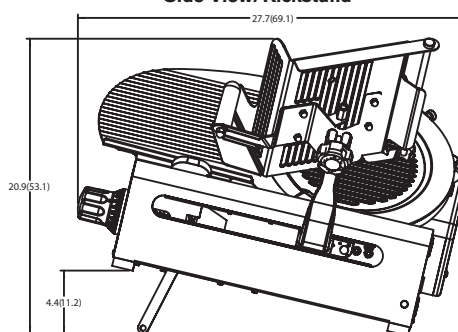
Plan / Top View



Elevation / Front View with 3" extension legs



Side View/Kickstand



Note: different chute options
will change overall height

Drawings available through KCL. www.kclcad.com

SPECIFICATIONS

Model	Motor	Volts	Amps	NEMA Plug Type	Drive Type	Slicing Vol. / Day	Cheese Slicing	Blade Diameter	Max Slice	Product Cutting Capacity		
										D (Diameter)	W (Width)	H (Height)
3600N	1/2 HP	115-60-1	7	5-15	Gear	All Day		13" (33.02 cm)	1-1/4" (3.18 cm)	7.5" (19.50 cm)	11.6" (29.46 cm)	9" (22.86 cm)
3600N-22050	1/2 HP	220-50-1	3.5	CEE 7/7	Gear	All Day		13" (33.02 cm)	1-1/4" (3.18 cm)	7.5" (19.50 cm)	11.6" (29.46 cm)	9" (22.86 cm)
3600N-22060	1/2HP	220-60-1	3.5	6-15P	Gear	All Day		13" (33.02 cm)	1-1/4" (3.18 cm)	7.5" (19.50 cm)	11.6" (29.46 cm)	9" (22.86 cm)

Cord & Plug: Attached 7 ft. flexible 3-wire cord with molded plug fits a grounded receptacle. **Please specify desired plug configuration when ordering.**

Please note: Special voltage slicers are non-returnable

DIMENSIONS | SHIPPING INFORMATION

Reinforced carton for shipping. The weight and dimensions of this reinforced carton are included below and may vary from shipment to shipment.

Shipped on a pallet. Freight class 77.5.

Model	Overall Dimensions	Net Weight	Shipping Dimensions	Shipping Weight
3600N 3600N-22050 3600N-22060	23" W x 26.7" D x 20.9" H (58 cm x 68 cm x 53.1 cm)	112 lbs. (50.8 kg)	25" W x 28" D x 28" H (63.5 cm x 71 cm x 71 cm)	132 lbs. (60 kg)

FACTORY INSTALLED OPTIONS:

- ☐ **QUICK-CLEAN™** Proprietary non-stick nickel-based coating (knife cover and slicer table)
- ☐ Dual arm lift lever for easy cleaning
- ☐ **CORR** Correctional package
- ☐ **MEATROOM** High moisture application package (includes 13" stainless steel knife)
- ☐ **LONGCHUTE** 15" long food chute
- ☐ **SSK** 13" long stainless steel knife

OPTIONAL ACCESSORIES:

- ☐ **1047** Stainless steel low food fence (12" L x 1 1/8" H)
- ☐ **1326** Stainless steel high food fence (12" L x 3" H)
- ☐ **873-SET** 3" extension legs (set of 4)
- ☐ **699-BAS** Stainless steel vegetable hopper (14" L x 7" D)
- ☐ **SC-LARGE** Clear plastic slicer cover (recommended for preconstruction)
- ☐ **CB** Additional cleaning brush

Submittal Sheet

12/20/2017

ITEM# 18 - EQUIPMENT STAND, FOR MIXER / SLICER (1 EA REQ'D)

Eagle Group T3030SEM-ST-CAH

Equipment Stand, mobile, 27-1/8"W x 31-1/8"D x 34"H, 600 lbs maximum capacity, 14/304 stainless steel top, box marine edge on all sides, removable pan rack holds (5) 18" x 26" pans, fixed stainless steel undershelf, Uni-Lok[®] gusset system, fully welded construction, stainless steel legs, 5" swivel casters with resilient tread (2 braked)



Profit from the Eagle Advantage®

Foodservice Division: (800) 441-8440

MHC/Retail Display Divisions: (800) 637-5100

FAX: (302) 653-2065

Short Form Specifications

Eagle Slicer Table, model _____. 14 gauge type 304 stainless steel tabletop features box marine edge to retard spillage. Heavy gauge stainless steel construction. Stainless steel legs with 5"-diameter heavy duty resilient casters. Stainless steel 5-pan slides mounted to removable angle. Welded bottom solid shelf.

Product Announcement

Item #: _____
 Model #: _____
 Project #: _____
 SIS #: _____

EG8127 Rev. 11/12

Features

- Uni-lok® gusset system (patent #5,165,349): gusset is recessed into hat channel underside tabletop, reducing lateral movement.
- 14 gauge type 304 stainless steel tabletop with box marine edge on all four sides.
- 600-lb. (272.2 kg) total weight capacity—evenly distributed static load.
- Stainless steel 5-pan slides mounted to a removable angle.
- 4½" slide spacing.
- Welded bottom solid shelf.
- Stainless steel legs with 5"-dia. heavy duty resilient-tread swivel casters — two with brake.

Options

- Rotary "donut" bumpers
- 5" polyurethane casters, with ball bearing seals
- Bullet feet

For custom configuration or fabrication needs, contact our **SpecFAB® Division**.

Phone: (302) 653-3000. FAX: (302) 653-3091.

E-mail: specfab@eaglegrp.com

Slicer Tables

with removable pan slides



Stationary

width		length		height		weight		model #
in.	mm	in.	mm	in.	mm	lbs.	kg	
31½"	791	27½"	689	34"	864	95	43.1	T3030SEM-ST

Mobile

width		length		height		weight		description of casters	model #
in.	mm	in.	mm	in.	mm	lbs.	kg		
31½"	791	27½"	689	34"	864	95	43.1	5" resilient	T3030SEM-ST-CAH

Eagle Slicer Table is built to withstand the most vigorous demands of everyday use. Heavy duty stainless steel welded construction featured. Options include donut bumpers, 5" polyurethane casters, and bullet feet.



Submittal Sheet

12/20/2017

ITEM# 19 - FOOD PROCESSOR EQUIPMENT STAND (1 EA REQ'D)

Robot Coupe R199

Robo-Cart Equipment Stand, 18-9/16"W x 34-1/8"D x 38-1/2"H, adjustable handle, adjustable aluminum cantilever shelf (adjusts from 10-3/16" to 27-1/2"H), stainless steel insert shelving with (10) cutting disc slots, includes (1) 5/32" Allen wrench for assembly/disassembly, 5" heavy duty swivel casters (200 lb capacity), heavy duty aluminum construction (plates not included)

Submittal Sheet

12/20/2017

ITEM# 20 - FOOD PROCESSOR (1 EA REQ'D)

Robot Coupe CL50E

Commercial Food Processor, includes: vegetable prep attachment with kidney shaped & cylindrical hopper (no bowl), (1) 3mm grating disc (28058), (1) 3mm slicing disc (28064), 2-disc rack, polycarbonate base, single speed 425 RPM, 1-1/2 HP, 120v/60/1-ph, 12.0 amps, NEMA 5-15P, cETLus, ETL-Sanitation

ACCESSORIES

Mfr	Qty	Model	Spec
Robot Coupe	1		1 year parts & labor warranty

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1	120	60	1	Cord & Plug		5-15P	12		1-1/2		

VEGETABLE PREPARATION MACHINE

robot coupe®

CL 50



9 Dicing
3 French
Fry Kits

52
DISCS

**A SALES FEATURES**

The CL 50 Vegetable Preparation Machine is ideal for slicing, ripple cutting, grating, dicing, shredding and making french fries from all types of fruit and vegetables, as well as grating cheese.

B TECHNICAL FEATURES

The CL 50 Vegetable Preparation Machine – Single-phase 120V/60/1. Power 1.5 HP. Speed 425 rpm. Equipped with a magnetic safety system, motor brake and lever-activated auto restart. This Veg. Prep. Machine has a lateral ejection facility and is equipped with 2 hoppers: 1 kidney shaped hopper (LxW - 6 11/16" x 3") and a cylindrical hopper (2 1/4"). Metal vegetable chute and continuous feed lead. Suitable for 50 to 400 meals per service. Included: 28064 (3mm) 1/8" slicing disc, 28058 (3mm) 1/8" grating disc and 2 disc rack. Large choice of 52 discs available.

Select your options at the back page **F** part.

C TECHNICAL DATA

Output power	1.5 HP
Electrical data	Single-phase - 12 Amp plug included
Speed	425 rpm
Dimensions (HxLxW)	23 7/16" x 13 1/2" x 14 3/4" Cube: 3.57
Rate of recyclability	95%
Net weight	41 lbs
Nema #	5-15P
Reference	CL 50 E 120V/60/1

D	Number of meals per service	50 to 400
	Theoretical output per hour*	1 100 lbs

E PRODUCT FEATURES / BENEFITS**MOTOR BASE**

- Industrial induction motor for intensive use.
- Power - 1.5 HP
- Motor base in high resistant composite material.
- Stainless steel motor shaft.
- Magnetic safety system with motor brake.
- Speed - 425 rpm

VEGETABLE PREPARATION FUNCTION

- Vegetable Preparation Machine equipped with 2 hoppers: 1 kidney shaped hopper to cut bulky vegetables, like cabbage, beets, celeriac, etc. and 1 cylindrical hopper for long, delicate vegetables.
- Removable continuous feed lead.
- Reversible discharge plate for processing delicate produce.
- Lateral ejection facility for space-saving and greater user comfort, and accommodates 5 29/32 inch high gastronomy pans
- Lever-activated auto restart (by the pusher)
- Vertical pusher pressure exerted on vegetables to ensure uniform cuts.
- Large choice of 52 discs available.
- Packed with two processing discs (28064 - 3mm/1/8" slicing disc & 28058 - 3mm/1/8" grating disc) as standard.
- Stainless steel blades on slicing discs, blades on Julienne discs and grating discs are removable.

MASHED POTATO FUNCTION

- Optional: a simple way of making large quantities, up to 20 lbs, of fresh mashed potato in just 2 minutes

STANDARDS

ETL electrical and sanitation Listed/ cETL (Canada)



* Results may differ depending on the type of the hopper used, the choice of the cut and the setup of the workstation.

Specification sheet

www.robotcoupeusa.com

Update : November 2014

Robot Coupe USA, Inc.

264 South Perkins - Ridgeland, MS 39157

PH: 601-898-8411 - Toll free: 800-824-1646 - Fax: 601-898-9134

info@robotcoupeusa.com

VEGETABLE PREPARATION MACHINE

robot coupe®

CL 50

F OPTIONAL ACCESSORIES

- 3 mm (1/8") Mashed potato ricer attachment - ref 28207

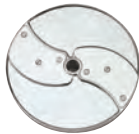


- Wall 8-disc holder - ref 107812
- Dice Cleaning Kit: cleaning tool for dicing grids 5 mm (3/16"), 8 mm (5/16") and 10 mm (3/8")

SUGGESTED PACKS OF DISCS

3 disc package	5mm (3/16") coarse grating, 6mm (1/4"x1/4") julienne and 5mm (3/16") slicing discs.
5 disc package	5mm (3/16") coarse grating; 6mm (1/4"x1/4") julienne; 5mm (3/16"), 10mm (3/8") slicing discs; 10x10mm (3/8" x 3/8") dicing grid
16 disc package	Slicers - 0.8mm (1/32"), 2mm (5/64") & 5mm (3/16"). 2 graters - 2mm (5/64") & 5mm (3/16"); 3 dicing - 5x5x5mm (3/16"), 10x10x10mm (3/8") & 14x14x5mm (9/16"x9/16"x3/16"). 2 Julienne sticks - 2.5 x 2.5mm (1/10"x1/10") & 2 x 10mm (5/64"x3/8"). Dice Cleaning Kit and 2 disc holders.

OPTIONAL DISCS



SLICING

0.6 mm	28166
0.8 mm	28069
1 mm (1/32")	28062
2 mm (5/64")	28063
3 mm (1/8")	28064
4 mm (5/32")	28004
5 mm (3/16")	28065
6 mm (1/4")	28196
8 mm (5/16")	28066
10 mm (3/8")	28067
14 mm (9/16")	28068
20 mm (25/32")	28132
25 mm (1")	28133
cooked potatoes 4 mm (5/32")	27244
cooked potatoes 6 mm (1/4")	27245



RIPPLE CUTTING

2 mm (5/64")	27068
3 mm (1/8")	27069
5 mm (3/16")	27070



GRATERS

1.5 mm (1/16")	28056
2 mm (5/64")	28057
3 mm (1/8")	28058
4 mm (5/32")	28136
5 mm (3/16")	28163
7 mm (9/32")	28164
9 mm (11/32")	28165
Röstis potatoes	27164
Raw potatoes	27219
Fine Pulping disc	28055
Hard Cheese grate	28061



JULIENNE

1x8 mm tagliatelle (1/32"x5/16")	28172
1x26 onion/cabbage (1/32"x1 1/4")	28153
2x2 mm (5/64" x 5/64")	28051
2x4 mm (5/64" x 5/32")	27072
2x6 mm (5/64" x 1/4")	27066
2x8 mm (5/64" x 5/16")	27067
2x10 tagliatelle (5/64"x3/8")	28173
2.5x2.5 mm (1/10" x 1/10")	28195
3x3 mm (1/8" x 1/8")	28101
4x4 mm (5/32" x 5/32")	28052
6x6 mm (1/4" x 1/4")	28053
8x8 mm (5/16" x 5/16")	28054



DICING EQUIPMENT

5x5 mm (3/16")	28110
8x8 mm (5/16")	28111
10x10 mm (3/8")	28112
12x12 mm (15/32")	28197
14x14x5 mm Mozzarella (9/16"x9/16"x3/16")	28181
14x14x10mm (9/16"x9/16"x3/8")	28179
14x14 mm (9/16")	28113
20x20 mm (25/32")	28114
25x25 mm (1")	28115
2" Lettuce Cut	28180



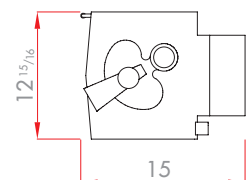
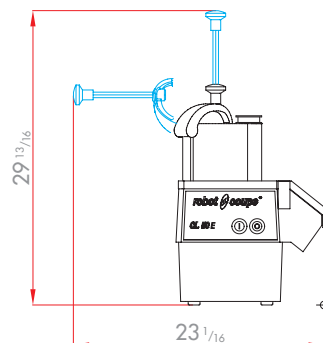
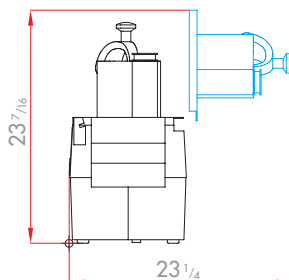
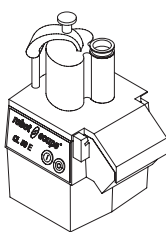
FRENCH FRY EQUIPMENT

8x8 mm (5/16" x 5/16")	28134
8x16 mm (5/16" x 5/8")	28159
10x10 mm (3/8" x 3/8")	28135
10x16 mm (3/8" x 5/8")	28158

G

ELECTRICAL DATA

120V/60/1 - delivered with cord and plug.



CL 50

Submittal Sheet

12/20/2017

ITEM# 21 - ONE (1) COMPARTMENT SINK (1 EA REQ'D)

Eagle Group FN2018-1-36L14/3

Spec-Master® FN Series Sink, one compartment, 57-1/2"W x 27"D, 14/304 stainless steel top, 18" wide x 20" front-to-back x 14" deep compartment, 36" drainboard on left, 9-1/2"H backsplash with 1" upturn & tile edge, 8" O.C. splash mount faucet holes, rolled edges on front & sides, includes 3-1/2" basket drain, stainless steel crossbracing on all sides, stainless steel legs & adjustable bullet feet, NSF

ACCESSORIES

Mfr	Qty	Model	Spec
Eagle Group	1	313293	T&S Faucet, splash-mounted, 8" centers, 12" swing spout, extra heavy duty
Eagle Group	1	341189	Twist Handle Drain, 1-1/2 or 2" NPS connection
Eagle Group	1	-TB	Twist bracket, per drain

WATER

	HOT SIZE	HOT AFF	HOT GPH	COLD SIZE	COLD AFF	FILTERED SIZE	FILTERED AFF	CONDENSER INLET SIZE	CONDENSER OUTLET SIZE
1									
2	1/2"			1/2"					
3									

WASTE

	INDIRECT SIZE	DIRECT SIZE
1	1-1/2"	
2		
3	2"	

PLUMBING 1 REMARKS

(1) set of 1-1/8" faucet holes, 8" O.C.



Profit from the Eagle Advantage®

Specification Sheet

Short Form Specifications

Eagle Spec-Master® One-Compartment Sinks, model _____, Unit constructed of 14/304, 18-8 stainless steel throughout. Sink bowls coved with a full $\frac{1}{2}$ " radius, and shall have a 14" water level. Drainboards, when required, shall be "V" creased for positive drainage. 9 $\frac{1}{2}$ " high backsplash with 1" upturn and tile edge. Legs to be 1 $\frac{1}{2}$ " O.D., stainless steel, with stainless steel gussets, stainless steel crossbracing and adjustable stainless steel bullet feet.



one-compartment FN sink

Options / Accessories

- | | |
|--|--|
| <input type="checkbox"/> Lever drain | <input type="checkbox"/> Sink kits |
| <input type="checkbox"/> Lever drain with overflow | <input type="checkbox"/> Faucets |
| <input type="checkbox"/> Twist handle drains | <input type="checkbox"/> Polyboard sink covers |
| <input type="checkbox"/> Overflow hole | <input type="checkbox"/> Stainless steel sink covers |

Assembly:

- Entire assembly is fuse-welded and planished, providing a one-piece seamless sink unit.
- Welded areas are high-speed belt blended to match adjacent surfaces with continuity of satin finish.
- All outside corners of assembly are bullnosed to provide safe, clean edges.
- Water supply is $\frac{1}{2}$ " (13mm) IPS for hot and cold lines.

EAGLE GROUP

100 Industrial Boulevard, Clayton, DE 19938-8903 USA

Phone: 302-653-3000 • Fax: 302-653-2065

www.eaglegrp.com

Foodservice Division: Phone 800-441-8440

MHC/Retail Display Divisions: Phone 800-637-5100

For custom configuration or fabrication needs, contact our **SpecFAB®** Division.

Phone: 302-653-3000 • Fax: 302-653-3091 • e-mail: specfab@eaglegrp.com

Item No.: _____
Project No.: _____
S.I.S. No.: _____

Spec-Master® FN Series Coved Corner One-Compartment Sinks

MODELS:

- | | |
|--|--|
| <input type="checkbox"/> FN2016-1-* | <input type="checkbox"/> FN2424-1-* |
| <input type="checkbox"/> FN2018-1-* | <input type="checkbox"/> FN2820-1-* |
| <input type="checkbox"/> FN2020-1-* | |

* See chart on back for complete model numbers.

Top:

- Drainboards, backsplash and rolled rims are 14 gauge type 304 stainless steel.
- Drainboards, when provided, are integrally welded.
- All rolled edges are highlighted for enhanced appearance.
- 9 $\frac{1}{2}$ " high backsplash with 1" upturn and tile edge.
- 1 $\frac{1}{2}$ " (29mm) faucet holes punched on 8" (203mm) centers.

Base:

- Legs: 1 $\frac{1}{2}$ " (41mm)-diameter stainless steel tubing with stainless steel gussets and fully adjustable stainless steel bullet feet.
- Crossbracing: Adjustable, 1 $\frac{1}{4}$ " (32mm)-diameter stainless steel; running left-to-right and front-to-back.
- Leg locations fall directly under sink bowl, providing increased stability and maximum weight support.
- Leg gussets welded to a die-cut heavy-gauge stainless steel reinforcing corner plate.
- Legs are crossbraced on all sides for increased stability.

Sink Bowl:

- 14 gauge type 304 stainless steel.
- 14" (356mm) water level, 17" (432mm) flood level.
- Sink compartment coved on a full $\frac{1}{2}$ " (41mm) radius and constructed using state-of-the-art seamless welding techniques.
- Basket-type waste drain fits sink bowl's 3 $\frac{1}{2}$ " (89mm) opening and features 1 $\frac{1}{2}$ " (38mm) outlet.

Certifications / Approvals



Spec sheets available for viewing, printing or downloading from our online literature library at www.eaglegrp.com

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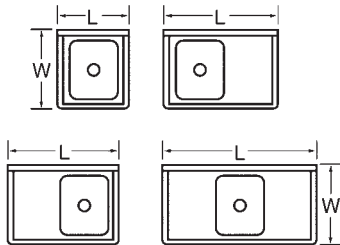
Profit from the Eagle Advantage®

Item No.: _____

Project No.: _____

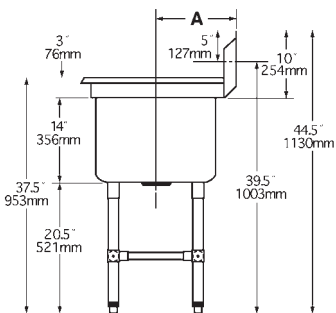
S.I.S. No.: _____

Spec-Master® FN Series Coved Corner One-Compartment Sinks



Drain location for rough-in

bowl width in. mm	bowl length in. mm	Dimension A	
20" 508	16" 406	14"	356
20" 508	18" 457	14"	356
20" 508	20" 508	14"	356
24" 610	24" 610	16"	406
28" 711	20" 508	18"	457



model #	BOWL DIMENSIONS				DRAINBOARD			OVERALL DIMENSIONS				weight	
	width in. mm	length in. mm	width in. mm	length in. mm	quantity	in. mm	length in. mm	width in. mm	length in. mm	width in. mm	length in. mm	lbs.	kg
FN2016-1-14/3	20"	508	16"	406	0	-	-	27"	686	21"	533	55	24.9
FN2016-1-18R or L-14/3	20"	508	16"	406	1	18"	457	27"	686	37 1/2"	953	74	30.8
FN2016-1-18-14/3	20"	508	16"	406	2	18"	457	27"	686	54"	1372	93	37.6
FN2016-1-24R or L-14/3	20"	508	16"	406	1	24"	610	27"	686	43 1/2"	1105	80	33.1
FN2016-1-24-14/3	20"	508	16"	406	2	24"	610	27"	686	66"	1676	105	42.1
FN2016-1-30R or L-14/3	20"	508	16"	406	1	30"	762	27"	686	49 1/2"	1257	85	38.6
FN2016-1-30-14/3	20"	508	16"	406	2	30"	762	27"	686	78"	1981	115	52.2
FN2016-1-36R or L-14/3	20"	508	16"	406	1	36"	914	27"	686	55 1/2"	1410	90	40.8
FN2016-1-36-14/3	20"	508	16"	406	2	36"	914	27"	686	90"	2286	125	56.7
FN2018-1-14/3	20"	508	18"	457	0	-	-	27"	686	23"	584	58	26.3
FN2018-1-18R or L-14/3	20"	508	18"	457	1	18"	457	27"	686	39 1/2"	1003	76	34.4
FN2018-1-18-14/3	20"	508	18"	457	2	18"	457	27"	686	56"	1422	96	43.5
FN2018-1-24R or L-14/3	20"	508	18"	457	1	24"	610	27"	686	45 1/2"	1156	81	36.7
FN2018-1-24-14/3	20"	508	18"	457	2	24"	610	27"	686	68"	1727	106	48.1
FN2018-1-30R or L-14/3	20"	508	18"	457	1	30"	762	27"	686	51 1/2"	1308	88	39.9
FN2018-1-30-14/3	20"	508	18"	457	2	30"	762	27"	686	90"	2032	118	53.5
FN2018-1-36R or L-14/3	20"	508	18"	457	1	36"	914	27"	686	57 1/2"	1464	93	42.2
FN2018-1-36-14/3	20"	508	18"	457	2	36"	914	27"	686	92"	2337	128	58.1
FN2020-1-14/3	20"	508	20"	508	0	-	-	27"	686	25"	635	60	27.2
FN2020-1-18R or L-14/3	20"	508	20"	508	1	18"	457	27"	686	41 1/2"	1054	79	35.8
FN2020-1-18-14/3	20"	508	20"	508	2	18"	457	27"	686	58"	1473	98	44.5
FN2020-1-24R or L-14/3	20"	508	20"	508	1	24"	610	27"	686	47 1/2"	1207	85	37.2
FN2020-1-24-14/3	20"	508	20"	508	2	24"	610	27"	686	70"	1778	110	48.5
FN2020-1-30R or L-14/3	20"	508	20"	508	1	30"	762	27"	686	53 1/2"	1359	90	40.8
FN2020-1-30-14/3	20"	508	20"	508	2	30"	762	27"	686	82"	2083	120	54.4
FN2020-1-36R or L-14/3	20"	508	20"	508	1	36"	914	27"	686	59 1/2"	1511	95	43.1
FN2020-1-36-14/3	20"	508	20"	508	2	36"	914	27"	686	94"	2388	130	59.0
FN2424-1-14/3	24"	610	24"	610	0	-	-	31"	787	29"	737	69	31.2
FN2424-1-18R or L-14/3	24"	610	24"	610	1	18"	457	31"	787	45 1/2"	1156	88	39.9
FN2424-1-18-14/3	24"	610	24"	610	2	18"	457	31"	787	62"	1575	107	48.5
FN2424-1-24R or L-14/3	24"	610	24"	610	1	24"	610	31"	787	51 1/2"	1308	88	37.6
FN2424-1-24-14/3	24"	610	24"	610	2	24"	610	31"	787	74"	1880	119	49.0
FN2424-1-30R or L-14/3	24"	610	24"	610	1	30"	762	31"	787	57 1/2"	1461	99	44.9
FN2424-1-30-14/3	24"	610	24"	610	2	30"	762	31"	787	86"	2184	129	58.5
FN2424-1-36R or L-14/3	24"	610	24"	610	1	36"	914	31"	787	63 1/2"	1613	104	47.2
FN2424-1-36-14/3	24"	610	24"	610	2	36"	914	31"	787	98"	2489	139	63.1
FN2820-1-14/3	28"	711	20"	508	0	-	-	35"	889	25"	635	79	35.8
FN2820-1-18R or L-14/3	28"	711	20"	508	1	18"	457	35"	889	41 1/2"	1054	98	44.5
FN2820-1-18-14/3	28"	711	20"	508	2	18"	457	35"	889	58"	1473	117	53.1
FN2820-1-24R or L-14/3	28"	711	20"	508	1	24"	610	35"	889	47 1/2"	1207	104	43.1
FN2820-1-24-14/3	28"	711	20"	508	2	24"	610	35"	889	70"	1778	129	55.3
FN2820-1-30R or L-14/3	28"	711	20"	508	1	30"	762	35"	889	53 1/2"	1359	109	49.4
FN2820-1-30-14/3	28"	711	20"	508	2	30"	762	35"	889	82"	2083	139	63.1
FN2820-1-36R or L-14/3	28"	711	20"	508	1	36"	914	35"	889	59 1/2"	1511	114	51.7
FN2820-1-36-14/3	28"	711	20"	508	2	36"	914	35"	889	94"	2388	149	67.6

EAGLE GROUP

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Profit from the Eagle Advantage®

Specification Sheet



19" (483mm) double-jointed
spout faucet



12" (305mm)
heavy duty faucet



standard
wrist handle faucet



12" (305mm)
T&S faucet



T&S
wrist handle faucet

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Item No.: _____

Project No.: _____

S.I.S. No.: _____

Sink Accessories/Replacements —Faucets and Prerinse Units

STANDARD FAUCETS

8" (203mm) centers.

model #	description
313918	8" (203mm) spout, standard, splash mounted
300716	12" (305mm) spout, standard, splash mounted
300804	14" (356mm) spout, standard, splash mounted
313919	16" (406mm) spout, standard, splash mounted
301001	12" (305mm) spout, heavy duty, splash mounted
301002	14" (406mm) spout, heavy duty, splash mounted
301003	19" (489mm) double-jointed spout, splash mounted
313075	gooseneck, splash mounted

REPAIR KIT FOR STANDARD FAUCETS

model #	description	for faucets #
304146	hot/cold stems, handles, seats, bonnet nuts, O-rings	313918, 313919
368421	hot/cold ceramic cartridge	300716, 300804

STANDARD FAUCETS WITH WRIST HANDLES

Deck mounted with 4" (102mm) centers. Features include 4" (102mm) long wrist handles and rigid gooseneck spout.

model #	description
301005	standard
301004	heavy duty



T&S EXTRA HEAVY DUTY FAUCETS **OUR BEST**

Top-of-the-line. Splash mounted with 8" (203mm) centers. Features T&S quality products.

model #	description
313920	8" (203mm) spout
340380	10" (254mm) spout
313293	12" (305mm) spout
313294	14" (356mm) spout



T&S EXTRA HEAVY DUTY FAUCET WITH WRIST HANDLES **OUR BEST**

Top-of-the-line T&S quality. Deck mounted with 4" (102mm) centers. 4" (102mm) long wrist handles and rigid gooseneck spout.

model #	description
313304	extra heavy duty

Certifications / Approvals



(fabricated to NSF-applicable standards)

AUTOQUOTES

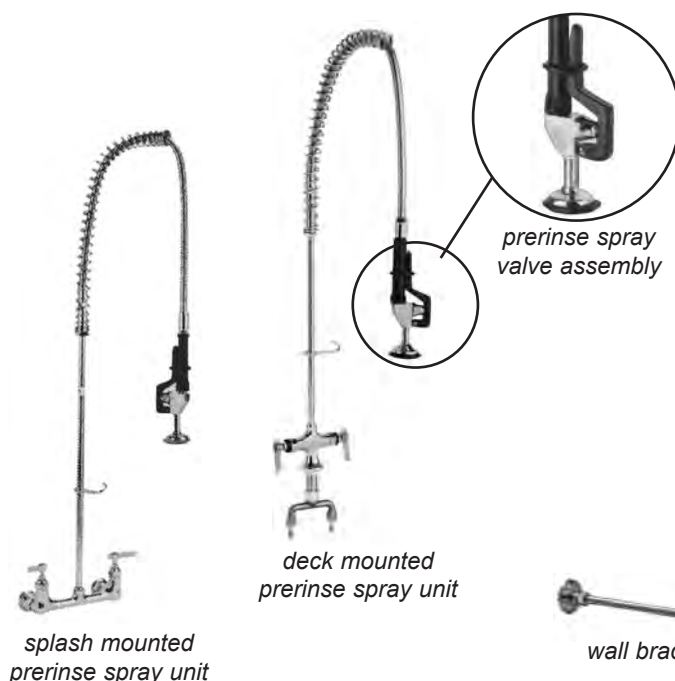




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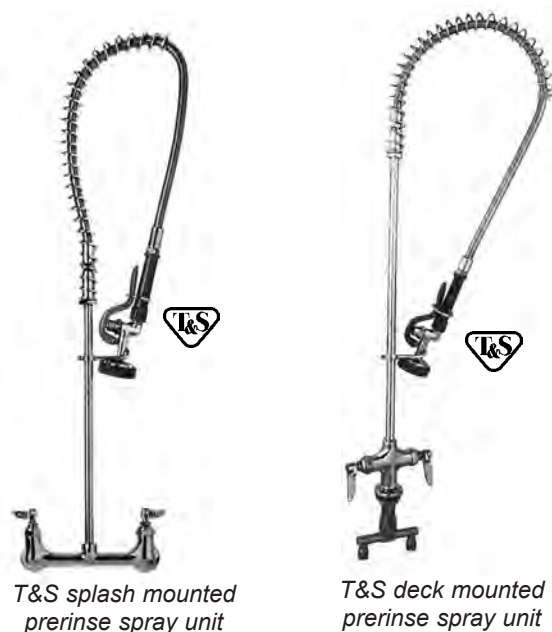
Item No.: _____
 Project No.: _____
 S.I.S. No.: _____

Sink Accessories/Replacements—Faucets and Prerinse Units



STANDARD PRERINSE UNITS AND COMPONENTS

model #	description
300719	splash mounted spray unit
300718	deck mounted spray unit
301189	faucet add-on with 12" (305mm) spout
301190	wall bracket
313116	prerinse hose, 36" (914mm) length
313323	prerinse spray valve assembly for spray units #300718 and 300719



T&S EXTRA HEAVY DUTY PRERINSE UNITS AND COMPONENTS **OUR BEST**

Top-of-the-line.

model #	description
313296	splash mounted spray unit with wall bracket
313295	deck mounted spray unit with wall bracket
313297	faucet add-on with 12" (305mm) spout for use with #313296 unit



T&S prerinse faucet add-on

EAGLE GROUP

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Specification Sheet

OUR BEST



T&S faucet #313293



crossbraced legs
with stainless steel
feet



lever drain
(with Sink Kit B for
Spec-Master® Sinks)



twist handle drain
(with Sink Kit D for
Spec-Master® Sinks)



stainless steel sink cover



polyboard sink cover

Sink Accessories/Replacements —Sink Kits, Miscellaneous

SINK KITS FOR 314, 412, AND 414 SERIES SINKS

All kits include stainless steel crossbraced legs, gussets, feet and T&S faucet #313293.

add

suffix #	Kit #	description
-CLF	A	s/s crossbraced legs, gussets, feet, T&S faucet
-CLFD	B	s/s crossbraced legs, gussets, feet, T&S faucet, lever drain
-CLFDO	C	s/s crossbraced legs, gussets, feet, T&S faucet, lever drain with overflow
-CLFDT	D	s/s crossbraced legs, gussets, feet, T&S faucet, twist handle drain, twist handle bracket
-CLFDOT	E	s/s crossbraced legs, gussets, feet, T&S faucet, twist handle drain with overflow, twist handle bracket

SINK KITS FOR SPEC-MASTER® FN SERIES SINKS

Includes T&S faucet #313293.

add

suffix #	Kit #	description
-F	A	T&S faucet
-FD	B	T&S faucet, lever drain
-FDO	C	T&S faucet, lever drain with overflow
-FDT	D	T&S faucet, twist handle drain, twist handle bracket
-FDOT	E	T&S faucet, twist handle drain with overflow, twist handle bracket

SINK COVERS

For 314, 412, 414, and FN Series sinks only.

POLYBOARD

STAINLESS

model #	model #	fits sink bowl size
313207	321555	14" x 10" (356 x 254mm)
351584	351585	16" x 20" (483 x 508mm)
335377	346175	20" x 18" (508 x 457mm)
326267	305428	20" x 20" (508 x 508mm)
313204	321557	22" x 22" (559 x 559mm)
326268	326270	24" x 18" (610 x 457mm)
313205	321558	24" x 24" (610 x 610mm)
326269	326271	28" x 20" (711 x 508mm)

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Certifications / Approvals



(fabricated to NSF-applicable standards)

AUTOQUOTES



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EG20.51A Rev. 02/13



Profit from the Eagle Advantage®

Item No.: _____
 Project No.: _____
 S.I.S. No.: _____

Sink Accessories/Replacements—Sink Kits, Miscellaneous



flanged bullet foot

LEG COMPONENTS

model #	description
300315	19" (483mm) stainless steel leg for utility sinks
300692	stainless steel bullet feet
313835	flanged bullet feet
300293	plastic bullet feet



P-trap



tail piece



anti-siphon
vacuum breaker

backflow
preventer

PLUMBING COMPONENTS

model #	description
300789	p-trap, nickel-plated
300791	tail piece for 1.5" (38mm) IPS connection, nickel-plated
313832	anti-siphon vacuum breaker
313834	backflow preventer

DRAINS

model #	description	MAX. fLOW RATE	
		gal. per minute	gal. per hour
300720	lever handle drain with 1.5" or 2" (38 or 51mm) NPS connection	27	1620
300721	lever handle drain with 2" (51mm) NPS connection	32	1920
300722	lever handle drain with 2" (51mm) NPS connection and overflow	32	1920
341189*	twist handle drain with 1.5" or 2" (38 or 51mm) NPS connection	27	1620
336002*	twist handle drain with 2" (51mm) NPS connection	32	1920
341190*	twist handle drain with 2" (51mm) NPS connection and overflow	32	1920
369653	rotary drain, nickel-plated solid brass, with 1.5" or 2" (38 or 51mm) NPS connection	40	2400
300287	crumb cup strainer with 1.5" (38mm) outlet	18	1080

* Twist handle bracket, for use with twist handle drain, should be ordered as sink option "-TB" at time of sink order.



lever drain



twist handle drain



control bracket

CONTROL BRACKET

Requires custom mounting.

model #	description
309796	3" x 5" (76 x 127mm), extra heavy duty

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Submittal Sheet

12/20/2017

ITEM# 22 - SHELVING, WALL-MOUNTED (2 EA REQ'D)

Metro 12WS52C

Regular Erecta® Wall Shelf Kit, 50-1/4"W x 13"D x 21"H, includes: (2) 48"W x 12"D shelves, shelf supports & mounting brackets (wall bolts & screws not included), chrome, NSF



Item# _____

Job _____



REGULAR ERECTA SHELF® SHELVING ACCESSORIES

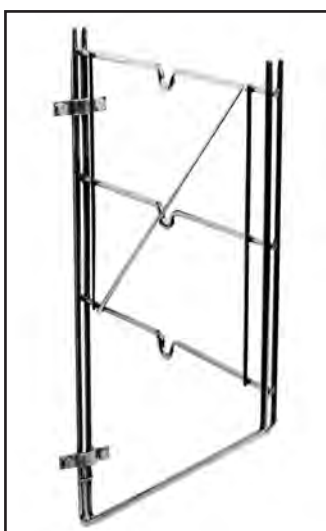
- **Wall Mounts:** Used to create wall-mounted shelving units with 12" or 18" (305 or 460mm) regular Erecta Shelf® shelves of any length. Models are available to accommodate from one to five shelves. Each mount consists of shelf support and mounting brackets. Wall bolts or screws not included; they must be selected according to type of wall. Order shelves from sheet #10.50.

DIMENSIONS:

Width		Height		Capacity	Cat. No. Chrome	Approx. Pkd. Wt. (Pr.)	
(in.)	(mm)	(in.)	(mm)			(lbs.)	(kg)
12	305	10 ³ / ₄	273	1 shelf	12WB1C	2 ¹ / ₂	1
12	305	20 ¹³ / ₁₆	529	1 to 3 shelves	12WB3C	5	2
12	305	30 ¹³ / ₁₆	783	1 to 5 shelves	12WB5C	7 ¹ / ₄	3 ¹ / ₄
18	460	11 ³ / ₄	298	1 shelf	18WB1C	3	1 ¹ / ₂
18	460	21 ⁵ / ₈	549	1 to 3 shelves	18WB3C	6	2 ³ / ₄
18	460	31 ⁵ / ₈	803	1 to 5 shelves	18WB5C	8 ¹ / ₂	4

For additional mounting brackets (single) order **Cat. No. 9975C**

Double mounting brackets are also available for use where continuous wall shelving is to be installed. **Cat. No. 9976C**



- **Wall Kit:** Kit includes two shelves, shelf supports, and mounting brackets. Wall bolts and screws not included; they must be selected according to type of wall.

Cat. No.	Shelf Length		Overall Length		Shelf Width		Overall Width		Overall Height		Approx. Pkd. Wt	
	(in.)	(mm)	(in.)	(mm)	(in.)	(mm)	(in.)	(mm)	(in.)	(mm)	(lbs.)	(kg)
12WS12C	24	610	26 ¹ / ₄	670	12	305	13	330	21	530	18 ¹ / ₂	8 ¹ / ₂
12WS32C	36	910	38 ¹ / ₄	970	12	305	13	330	21	530	25 ¹ / ₄	11 ¹ / ₂
12WS52C	48	1220	50 ¹ / ₄	1275	12	305	13	330	21	530	32	14 ³ / ₄

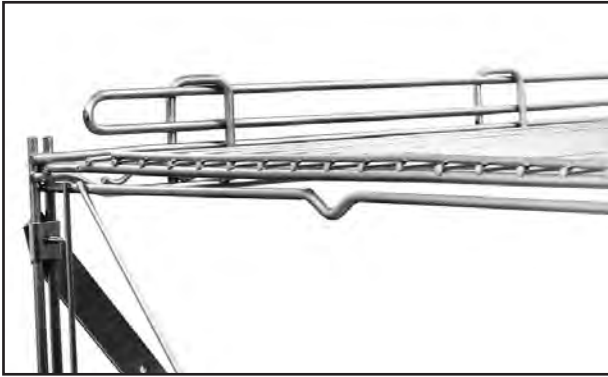
Kit packaged in one box and UPS shippable



InterMetro Industries Corporation
North Washington Street
Wilkes-Barre, PA 18705
www.metro.com



REGULAR ERECTA SHELF® SHELVING ACCESSORIES



1" (25mm) Ledge

- **1" Shelf Ledges:** To prevent items from protruding or falling off shelves, ledges can be installed on the shelf edges.

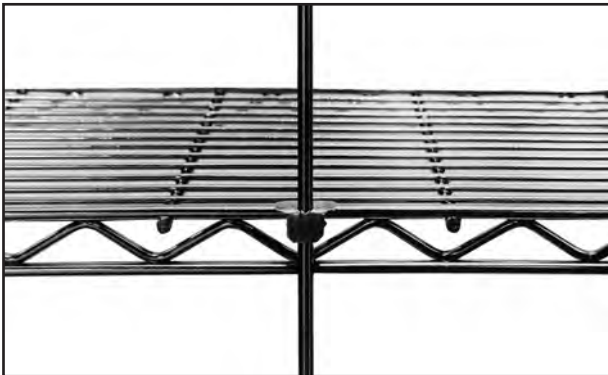
In many cases a one-inch (25mm) ledge will serve the purpose, while allowing access to the shelf from all sides. When a higher ledge is needed, the four-inch (100mm) size can be used on the back or front of the shelf.

For enclosure of the entire back of a shelving unit, rods and tabs (below) can be attached.

DIMENSIONS:

1" (25mm) Back Ledges

Length		Cat. No. Chrome	Approx. Pkd. Wt Per 1/2 Doz.	
(in.)	(mm)		(lbs.)	(kg)
24	610	L24N-1C	6	2 ³ / ₄
30	760	L30N-1C	12	5 ¹ / ₂
36	910	L36N-1C	15	7
42	1060	L42N-1C	16 ¹ / ₂	7
48	1220	L48N-1C	21	9 ¹ / ₂
60	1525	L60N-1C	22 ¹ / ₂	10



- **Rods & Tabs:** Rods hook over wires of top shelf and are attached to each of the other shelves with spring-clip tab. Each rod requires one tab for each shelf except top self. Chrome.

DIMENSIONS:

Rods

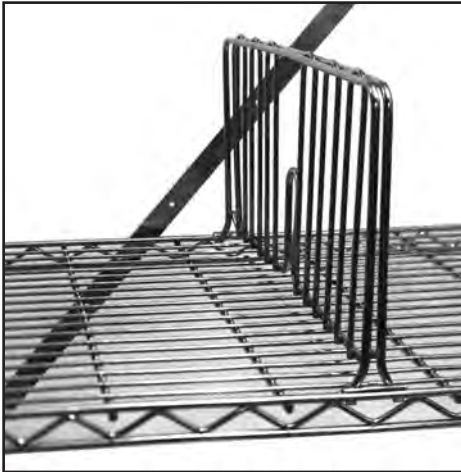
Upright Height		Rod Length		Cat. No.	Approx. Pkd. Wt	
(in.)	(mm)	(in.)	(mm)		(lbs.)	(kg)
53 ¹ / ₂	1360	52	1320	R52C	1	¹ / ₂
63 ¹ / ₂	1610	61	1550	R61C	1	¹ / ₂
73 ¹ / ₂	1870	72	1830	R72C	1 ¹ / ₄	¹ / ₂
88 ¹ / ₂	2250	86	2185	R86C	1 ¹ / ₂	³ / ₄

Tabs

Rods are shipped with sufficient tabs for a 4-shelf unit. For additional tabs order:

Wire Shelf Tab – Cat. No. 9084Z

REGULAR ERECTA SHELF® SHELVING ACCESSORIES



- **8" (203mm) Shelf Dividers:** Shelf dividers enable you to compartmentalize shelves, help keep shelf contents orderly. Because they snap into place, they can be positioned and repositioned to exact size of section needed. All models 8" (203mm) high.

Shelf Width (in.) (mm)		Cat. No. Chrome	Approx. Pkd. Wt. Per 1/2 Doz. (lbs.) (kg)	
12	305	DD12C	12	5 1/2
18	460	DD18C	13 1/2	6
24	610	DD24C	16 1/2	7 1/2

Rods and tabs can serve a similar purpose when entire unit is to be compartmentalized.

Job _____



REGULAR ERECTA SHELF® SHELVING ACCESSORIES



- **Shelf Spacers:** Where shelves are wanted at spacing other than 5" (127mm) increments, shelf spacers wedge into the upright channels to provide a solid support at the desired level. Spacers are used at outside corners, four per shelf.

	Cat. No.
Spacer	9988Z



- **Corner Brace:** When regular Erecta Shelf® units are to be joined at right angles, corner braces link shelf ends of one unit to shelf sides of the other, eliminating one upright and leaving the shelving corner open and fully usable. Two required per shelf.
Cat. No 9999Z



- **Upright Clamp:** Where regular Erecta Shelf® units are to be joined end-to-end, the upright clamp holds the adjacent uprights securely so that each unit buttresses the other.
Cat. No 9971Z



- **Foot Plate:** Replaces the leveling bolt. Used when units are to be bolted to the floor or, without bolts, when a broader foot is desired.
Cat. No 9993Z

Manufactured by:



InterMetro Industries Corporation

North Washington Street, Wilkes-Barre, PA 18705

Phone: 570-825-2741 • Fax: 570-825-2852

For Product Information Call: 1-800-433-2232

Visit Our Web Site: www.metro.com

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Submittal Sheet

12/20/2017

ITEM# 23 - ONE (1) COMPARTMENT SINK (1 EA REQ'D)

Eagle Group FN2018-1-36L14/3

Spec-Master® FN Series Sink, one compartment, 57-1/2"W x 27"D, 14/304 stainless steel top, 18" wide x 20" front-to-back x 14" deep compartment, 36" drainboard on left, 9-1/2"H backsplash with 1" upturn & tile edge, 8" O.C. splash mount faucet holes, rolled edges on front & sides, includes 3-1/2" basket drain, stainless steel crossbracing on all sides, stainless steel legs & adjustable bullet feet, NSF

The spec sheet for this item can be viewed on item 21)

ACCESSORIES

Mfr	Qty	Model	Spec
Eagle Group	1	313293	T&S Faucet, splash-mounted, 8" centers, 12" swing spout, extra heavy duty
Eagle Group	1	341189	Twist Handle Drain, 1-1/2 or 2" NPS connection
Eagle Group	1	-TB	Twist bracket, per drain

WATER

	HOT SIZE	HOT AFF	HOT GPH	COLD SIZE	COLD AFF	FILTERED SIZE	FILTERED AFF	CONDENSER INLET SIZE	CONDENSER OUTLET SIZE
1									
2	1/2"			1/2"					
3									

WASTE

	INDIRECT SIZE	DIRECT SIZE
1	1-1/2"	
2		
3	2"	

PLUMBING 1 REMARKS

(1) set of 1-1/8" faucet holes, 8" O.C.

Submittal Sheet

12/20/2017

ITEM# 24 - HAND SINK (1 EA REQ'D)

Eagle Group HSA-10-F

Hand Sink, wall mount, 13-1/2" wide x 9-3/4" front-to-back x 6-3/4" deep bowl, 304 stainless steel construction, splash mount gooseneck faucet, basket drain, deep-drawn seamless design-positive drain, inverted "V" edge, NSF

ACCESSORIES

Mfr	Qty	Model	Spec
Eagle Group	1	307120	Wrist Handles, for 303987 faucet, NSF

WATER

	HOT SIZE	HOT AFF	HOT GPH	COLD SIZE	COLD AFF	FILTERED SIZE	FILTERED AFF	CONDENSER INLET SIZE	CONDENSER OUTLET SIZE
1									

WASTE

	INDIRECT SIZE	DIRECT SIZE
1		1-1/2"



Profit from the Eagle Advantage®

Specification Sheet

Short Form Specifications

Eagle Hand Sink, model HSA-10. Constructed of type 304 stainless steel, all-welded with deep-drawn positive drain sink bowl, inverted "V" edge to prevent spillage and basket drain. Unit less faucet.

Eagle Hand Sink, model HSA-10-F. Features the same as sink #HSA-10, plus splash mounted gooseneck faucet.

Eagle Hand Sink, model HSA-10-FA. Features the same as sink #HSA-10, plus p-trap, tailpiece, and splash mounted gooseneck faucet.

Eagle Hand Sink, model HSA-10-FAW. Features the same as sink #HSA-10, plus p-trap, tailpiece, and splash mounted gooseneck faucet with wrist handles.

Eagle Hand Sink, model HSA-10-FL. Constructed of type 304 stainless steel, all-welded with deep-drawn positive drain sink bowl, inverted "V" edge to prevent spillage, polymer lever drain, and splash mounted gooseneck faucet.

Eagle Hand Sink, model HSA-10-FO. Features the same as sink #HSA-10-FL, plus polymer lever drain includes overflow.



#HSA-10-F

Item No.:	_____
Project No.:	_____
S.I.S. No.:	_____

Traditional Hand Sinks

MODELS:

- ☐ HSA-10
- ☐ HSA-10-F
- ☐ HSA-10-FAW
- ☐ HSA-10-FA
- ☐ HSA-10-FL
- ☐ HSA-10-FO

Design & Construction Features

- Heavy gauge type 304 stainless steel all-welded construction.
- Inverted "V" edge rim retards spillage.
- Unique deep-drawn positive-drain bowl assures complete drainage to meet the most stringent health code requirements.
- Water inlet: ½" (13mm) NPS.
- Drain outlet: 1½" (38mm) NPS.
- Six models to choose from.

Options / Accessories

- ☐ P-trap
- ☐ Tail piece
- ☐ End splashes
- ☐ Front skirt
- ☐ Side mount wall bracket
- ☐ MICROGARD®* antimicrobial protection

* For hand sinks #HSA-10, HSA-10-F, HSA-10-FA, and HSA-10-FAW

EAGLE GROUP

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For custom configuration or fabrication needs, contact our SpecFAB® Division.

Phone: 302-653-3000 • Fax: 302-653-3091 • e-mail: quotes@eaglegrp.com

Certifications / Approvals



AUTOQUOTES



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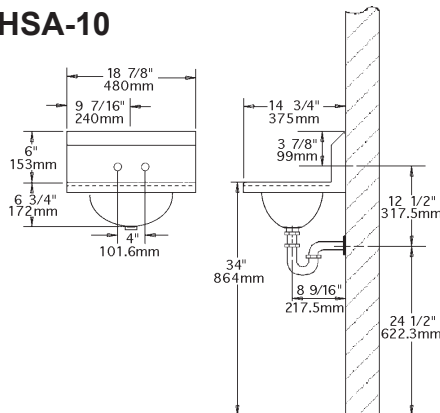


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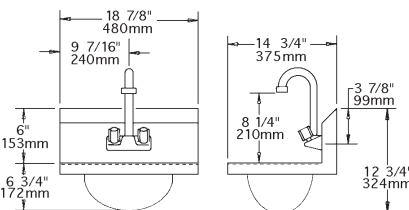
Item No.: _____
 Project No.: _____
 S.I.S. No.: _____

Traditional Hand Sinks

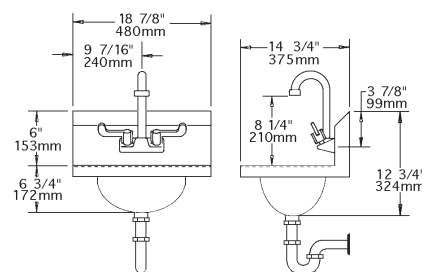
HSA-10



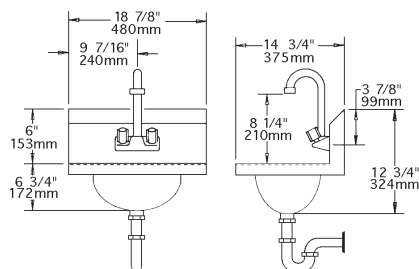
HSA-10-F



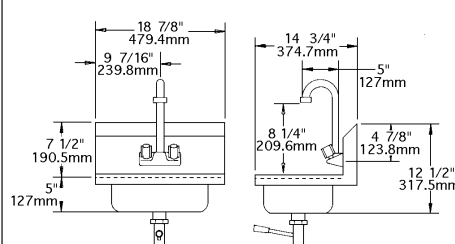
HSA-10-FAW



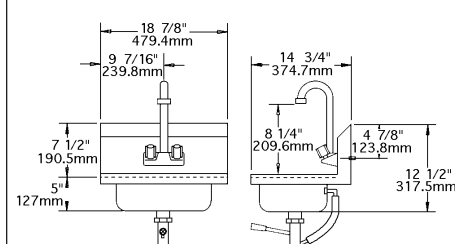
HSA-10-FA



HSA-10-FL



HSA-10-FO



model #	includes	bowl size		overall size		weight	
		width	length x depth	width	length x height	lbs.	kg
HSA-10 *	4" (102mm) centerline faucet holes, basket drain	9 3/4"	13 1/2" x 6 3/4"	14 3/4"	18 7/8" x 12 3/4"	10	4.5
HSA-10-F	faucet, basket drain	9 3/4"	13 1/2" x 6 3/4"	14 3/4"	18 7/8" x 12 3/4"	12	5.2
HSA-10-FA	faucet, p-trap, tail piece, basket drain	9 3/4"	13 1/2" x 6 3/4"	14 3/4"	18 7/8" x 12 3/4"	14	6.4
HSA-10-FAW	faucet w/wrist handles, p-trap, tail piece, basket drain	9 3/4"	13 1/2" x 6 3/4"	14 3/4"	18 7/8" x 12 3/4"	14	6.4
HSA-10-FL	faucet, polymer lever drain	10"	14" x 5"	14 3/4"	18 7/8" x 12 1/2"	15	6.6
HSA-10-FO	faucet, polymer lever drain w/overflow	10"	14" x 5"	14 3/4"	18 7/8" x 12 1/2"	13	5.9

* To order hand sink with no faucet holes, add suffix "-NH" to model number (example: HSA-10-NH).

EAGLE GROUP

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Rev. 02/13



Profit from the Eagle Advantage®

Specification Sheet



splash mounted
faucet



deck mounted
faucet



deck mounted faucet
with 8" spout



battery-powered
electronic-eye faucet



T&S electronic-eye
faucet



splash
mounted
spout



short 90°

Hand Sink Accessories & Options —Faucets & Valves

FAUCETS

STANDARD FAUCETS

All standard faucets feature 4" (102mm) center, except #313075.

model #	description
303987	splash mounted, gooseneck spout
307120	wrist handles for faucet #303987
306495	splash mounted with wrist handles, gooseneck spout
302004	deck mounted, gooseneck spout
301248	deck mounted, 8" (203mm) spout
318495	drinking bubbler
313075	splash mounted, gooseneck spout, 8" (203mm) center

REPAIR KIT FOR STANDARD FAUCETS

For faucets #303987, 302004, and 301248 only.

model #	description
368421	hot/cold ceramic cartridges

BATTERY-POWERED ELECTRONIC-EYE FAUCETS

Used as a replacement for Hand Sinks with AC-Powered Electronic-Eye Faucet (EG20.42) by adding suffix "-B" when ordering hand sink, or as a replacement faucet for Hand Sinks with Battery-Powered Electronic-Eye Faucet (EG20.49) via model numbers below. Comes with Temperature Adjustment Valve (see back page).

model #	description
326014	splash-mount; (4) "AA" batteries; built-in low-battery indicator
356128	upgrade: T&S splash-mount electric-eye faucet, with batteries and AC adapter for dual operation. With AC plugged in, faucet automatically switches to AC power to conserve batteries.

SPOUT ASSEMBLY

model #	description
312162	splash-mounted replacement gooseneck for 120V AC electronic or pedal-operated models

SHORT 90° FOR SPLASH MOUNT FAUCETS

model #	description
376740	set of two, 1/2" NPT female x male

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AUTOQUOTES



EG20.52A Rev. 11/15



Profit from the Eagle Advantage®

Item No.: _____
 Project No.: _____
 S.I.S. No.: _____

Hand Sink Accessories & Options—Faucets & Valves



emergency
eye wash unit
#326272



#377563



anti-scald valve
#373848



anti-scald valve
#326696



tempering valve



temperature
adjustment valve



non-temperature
adjustment valve



shut-off valve



foot pedal valve
(double pedal)



foot pedal valve
(single pedal)



knee pedal valve
(double pedal)

FAUCET-MOUNT EMERGENCY EYE WASH UNITS

Fits in place of standard aerator on spout.

IMPORTANT: If anti-scald valve is needed, order #373848 only.

model #	description
326272	pull valve activation, includes two dust covers, chrome
377563	rotate to activate, "eye-pod" design, polished stainless

VALVES

ANTI-SCALD VALVE FOR EMERGENCY EYE WASH UNIT #326272

Meets ANSI Z358.1 and ASSE 1071 standards.

model #	description
373848	1/2" (13mm) NPT, 65°-90°F

ANTI-SCALD VALVE

Features automatic shutdown with either hot or cold water failure. ASSE 1016 and 1017 listed.

IMPORTANT: Do not use with emergency eye wash unit (#326272).

model #	description
326696	1/2" (13mm) NPT, 100°-145°F

TEMPERING VALVE

120°F maximum output. Maximum pressure of 150 psi. ASSE 1016 and 1070 listed.

model #	description
375612	thermoplastic body, 3/8" (10mm) male compression fittings, 80°F-120°F, 0.5-2.5 gpm, built-in check valve

TEMPERATURE ADJUSTMENT VALVE ("MIXING VALVE")

For hand sinks with AC-powered electronic faucet or hand sinks with single-pedal valve. Cast brass body. 3/8" (10mm) all connections.

model #	description
326015	built-in check valves to prevent backflow, adjustable screw valves to mix hot and cold

REPLACEMENT NON-ADJUSTABLE Y-INLET MIXING VALVE

Standard only on AC-powered electronic hand sinks and hand sinks with single-pedal valve. "Y" shaped single-piece component. Chrome-plated brass body.

model #	description
342938	male connections; threads are 9/16-24 UNEF

SHUT-OFF VALVE

Antibacterial surface. Screws onto faucet aerator. Polished chrome.

model #	description
349921	shut-off push valve

KNEE/FOOT PEDAL VALVES

Replacement cartridge available for all pedal valves: Model #374955.

Double Pedals		Single Pedals	description
model #	model #	model #	
300604	355994		foot pedal valve, floor mount
313481	351738		knee pedal valve

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Rev. 11/15

Submittal Sheet

12/20/2017

ITEM# 25 - DUNNAGE RACK (5 EA REQ'D)

Metro HP2236PD

Metro Bow-Tie™ Dunnage Rack, 22" x 36" x 12"H, slotted, with separate polymer tie for joining racks, corrosion proof polymer construction, NSF

The spec sheet for this item can be viewed on item 01)

Submittal Sheet

12/20/2017

ITEM# 27 - WIRE SHELVING (12 EA REQ'D)

Metro 2148NK3

Super Erecta® Shelf, wire, 48"W x 21"D, plastic split sleeves are included in each carton, Metroseal 3™ epoxy-coated corrosion-resistant finish with Microban® antimicrobial protection, NSF

The spec sheet for this item can be viewed on item 02)

ACCESSORIES

Mfr	Qty	Model	Spec
Metro	12	63UPK3	Super Erecta® SiteSelect™ Post, 61-13/16"H, for use with stem casters, Metroseal 3 epoxy coated corrosion-resistant finish with Microban® antimicrobial protection
Metro	6	5MDA	Super Erecta® Stem Caster, swivel, 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity
Metro	6	5MDBA	Super Erecta® Stem Caster, brake (foot operated), 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity, brakes are foot operated

Submittal Sheet

12/20/2017

ITEM# 28 - WIRE SHELVING (24 EA REQ'D)

Metro 2136NK3

Super Erecta® Shelf, wire, 36"W x 21"D, plastic split sleeves are included in each carton, Metroseal 3™ epoxy-coated corrosion-resistant finish with Microban® antimicrobial protection, NSF

The spec sheet for this item can be viewed on item 02)

ACCESSORIES

Mfr	Qty	Model	Spec
Metro	24	63UPK3	Super Erecta® SiteSelect™ Post, 61-13/16"H, for use with stem casters, Metroseal 3 epoxy coated corrosion-resistant finish with Microban® antimicrobial protection
Metro	12	5MDA	Super Erecta® Stem Caster, swivel, 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity
Metro	12	5MDBA	Super Erecta® Stem Caster, brake (foot operated), 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity, brakes are foot operated

Submittal Sheet

12/20/2017

ITEM# 29 - WIRE SHELVING (8 EA REQ'D)

Metro 2154NK3

Super Erecta® Shelf, wire, 54"W x 21"D, plastic split sleeves are included in each carton, Metroseal 3™ epoxy-coated corrosion-resistant finish with Microban® antimicrobial protection, NSF

The spec sheet for this item can be viewed on item 02)

ACCESSORIES

Mfr	Qty	Model	Spec
Metro	8	63UPK3	Super Erecta® SiteSelect™ Post, 61-13/16"H, for use with stem casters, Metroseal 3 epoxy coated corrosion-resistant finish with Microban® antimicrobial protection
Metro	4	5MDA	Super Erecta® Stem Caster, swivel, 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity
Metro	4	5MDBA	Super Erecta® Stem Caster, brake (foot operated), 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity, brakes are foot operated

Submittal Sheet

12/20/2017

ITEM# 30 - WIRE SHELVING (8 EA REQ'D)

Metro 2142NK3

Super Erecta® Shelf, wire, 42"W x 21"D, plastic split sleeves are included in each carton, Metroseal 3™ epoxy-coated corrosion-resistant finish with Microban® antimicrobial protection, NSF

The spec sheet for this item can be viewed on item 02)

ACCESSORIES

Mfr	Qty	Model	Spec
Metro	8	63UPK3	Super Erecta® SiteSelect™ Post, 61-13/16"H, for use with stem casters, Metroseal 3 epoxy coated corrosion-resistant finish with Microban® antimicrobial protection
Metro	4	5MDA	Super Erecta® Stem Caster, swivel, 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity
Metro	4	5MDBA	Super Erecta® Stem Caster, brake (foot operated), 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity, brakes are foot operated

Submittal Sheet

12/20/2017

ITEM# 31 - WIRE SHELVING (8 EA REQ'D)

Metro 2436NK3

Super Erecta® Shelf, wire, 36"W x 24"D, plastic split sleeves are included in each carton, Metroseal 3™ epoxy-coated corrosion-resistant finish with Microban® antimicrobial protection, NSF

The spec sheet for this item can be viewed on item 02)

ACCESSORIES

Mfr	Qty	Model	Spec
Metro	8	63UPK3	Super Erecta® SiteSelect™ Post, 61-13/16"H, for use with stem casters, Metroseal 3 epoxy coated corrosion-resistant finish with Microban® antimicrobial protection
Metro	4	5MDA	Super Erecta® Stem Caster, swivel, 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity
Metro	4	5MDBA	Super Erecta® Stem Caster, brake (foot operated), 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity, brakes are foot operated

Submittal Sheet

12/20/2017

ITEM# 32 - WIRE SHELVING (4 EA REQ'D)

Metro 2142NK3

Super Erecta® Shelf, wire, 42"W x 21"D, plastic split sleeves are included in each carton, Metroseal 3™ epoxy-coated corrosion-resistant finish with Microban® antimicrobial protection, NSF

The spec sheet for this item can be viewed on item 02)

ACCESSORIES

Mfr	Qty	Model	Spec
Metro	4	63UPK3	Super Erecta® SiteSelect™ Post, 61-13/16"H, for use with stem casters, Metroseal 3 epoxy coated corrosion-resistant finish with Microban® antimicrobial protection
Metro	2	5MDA	Super Erecta® Stem Caster, swivel, 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity
Metro	2	5MDBA	Super Erecta® Stem Caster, brake (foot operated), 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity, brakes are foot operated

Submittal Sheet

12/20/2017

ITEM# 33 - WIRE SHELVING (4 EA REQ'D)

Metro 2160NK3

Super Erecta® Shelf, wire, 60"W x 21"D, plastic split sleeves are included in each carton, Metroseal 3™ epoxy-coated corrosion-resistant finish with Microban® antimicrobial protection, NSF

The spec sheet for this item can be viewed on item 02)

ACCESSORIES

Mfr	Qty	Model	Spec
Metro	4	63UPK3	Super Erecta® SiteSelect™ Post, 61-13/16"H, for use with stem casters, Metroseal 3 epoxy coated corrosion-resistant finish with Microban® antimicrobial protection
Metro	2	5MDA	Super Erecta® Stem Caster, swivel, 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity
Metro	2	5MDBA	Super Erecta® Stem Caster, brake (foot operated), 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity, brakes are foot operated

Submittal Sheet

12/20/2017

ITEM# 34 - WIRE SHELVING (16 EA REQ'D)

Metro 2472BR

Super Erecta® Shelf, wire, 72"W x 24"D, Bright (zinc) finish, plastic split sleeves are included in each carton, NSF
The spec sheet for this item can be viewed on item 02)

ACCESSORIES

Mfr	Qty	Model	Spec
Metro	16	63UP	Super Erecta® Post, 61-13/16"H, for use with stem casters, chrome plated finish
Metro	8	5MDA	Super Erecta® Stem Caster, swivel, 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity
Metro	8	5MDBA	Super Erecta® Stem Caster, brake (foot operated), 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity, brakes are foot operated

Submittal Sheet

12/20/2017

ITEM# 35 - WIRE SHELVING (24 EA REQ'D)

Metro 2460BR

Super Erecta® Shelf, wire, 60"W x 24"D, Bright (zinc) finish, plastic split sleeves are included in each carton, NSF
The spec sheet for this item can be viewed on item 02)

ACCESSORIES

Mfr	Qty	Model	Spec
Metro	24	63UP	Super Erecta® Post, 61-13/16"H, for use with stem casters, chrome plated finish
Metro	12	5MDA	Super Erecta® Stem Caster, swivel, 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity
Metro	12	5MDBA	Super Erecta® Stem Caster, brake (foot operated), 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity, brakes are foot operated

Submittal Sheet

12/20/2017

ITEM# 36 - WIRE SHELVING (8 EA REQ'D)

Metro 2148BR

Super Erecta® Shelf, wire, 48"W x 21"D, Bright (zinc) finish, plastic split sleeves are included in each carton, NSF
The spec sheet for this item can be viewed on item 02)

ACCESSORIES

Mfr	Qty	Model	Spec
Metro	8	63UP	Super Erecta® Post, 61-13/16"H, for use with stem casters, chrome plated finish
Metro	4	5MDA	Super Erecta® Stem Caster, swivel, 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity
Metro	4	5MDBA	Super Erecta® Stem Caster, brake (foot operated), 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity, brakes are foot operated

Submittal Sheet

12/20/2017

ITEM# 37 - WIRE SHELVING (8 EA REQ'D)

Metro 2448BR

Super Erecta® Shelf, wire, 48"W x 24"D, Bright (zinc) finish, plastic split sleeves are included in each carton, NSF
The spec sheet for this item can be viewed on item 02)

ACCESSORIES

Mfr	Qty	Model	Spec
Metro	8	63UP	Super Erecta® Post, 61-13/16"H, for use with stem casters, chrome plated finish
Metro	4	5MDA	Super Erecta® Stem Caster, swivel, 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity
Metro	4	5MDBA	Super Erecta® Stem Caster, brake (foot operated), 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity, brakes are foot operated

Submittal Sheet

12/20/2017

ITEM# 38 - WIRE SHELVING (8 EA REQ'D)

Metro 2436BR

Super Erecta® Shelf, wire, 36"W x 24"D, Bright (zinc) finish, plastic split sleeves are included in each carton, NSF
The spec sheet for this item can be viewed on item 02)

ACCESSORIES

Mfr	Qty	Model	Spec
Metro	8	63UP	Super Erecta® Post, 61-13/16"H, for use with stem casters, chrome plated finish
Metro	4	5MDA	Super Erecta® Stem Caster, swivel, 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity
Metro	4	5MDBA	Super Erecta® Stem Caster, brake (foot operated), 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity, brakes are foot operated

Submittal Sheet

12/20/2017

ITEM# 39 - WIRE SHELVING (36 EA REQ'D)

Metro 2160BR

Super Erecta® Shelf, wire, 60"W x 21"D, Bright (zinc) finish, plastic split sleeves are included in each carton, NSF
The spec sheet for this item can be viewed on item 02)

ACCESSORIES

Mfr	Qty	Model	Spec
Metro	36	63UP	Super Erecta® Post, 61-13/16"H, for use with stem casters, chrome plated finish
Metro	18	5MDA	Super Erecta® Stem Caster, swivel, 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity
Metro	18	5MDBA	Super Erecta® Stem Caster, brake (foot operated), 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity, brakes are foot operated

Submittal Sheet

12/20/2017

ITEM# 40 - WIRE SHELVING (8 EA REQ'D)

Metro 2148BR

Super Erecta® Shelf, wire, 48"W x 21"D, Bright (zinc) finish, plastic split sleeves are included in each carton, NSF
The spec sheet for this item can be viewed on item 02)

ACCESSORIES

Mfr	Qty	Model	Spec
Metro	8	63UP	Super Erecta® Post, 61-13/16"H, for use with stem casters, chrome plated finish
Metro	4	5MDA	Super Erecta® Stem Caster, swivel, 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity
Metro	4	5MDBA	Super Erecta® Stem Caster, brake (foot operated), 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity, brakes are foot operated

Submittal Sheet

12/20/2017

ITEM# 41 - WIRE SHELVING (8 EA REQ'D)

Metro 2130BR

Super Erecta® Shelf, wire, 30"W x 21"D, Bright (zinc) finish, plastic split sleeves are included in each carton, NSF
The spec sheet for this item can be viewed on item 02)

ACCESSORIES

Mfr	Qty	Model	Spec
Metro	8	63UP	Super Erecta® Post, 61-13/16"H, for use with stem casters, chrome plated finish
Metro	4	5MDA	Super Erecta® Stem Caster, swivel, 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity
Metro	4	5MDBA	Super Erecta® Stem Caster, brake (foot operated), 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity, brakes are foot operated

Submittal Sheet

12/20/2017

ITEM# 42 - WIRE SHELVING (8 EA REQ'D)

Metro 2172BR

Super Erecta® Shelf, wire, 72"W x 21"D, Bright (zinc) finish, plastic split sleeves are included in each carton, NSF
The spec sheet for this item can be viewed on item 02)

ACCESSORIES

Mfr	Qty	Model	Spec
Metro	8	63UP	Super Erecta® Post, 61-13/16"H, for use with stem casters, chrome plated finish
Metro	4	5MDA	Super Erecta® Stem Caster, swivel, 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity
Metro	4	5MDBA	Super Erecta® Stem Caster, brake (foot operated), 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity, brakes are foot operated

Submittal Sheet

12/20/2017

ITEM# 43 - COLD STORAGE ASSEMBLY (1 REQ'D)

American Panel CUSTOM

Submittal Sheet

12/20/2017

ITEM# 43.1 - LIGHT, COOLER (1 REQ'D)

Custom CUSTOM

Submittal Sheet

12/20/2017

ITEM# 43.2 - COOLER EVAPORATOR (1 REQ'D)

Custom CUSTOM

Submittal Sheet

12/20/2017

ITEM# 43.3 - COOLER CONDENSOR (1 REQ'D)

Custom CUSTOM

Submittal Sheet

12/20/2017

ITEM# 43.4 - LIGHT, COOLER (1 REQ'D)

Custom CUSTOM

Submittal Sheet

12/20/2017

ITEM# 43.5 - COOLER EVAPORATOR (1 REQ'D)

Custom CUSTOM

Submittal Sheet

12/20/2017

ITEM# 43.6 - COOLER CONDENSOR (1 REQ'D)

Custom CUSTOM

Submittal Sheet

12/20/2017

ITEM# 43.7 - LIGHT, COOLER (1 REQ'D)

Custom CUSTOM

Submittal Sheet

12/20/2017

ITEM# 43.8 - COOLER EVAPORATOR (1 REQ'D)

Custom CUSTOM

Submittal Sheet

12/20/2017

ITEM# 43.9 - COOLER CONDENSOR (1 REQ'D)

Custom CUSTOM

Submittal Sheet

12/20/2017

ITEM# 44.1 - WIRE SHELVING (8 EA REQ'D)

Metro 1860NK3

Super Erecta® Shelf, wire, 60"W x 18"D, plastic split sleeves are included in each carton, Metroseal 3™ epoxy-coated corrosion-resistant finish with Microban® antimicrobial protection, NSF

The spec sheet for this item can be viewed on item 02)

ACCESSORIES

Mfr	Qty	Model	Spec
Metro	8	63UPK3	Super Erecta® SiteSelect™ Post, 61-13/16"H, for use with stem casters, Metroseal 3 epoxy coated corrosion-resistant finish with Microban® antimicrobial protection
Metro	4	5MDA	Super Erecta® Stem Caster, swivel, 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity
Metro	4	5MDBA	Super Erecta® Stem Caster, brake (foot operated), 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity, brakes are foot operated

Submittal Sheet

12/20/2017

ITEM# 44.2 - WIRE SHELVING (4 EA REQ'D)

Metro 2142NK3

Super Erecta® Shelf, wire, 42"W x 21"D, plastic split sleeves are included in each carton, Metroseal 3™ epoxy-coated corrosion-resistant finish with Microban® antimicrobial protection, NSF

The spec sheet for this item can be viewed on item 02)

ACCESSORIES

Mfr	Qty	Model	Spec
Metro	4	63UPK3	Super Erecta® SiteSelect™ Post, 61-13/16"H, for use with stem casters, Metroseal 3 epoxy coated corrosion-resistant finish with Microban® antimicrobial protection
Metro	2	5MDA	Super Erecta® Stem Caster, swivel, 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity
Metro	2	5MDBA	Super Erecta® Stem Caster, brake (foot operated), 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity, brakes are foot operated

Submittal Sheet

12/20/2017

ITEM# 44.3 - WIRE SHELVING (4 EA REQ'D)

Metro 2148NK3

Super Erecta® Shelf, wire, 48"W x 21"D, plastic split sleeves are included in each carton, Metroseal 3™ epoxy-coated corrosion-resistant finish with Microban® antimicrobial protection, NSF

The spec sheet for this item can be viewed on item 02)

ACCESSORIES

Mfr	Qty	Model	Spec
Metro	4	63UPK3	Super Erecta® SiteSelect™ Post, 61-13/16"H, for use with stem casters, Metroseal 3 epoxy coated corrosion-resistant finish with Microban® antimicrobial protection
Metro	2	5MDA	Super Erecta® Stem Caster, swivel, 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity
Metro	2	5MDBA	Super Erecta® Stem Caster, brake (foot operated), 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity, brakes are foot operated

Submittal Sheet

12/20/2017

ITEM# 44.4 - WIRE SHELVING (8 EA REQ'D)

Metro 2160NK3

Super Erecta® Shelf, wire, 60"W x 21"D, plastic split sleeves are included in each carton, Metroseal 3™ epoxy-coated corrosion-resistant finish with Microban® antimicrobial protection, NSF

The spec sheet for this item can be viewed on item 02)

ACCESSORIES

Mfr	Qty	Model	Spec
Metro	8	63UPK3	Super Erecta® SiteSelect™ Post, 61-13/16"H, for use with stem casters, Metroseal 3 epoxy coated corrosion-resistant finish with Microban® antimicrobial protection
Metro	4	5MDA	Super Erecta® Stem Caster, swivel, 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity
Metro	4	5MDBA	Super Erecta® Stem Caster, brake (foot operated), 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity, brakes are foot operated

Submittal Sheet

12/20/2017

ITEM# 44.5 - WIRE SHELVING (4 EA REQ'D)

Metro 1854NK3

Super Erecta® Shelf, wire, 54"W x 18"D, plastic split sleeves are included in each carton, Metroseal 3™ epoxy-coated corrosion-resistant finish with Microban® antimicrobial protection, NSF

The spec sheet for this item can be viewed on item 02)

ACCESSORIES

Mfr	Qty	Model	Spec
Metro	4	63UPK3	Super Erecta® SiteSelect™ Post, 61-13/16"H, for use with stem casters, Metroseal 3 epoxy coated corrosion-resistant finish with Microban® antimicrobial protection
Metro	2	5MDA	Super Erecta® Stem Caster, swivel, 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity
Metro	2	5MDBA	Super Erecta® Stem Caster, brake (foot operated), 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity, brakes are foot operated

Submittal Sheet

12/20/2017

ITEM# 44.6 - WIRE SHELVING (16 EA REQ'D)

Metro 1448NK3

Super Erecta® Shelf, wire, 48"W x 14"D, plastic split sleeves are included in each carton, Metroseal 3™ epoxy-coated corrosion-resistant finish with Microban® antimicrobial protection, NSF

The spec sheet for this item can be viewed on item 02)

ACCESSORIES

Mfr	Qty	Model	Spec
Metro	16	63UPK3	Super Erecta® SiteSelect™ Post, 61-13/16"H, for use with stem casters, Metroseal 3 epoxy coated corrosion-resistant finish with Microban® antimicrobial protection
Metro	8	5MDA	Super Erecta® Stem Caster, swivel, 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity
Metro	8	5MDBA	Super Erecta® Stem Caster, brake (foot operated), 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity, brakes are foot operated

Submittal Sheet

12/20/2017

ITEM# 44.7 - WIRE SHELVING (12 EA REQ'D)

Metro 2154NK3

Super Erecta® Shelf, wire, 54"W x 21"D, plastic split sleeves are included in each carton, Metroseal 3™ epoxy-coated corrosion-resistant finish with Microban® antimicrobial protection, NSF

The spec sheet for this item can be viewed on item 02)

ACCESSORIES

Mfr	Qty	Model	Spec
Metro	12	63UPK3	Super Erecta® SiteSelect™ Post, 61-13/16"H, for use with stem casters, Metroseal 3 epoxy coated corrosion-resistant finish with Microban® antimicrobial protection
Metro	6	5MDA	Super Erecta® Stem Caster, swivel, 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity
Metro	6	5MDBA	Super Erecta® Stem Caster, brake (foot operated), 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity, brakes are foot operated

Submittal Sheet

12/20/2017

ITEM# 44.8 - WIRE SHELVING (8 EA REQ'D)

Metro 1848NK3

Super Erecta® Shelf, wire, 48"W x 18"D, plastic split sleeves are included in each carton, Metroseal 3™ epoxy-coated corrosion-resistant finish with Microban® antimicrobial protection, NSF

The spec sheet for this item can be viewed on item 02)

ACCESSORIES

Mfr	Qty	Model	Spec
Metro	8	63UPK3	Super Erecta® SiteSelect™ Post, 61-13/16"H, for use with stem casters, Metroseal 3 epoxy coated corrosion-resistant finish with Microban® antimicrobial protection
Metro	4	5MDA	Super Erecta® Stem Caster, swivel, 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity
Metro	4	5MDBA	Super Erecta® Stem Caster, brake (foot operated), 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity, brakes are foot operated

Submittal Sheet

12/20/2017

ITEM# 44.9 - WIRE SHELVING (4 EA REQ'D)

Metro 2148NK3

Super Erecta® Shelf, wire, 48"W x 21"D, plastic split sleeves are included in each carton, Metroseal 3™ epoxy-coated corrosion-resistant finish with Microban® antimicrobial protection, NSF

The spec sheet for this item can be viewed on item 02)

ACCESSORIES

Mfr	Qty	Model	Spec
Metro	4	63UPK3	Super Erecta® SiteSelect™ Post, 61-13/16"H, for use with stem casters, Metroseal 3 epoxy coated corrosion-resistant finish with Microban® antimicrobial protection
Metro	2	5MDA	Super Erecta® Stem Caster, swivel, 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity
Metro	2	5MDBA	Super Erecta® Stem Caster, brake (foot operated), 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity, brakes are foot operated

Submittal Sheet

12/20/2017

ITEM# 44.10 - WIRE SHELVING (16 EA REQ'D)

Metro 1836NK3

Super Erecta® Shelf, wire, 36"W x 18"D, plastic split sleeves are included in each carton, Metroseal 3™ epoxy-coated corrosion-resistant finish with Microban® antimicrobial protection, NSF

The spec sheet for this item can be viewed on item 02)

ACCESSORIES

Mfr	Qty	Model	Spec
Metro	16	63UPK3	Super Erecta® SiteSelect™ Post, 61-13/16"H, for use with stem casters, Metroseal 3 epoxy coated corrosion-resistant finish with Microban® antimicrobial protection
Metro	8	5MDA	Super Erecta® Stem Caster, swivel, 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity
Metro	8	5MDBA	Super Erecta® Stem Caster, brake (foot operated), 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity, brakes are foot operated

Submittal Sheet

12/20/2017

ITEM# 44.11 - WIRE SHELVING (4 EA REQ'D)

Metro 1460NK3

Super Erecta® Shelf, wire, 60"W x 14"D, plastic split sleeves are included in each carton, Metroseal 3™ epoxy-coated corrosion-resistant finish with Microban® antimicrobial protection, NSF

The spec sheet for this item can be viewed on item 02)

ACCESSORIES

Mfr	Qty	Model	Spec
Metro	4	63UPK3	Super Erecta® SiteSelect™ Post, 61-13/16"H, for use with stem casters, Metroseal 3 epoxy coated corrosion-resistant finish with Microban® antimicrobial protection
Metro	2	5MDA	Super Erecta® Stem Caster, swivel, 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity
Metro	2	5MDBA	Super Erecta® Stem Caster, brake (foot operated), 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity, brakes are foot operated

Submittal Sheet

12/20/2017

ITEM# 45 - ICE BIN FOR ICE MACHINES (1 EA REQ'D)

Hoshizaki B-500SF

Ice Bin, 30"W, top-hinged front-opening door, 500-lb ice storage capacity, for top-mounted ice maker, stainless steel exterior, painted legs included, protected with H-GUARD Plus Antimicrobial Agent, ETL, ETL-Sanitation

ACCESSORIES

Mfr	Qty	Model	Spec
Hoshizaki	1		Warranty: 3-Year parts & labor for bin
Hoshizaki	1	LP-6 LEG	Leg Package, (4) x 6" stainless steel legs

WATER

	HOT SIZE	HOT AFF	HOT GPH	COLD SIZE	COLD AFF	FILTERED SIZE	FILTERED AFF	CONDENSER INLET SIZE	CONDENSER OUTLET SIZE
1									

WASTE

	INDIRECT SIZE	DIRECT SIZE
1	3/4"	



PF/SF Bins

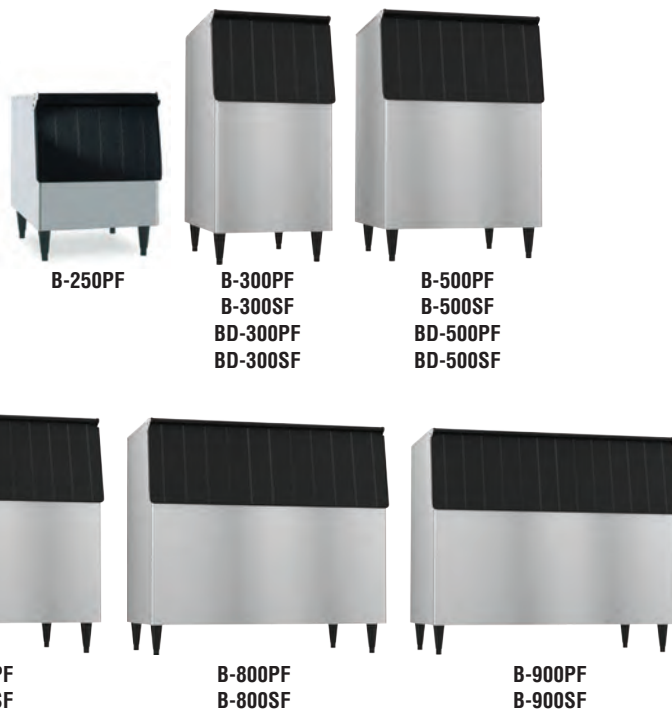
ICE STORAGE BIN SERIES




Item #: _____
 Project: _____
 Qty: _____
 AIA#: _____

PF - PVC Coated Galvanized Steel Finish

SF - Stainless Steel Finish



Features

- ▶ Protected by H-GUARD Plus Antimicrobial Agent 
 - ▶ Polyethylene bin liner for sanitary storage
 - ▶ Sturdy construction for side-by-side or stacked ice machine installation
 - Ice storage capacity from 250 lbs. up to 900 lbs.
 - Both surfaces are designed for easy cleaning
 - Long lasting attractive appearance
 - Foamed-in-place polyurethane insulation, in all bin walls and bottom, provides dependable ice storage
 - H-GUARD Plus Antimicrobial adds extra protection to the ice scoop (included)
- ### BD Bins
- Fit 24" - 24 1/2" deep ice machine without top kit extension

BD Bins

Warranty:

2 Year Parts & Labor (Production prior to January 2012)

3 Year Parts & Labor (Production January 2012 and after)

Valid in United States, Canada, Puerto Rico and U.S. Territories. Contact factory for warranty in other countries.



CANADIAN ENERGY
PERFORMANCE VERIFIED
RENDIMENT ENERGETIQUE VERIFIE



Model Number	Exterior Dimensions W x D x H*	Application Storage Capacity †	Cubic Volume	Interior Dimensions W x D x H*	Shipping Weight
B-250PF	30" x 32 ^{1/2} " x 33 ^{3/8} "	250 lbs.	10.30 ft ³	27 ^{1/10} " x 27 ^{7/10} " x 23 ^{7/10} "	130 lbs.
B(D)-300PF/SF	22" x 32 ^{1/2} " x 46"	300 lbs.	11.51 ft ³	19 ^{1/10} " x 27 ^{7/10} " x 37 ^{3/5} "	135 lbs.
B(D)-500PF/SF	30" x 32 ^{1/2} " x 46"	500 lbs.	16.33 ft ³	27 ^{1/10} " x 27 ^{7/10} " x 37 ^{3/5} "	155 lbs.
B-700PF/SF	44" x 32 ^{1/2} " x 46"	700 lbs.	24.77 ft ³	41 ^{1/10} " x 27 ^{7/10} " x 37 ^{3/5} "	200 lbs.
B-800PF/SF	48" x 32 ^{1/2} " x 46"	800 lbs.	26.90 ft ³	45 ^{1/10} " x 27 ^{7/10} " x 37 ^{3/5} "	210 lbs.
B-900PF/SF	52" x 32 ^{1/2} " x 46"	900 lbs.	29.59 ft ³	49 ^{1/10} " x 27 ^{7/10} " x 37 ^{3/5} "	220 lbs.

*Height includes 6" legs

† Capacity based on volume x 30 lb/ft³ average density of ice.

Printed in the U.S.A.

Hoshizaki reserves the right to change specifications without notice.



PF/SF Bins

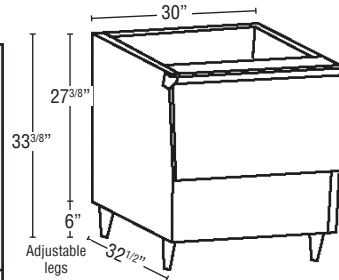
ICE STORAGE BIN SERIES



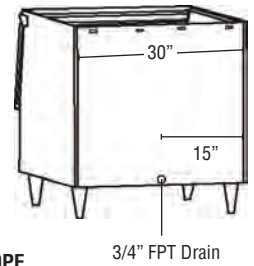
PF/SF Bins
11/27/17
Item # 13163

Ice Machine Model Application

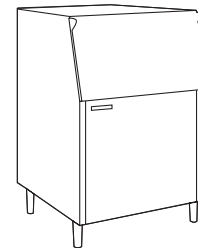
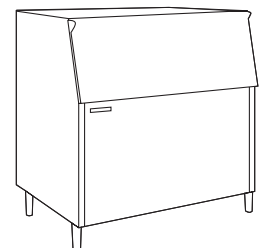
Bins	22" Width KM-340M KM-515M KM-600M KM-650M F-450M F-801M F-1002M	22" Width KMD-410M† KMS-822M† FD-650M-C† FD-1002M-C†	30" Width KM-901M KM-1340M KM-1601M KML Series F-1501M F-2001	30" Width KMD-460M† KMD-530M† KMD-850M† KMD-901MRH KMD-901MWH KMS-1401M* KMS-2000M*	44" Width 2 KM-340M 2 KM-515M 2 KM-600M 2 KM-650M IM-500S 2 F-450M 2 F-801M 2 F-1002M	44" Width 2 KMD-410M 2 KMS-822M 2 FD-650M-C 2 FD-1002M-C	48" Width KM-1301S KM-1400S KM-1601S KM-1900S KM-2100S KM-2500S
Bins B-300PF/SF	NO TOP KIT NEEDED	N/A	N/A	N/A	N/A	N/A	N/A
Bins B-250PF B-500PF/SF	NEED HS-2033	NEED HS-2033 & HS-2129	NO TOP KIT NEEDED	NEED HS-2129	N/A	N/A	N/A
Bins B-700PF/SF	NEED HS-2035	NEED HS-2035 & HS-2130	NEED HS-2034	NEED HS-2034 & HS-2130	NO TOP KIT NEEDED	NEED HS-2130	N/A
Bins B-800PF/SF	NEED HS-2035 & HS-2032	NEED HS-2035 & HS-2132/ 2131	NEED HS-2034 & HS-2032	NEED HS-2131 & HS-2034/2032	NEED HS-2032	NEED HS-2130 & HS-2131	NO TOP KIT NEEDED
Bins B-900PF/SF	NEED HS-2035 & HS-2033	NEED HS-2035 & HS-2033/ HS-2132	NEED HS-2035	NEED HS-2132 & HS-2035	NEED HS-2033	NEED HS-2033 & HS-2132	NEED HS-2032



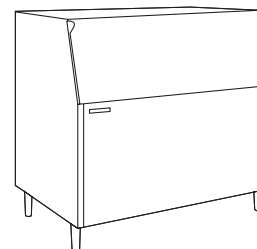
B-250PF



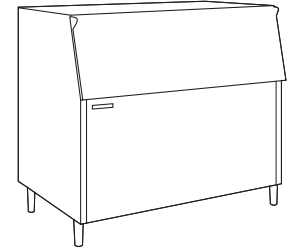
3/4" FPT Drain

B-300PF/SF
BD-300PF/SFB-500PF/SF
BD-500PF/SF

B-700PF/SF



B-800PF/SF



B-900PF/SF

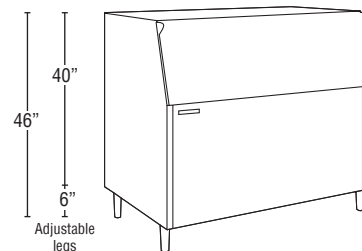
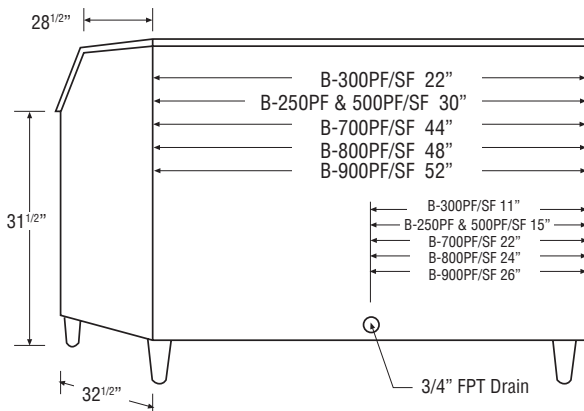
BD Bins fit 24" - 24 1/2" deep ice machine without Top Kit extension.

† BD-300PF/SF: KMD-410M, KMS-822M, FD-650M-C, FD-1002M-C

* BD-500PF/SF: KMD-460M, KMD-530, KMD-850

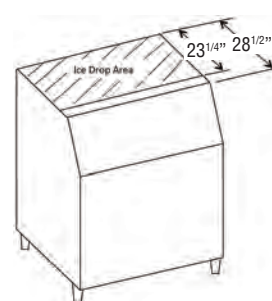
* Any KMS or FD on bin need Top Kit Extension:

- HS-2129 - for use with B-500 bins
- HS-2130 - for use with B-700 bins
- HS-2131 - for use with B-800 bins
- HS-2132 - for use with B-900 bins



Bin Height

B-300PF/SF
BD-300PF/SF
B-500PF/SF
BD-500PF/SF
B-700PF/SF
B-800PF/SF
B-900PF/SF

B Bins
Top ViewBD Bins
Top View

Submittal Sheet

12/20/2017

ITEM# 46 - NUGGET ICE MAKER (1 EA REQ'D)

Hoshizaki FD-1002MAJ-C

Ice Maker, Cubelet-Style, 22"W, air-cooled, self-contained condenser, production capacity up to 890 lb/24 hours at 70°/50° (726 lb AHRI certified at 90°/70°), stainless steel finish, H-Guard Plus antimicrobial agent, compressed cubelet style ice, Advanced CleanCycle24™, R-404A refrigerant, 115v/60/1-ph, 15.2 amps, NSF, UL, ENERGY STAR®

ACCESSORIES

Mfr	Qty	Model	Spec
Hoshizaki	1		Warranty: 3-Year parts & labor on entire machine
Hoshizaki	1		Warranty: 5-Year parts on compressor & air-cooled condenser
Hoshizaki	1	H9320-51	Water Filtration System, single configuration, 18.4" H (manifold & cartridge)

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1	115	60	1				15.2				

WATER

	HOT SIZE	HOT AFF	HOT GPH	COLD SIZE	COLD AFF	FILTERED SIZE	FILTERED AFF	CONDENSER INLET SIZE	CONDENSER OUTLET SIZE
1				1/2"					

WASTE

	INDIRECT SIZE	DIRECT SIZE
1	3/4"	

PLUMBING 1 REMARKS

Ice maker drain



FD-1002M_J-C

Modular Ice Machine
Slim-Line Dispenser Series



FD-1002M_J-C
08/29/17
Item # 13242

W x D x H
22" x 24" x 26"

FD-1002MAJ-C ★
Air-Cooled Cubelet
Shown on optional bin B-700

FD-1002MRJ-C ★
Remote Air-Cooled Cubelet



Features

- ▶ Durable stainless steel exterior
- ▶ Advanced CleanCycle24™ design 
- ▶ Stainless steel auger with greaseless bearing
- Up to 890 lbs. of ice production per 24 hours
- 2 second flush cycle every hour
- Flush cycle removes sediment for cleaner ice
- Infrared bin control for easy cleaning and reliability
- Protected by H-GUARD Plus Antimicrobial Agent 
- Ice on beverage design
- Popular cubelet ice
- R-404A Refrigerant

Available on Bins:

B-250PF B-500PF/SF B-700PF/SF B-800PF/SF B-900PF/SF

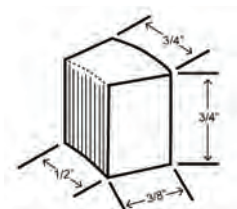
Top kit may be required; See Bin Spec Sheets.

Warranty:

3 Year Parts & Labor on entire machine. 5 Year Parts on Compressor; air-cooled condenser coil. Valid in United States, Canada, Puerto Rico and U.S. Territories. Contact factory for warranty in other countries.

Condenser	Model	ICE PRODUCTION		Type of Ice (Hardness Rating)	WATER USAGE		ELECTRICAL				Heat Rejection BTU/hr.	Shipping Weight	ENERGY STAR®
		Air / Water Temp Lbs. per 24 hours 70°/ 50°F 90°/ 70°F			Potable Gal. per 100 lbs. 90°/ 70°F	Condenser Gal. per 100 lbs. 90°/ 70°F	kWh Used per 100 lbs. 90°/ 70°F	Max. Fuse Size or HACR Circuit Breaker	Amperage	Voltage			
Air-Cooled	FD-1002MAJ-C	890	726	Cubelet (87.1)	12.0	N/A	4.57	20A	15.2A	115V/60/1	8,700	210 lbs.	★
Remote Air-Cooled	FD-1002MRJ-C	821	680	Cubelet (85.9)	12.0	N/A	4.94	20A	13.7A	115V/60/1	8,500	210 lbs.	★

Cube Dimensions*



* approximate size in inches, image not to scale

Operating Limits

- Ambient Temp Range 45 - 100°F
- Water Temp Range 45 - 90°F
- Water Pressure 10 - 113 PSIG
- Voltage Range 104-127V

Service

- Panels easily removed and all components accessible for service.
- Allow 24" (61 cm) clearance at top for removal of auger and 6" (15 cm) clearance at rear and sides for proper air circulation and ease of maintenance/service.

Plumbing

- Icemaker Water Supply Line: Minimum 1/4" Nominal ID Copper Water Tubing or Equivalent
- Icemaker Drain Line: Minimum 3/4" Nominal ID Hard Pipe or Equivalent



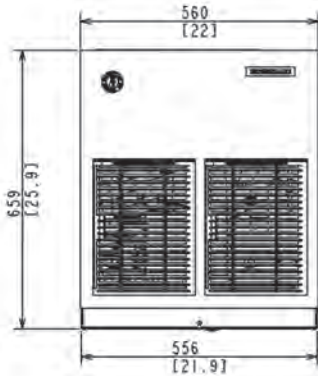
FD-1002M_J-C

Modular Ice Machine
Slim-Line Dispenser Series

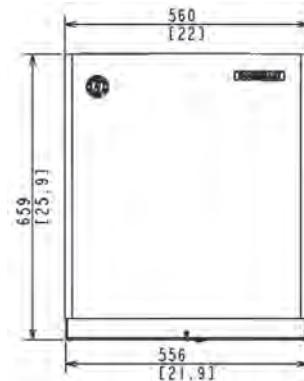


FD-1002M_J-C
08/29/17
Item # 13242

FRONT VIEW



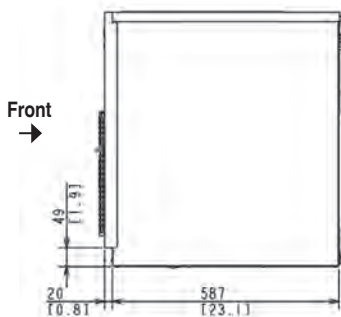
AIR-COOLED



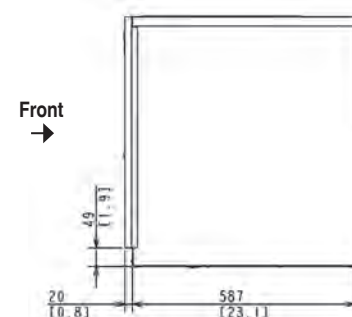
REMOTE AIR-COOLED

mm
[inch]

SIDE VIEW

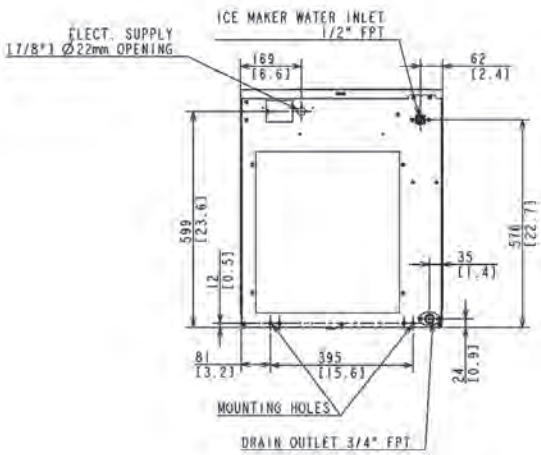


AIR-COOLED

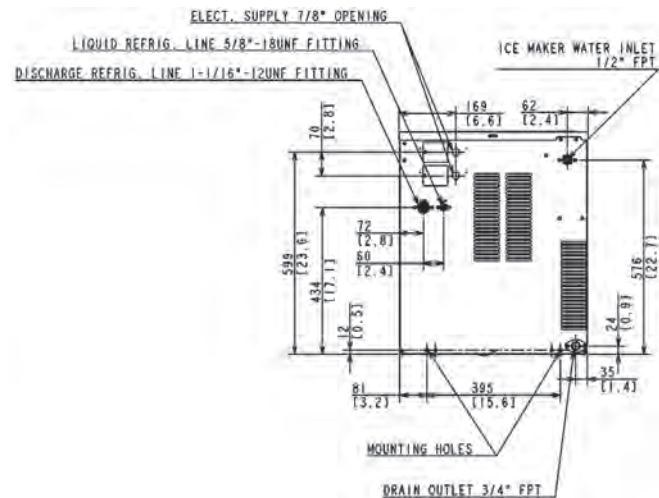


REMOTE AIR-COOLED

REAR VIEW

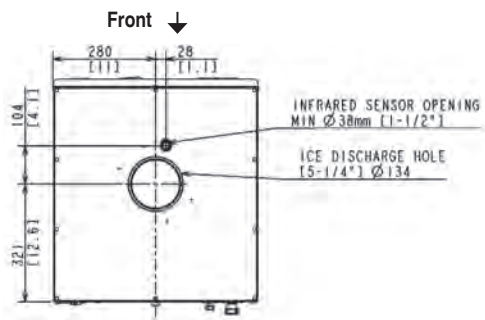


AIR-COOLED



REMOTE AIR-COOLED

BOTTOM VIEW



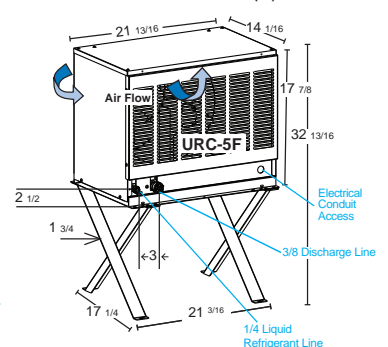
AIR-COOLED
REMOTE AIR-COOLED



Pre-Charged Tubing Kits
(Sold Separately)
20' R404-2046-2
35' R404-3546-2

Voltage supply for the URC
Remote Condenser is supplied
from the Ice Maker.
No additional circuit is required.

URC-5F Remote Condenser (Sold Separately)
(W x D x H) 21 13/16 x 14 1/16 x 32 13/16
For Use with FD-1002MRJ(-C)





WATER FILTERS

FILTRATION SYSTEMS

H9320 FILTER

Single, Double, Triple

*height includes manifold and cartridge



Single Configuration
18.4" H*



Double Configuration
19.11" H*



Triple Configuration
19.15" H*

- Keep ice makers functioning at full capacity
- 93.7% average reduction of chlorine from incoming water supply, eliminating tastes and odors of the ice
- Filters are rated as one (1) micron nominal producing crystal clear ice
- Decrease machine maintenance by reducing lime scale build-up

HOSHIZAKI H9320 FILTER

Available in single, double and triple configurations. Rated NSF Class 1, STD 42, for taste, odor and chlorine reduction and for mechanical filtration (95.6% removal of particles one (1) micron and larger in size.)

The H9320 Filters and their respective cartridges have been tested and listed by NSF only for the functions listed above. Check for compliance with state and local laws and regulations. Do not use where the water is microbiologically unsafe, or with waters of unknown quality without adequate disinfection before or after the unit. The H9320 filter can be used with water that may contain filterable cysts.



The H9320 System is tested and certified by NSF International against NSF/ANSI Standard 42 for the reduction of:

Std. No. 42 - Aesthetic effects

Aesthetic Effects

Bacteriostatic Effects

Chemical Reduction

Taste & Odor

Chlorine

Mechanical Filtration

Nominal Particulate Class 1

Item #: _____
Project: _____
Qty: _____
AIA#: _____

E-10 PREFILTER (9795-80)

E-20 PREFILTER (9795-90)



E-10
PREFILTER
(9795-80)

Recommended for
single configuration



E-20
PREFILTER
(9795-90)

Recommended for
twin and triple
configuration

E-10 and E-20 Prefilters can be used for ice. Everpure prefilters are designed to increase the life of Hoshizaki 4HC-H water filters in areas with an unusual amount of dirt in the water. With a 10 micron (nominal) rating, the economical Everpure prefilter traps much of the dirt which contributes to scale buildup in ice makers, and clogs the delicate orifices of other water-using equipment.

When you install an Everpure prefilter, the Hoshizaki 4HC-H water filters can concentrate on what they do best: remove particles one (1) micron nominal and larger in size.

Replacement Cartridges:

E-10 Prefilters: 12 pack (9534-12)
40 pack (9534-40)

E-20 Prefilters: 6 pack (9534-26)
20 pack (9534-20)



Warranty:

5 Year on all heads offered.

Valid in United States, Canada, Puerto Rico and U.S. Territories. Contact factory for warranty in other countries.

Hoshizaki reserves the right to change specifications without notice.



WATER FILTERS

FILTRATION SYSTEMS

Model Number	Description Flow Rate (Gal. per min.)	Undercounter KMs	KM Cubers	IM Cubers	Flakers	DCMs
H9320-51	Single (2 GPM)	AM-50B KM-61B KM-101B KM-151B KM-201B KM-260B	KM-340M, 515M KML-325M, 500M, 700M KMD-410M, 460M, 530M KMS-830M DKM-500B	IM-200BAA IM-500SAA	All Models	All Models
H9320-52	Twin 2 x (2 GPM)	N/A	KM-600M, 650M, 901M 1340M, 1601M 1601S, 1900S, 2200S KMD-850M, 901M KMS-822M, 1122M 1401M KMH-2000S	N/A	N/A	N/A
H9320-53	Triple 3 x (2 GPM)	N/A	KM-1301S KMS-2000M KM-2600S	N/A	N/A	N/A
H9655-11	Replacement Cartridge (1) One each					

Recommended water filter configurations based on average ice machine usage and regular filter replacement. If your operation has challenging water conditions or higher usage, then it may be necessary to use an additional filter or prefilter.

Submittal Sheet

12/20/2017

ITEM# 47 - HAND SINK (1 EA REQ'D)

Eagle Group HSA-10-F

Hand Sink, wall mount, 13-1/2" wide x 9-3/4" front-to-back x 6-3/4" deep bowl, 304 stainless steel construction, splash mount gooseneck faucet, basket drain, deep-drawn seamless design-positive drain, inverted "V" edge, NSF

The spec sheet for this item can be viewed on item 24)

ACCESSORIES

Mfr	Qty	Model	Spec
Eagle Group	1	303987	Gooseneck Faucet, standard, splash mount, 4" O.C., NSF
Eagle Group	1	307120	Wrist Handles, for 303987 faucet, NSF

WATER

	HOT SIZE	HOT AFF	HOT GPH	COLD SIZE	COLD AFF	FILTERED SIZE	FILTERED AFF	CONDENSER INLET SIZE	CONDENSER OUTLET SIZE
1									
2	1/2"			1/2"					

WASTE

	INDIRECT SIZE	DIRECT SIZE
1		1-1/2"
2		

Submittal Sheet

12/20/2017

ITEM# 48 - FLATWARE & TRAY CART (2 EA REQ'D)

Cambro TDCR12191

Dish Cart & Cutlery Rack, (12) compartments, 38-1/8"L x 22-3/4"W x 41-1/4"H, includes flatware cylinders, vinyl cover, (4) 6" swivel casters, polyethylene, granite gray, NSF

CAMBRO

Tray and Dish Cart

Cart and Cutlery Rack

Model TDCR12

Cart Only

Model TDC2029

Features & Benefits

- From kitchen to serving line, this cart streamlines self-service operations and provides compact sanitary storage. Holds a variety of plates, trays and cutlery.
- Made of single-molded, seamless, double-wall, high-density polyethylene construction.
- Easy to clean and impact resistant. Won't rust, peel, crack or dent.
- Foamed-in polyurethane insulation adds structural strength and reduces noise.
- Rounded corners protect walls.
- Available with or without detachable 12-Compartment Cutlery Rack CR12.
- Includes 12 flatware cylinders.
- Molded-in handles on both sides ensure easy & comfortable handling.
- Four 6" (15,2 cm) swivel casters, 2 w/ brakes, provide easy maneuvering.
- Convenient vinyl cover included for added protection and more sanitary storage. Cover is not NSF listed.
- No assembly required.
- Available in 6 colors.

Item No. _____

Specifier Identification No. _____

Model No. _____

Quantity _____



TDCR12



TDC2029

Approvals



CAMBRO
MANUFACTURING COMPANY
<http://www.cambro.com>

© 2008 Cambro Manufacturing Company 5801 Skylab Road, Huntington Beach, California 92647-2056-U.S.A.
Telephone (1)714 848 1555 Toll Free 800 854 7631 Customer Service 800 833 3003
LIT FCST-0102-42

Tray and Dish Cart

Cart and Cutlery Rack

Model TDCR12

Cart Only

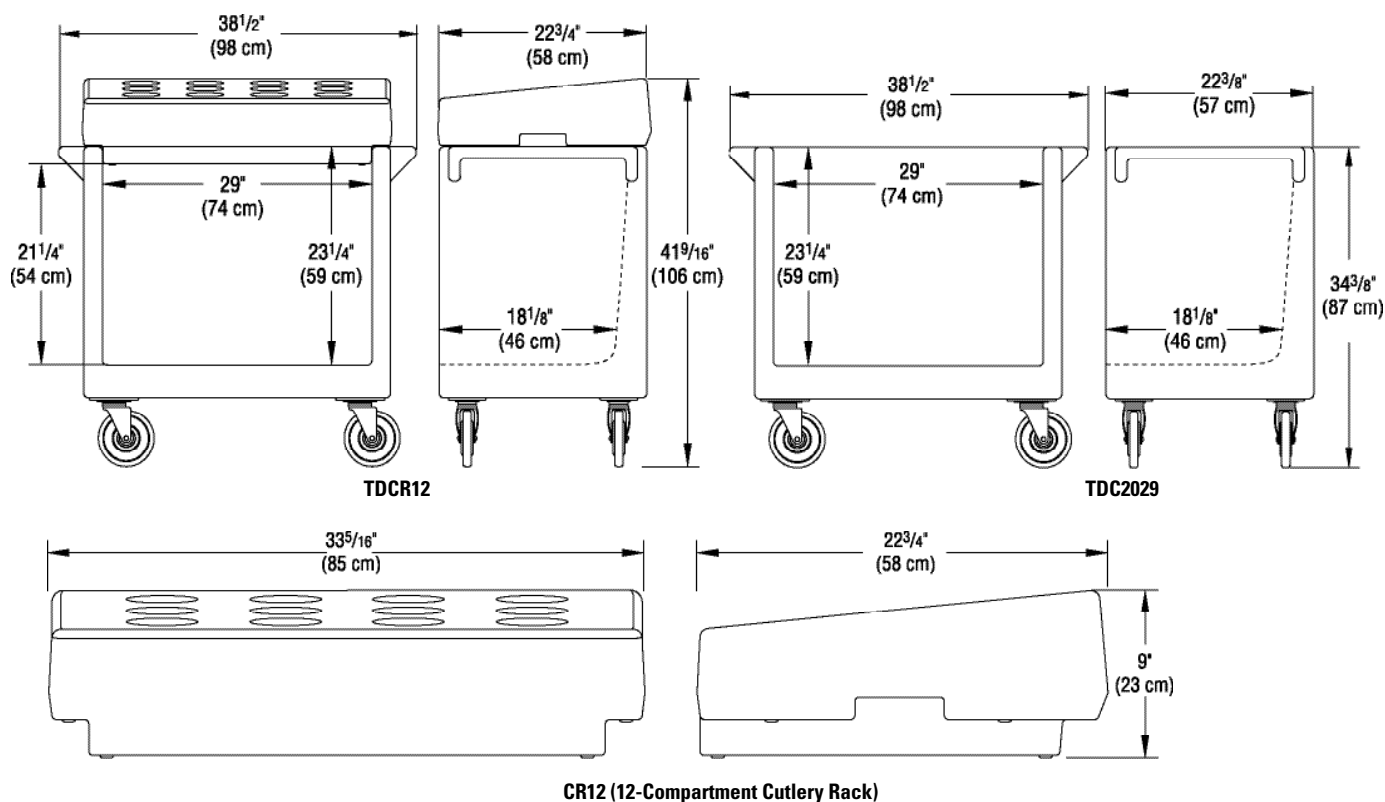
Model TDC2029

Item No. _____

Specifier Identification No. _____

Model No. _____

Quantity _____



Specifications

Dimension Tolerance: +/- 1/4" (0,64 cm)

Code	Description	Exterior Dimensions W x D x H	Case lbs./cube Kg/m ³
TDCR12	Cart & Cutlery Rack Combination	38 1/2" x 22 3/4" x 41 9/16" (98 x 58 x 106 cm)	88,5 (22,23) 40,5 (0,63)
TDC2029	Cart only	38 1/2" x 22 3/8" x 34 3/8" (98 x 57 x 87 cm)	65 (18,80) 29,5 (0,3)

Optional Accessories

12-Compartment Cutlery Rack ☐ CR12

W x D x H 33 5/16" x 22 3/4" x 9" (85 x 58 x 23 cm)

Replacement Vinyl Cover ☐ RDC2029C (1 included with cart)

*Note: Vinyl Cover is not NSF listed.

Standard Colors

- ☐ Slate Blue (401) ☐ Dark Brown (131) ☐ Coffee Beige (157)
☐ Gray (180) ☐ Granite Green (192) ☐ Granite Gray (191)

Architect Specs

The Tray and Dish Cart shall be Cambro Model..., manufactured by Cambro Mfg. Co., Huntington Beach, CA 92648 U.S.A. It shall be single-molded, seamless, double-wall, high density polyethylene and foam injected polyurethane. It shall have rounded corners and molded-in handles. It shall have four each 6" (15,2 cm) swivel casters, 2 w/ brakes, mounted on molded-in impact plates. It shall have a detachable 12-compartment Cutlery Rack. It shall have a vinyl cover included for added protection and sanitary storage and shall be available in 6 colors.

Approvals



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 Telephone (1)714 848 1555 Toll Free 800 854 7631 Customer Service 800 833 3003 Printed in USA

Submittal Sheet

12/20/2017

ITEM# 49 - SOILED DISHTABLE (1 EA REQ'D)

Eagle Group SDTR-96-14/3

Spec-Master® Soiled Dishtable, straight design, 96"W x 30"D x 43-1/2"H, right-to-left operation, 14/304 stainless steel top, 8"H backsplash, 20" x 20" x 5" Deep pre-rinse sink with basket drain, (1) deck mount faucet hole for pre-rinse, includes scrap block, raised rolled edges on front & side, stainless steel legs & side bracing, adjustable feet, NSF

ACCESSORIES

Mfr	Qty	Model	Spec
Eagle Group	1	300720	Lever Handle Drain, 1-1/2" or 2" IPS connection

WATER

	HOT SIZE	HOT AFF	HOT GPH	COLD SIZE	COLD AFF	FILTERED SIZE	FILTERED AFF	CONDENSER INLET SIZE	CONDENSER OUTLET SIZE
1									

WASTE

	INDIRECT SIZE	DIRECT SIZE
1	2"	



Profit from the Eagle Advantage®

Specification Sheet

Short Form Specifications

Eagle Soiled Dishtables, model _____. Top to be 16/430, 16/304, or 14/304 stainless steel with all seams welded, ground smooth, and polished. Front and ends to have 3"-high upturn with a 1½"-diameter rolled edge. Galvanized hat channels welded to underside. Backsplash is 8"-high. 20½" opening for dishwasher. 20" x 20" x 5" deep stainless steel prerinse sink with basket drain, hole for deck mounted prerinse spray, and rubber scrap block provided. Legs to be 1½" O.D. galvanized tubing with 1" diameter crossbracing and adjustable bullet feet (14/304 models come standard with stainless steel hat channels welded to underside of table, stainless steel crossbraced legs, and adjustable metal feet).



left-hand model shown with optional deck-mount prerinse unit (dishwasher not included)

Options / Accessories

- | | |
|--|--|
| <input type="checkbox"/> Rack slides | <input type="checkbox"/> Faucets |
| <input type="checkbox"/> Scrap basket | <input type="checkbox"/> Undershelf |
| <input type="checkbox"/> Scrap basket/
rack slide combo | <input type="checkbox"/> Stainless steel legs |
| <input type="checkbox"/> Prerinse unit | <input type="checkbox"/> Stainless steel gussets |
| | <input type="checkbox"/> Stainless steel feet |

EAGLE GROUP

100 Industrial Boulevard, Clayton, DE 19938-8903 USA

Phone: 302-653-3000 • Fax: 302-653-2065

www.eaglegrp.com

Foodservice Division: Phone 800-441-8440

MHC/Retail Display Divisions: Phone 800-637-5100

For custom configuration or fabrication needs, contact our **SpecFAB®** Division.

Phone: 302-653-3000 • Fax: 302-653-2065 • e-mail: quotes@eaglegrp.com

Item No.:	_____
Project No.:	_____
S.I.S. No.:	_____

Soiled Dishtables—Straight Design

MODELS:

- | | | |
|---------------------------------------|---------------------------------------|--|
| <input type="checkbox"/> SDTL-30-16/4 | <input type="checkbox"/> SDTL-60-16/4 | <input type="checkbox"/> SDTL-96-16/4 |
| <input type="checkbox"/> SDTL-30-16/3 | <input type="checkbox"/> SDTL-60-16/3 | <input type="checkbox"/> SDTL-96-16/3 |
| <input type="checkbox"/> SDTL-30-14/3 | <input type="checkbox"/> SDTL-60-14/3 | <input type="checkbox"/> SDTL-96-14/3 |
| <input type="checkbox"/> SDTR-30-16/4 | <input type="checkbox"/> SDTR-60-16/4 | <input type="checkbox"/> SDTR-96-16/4 |
| <input type="checkbox"/> SDTR-30-16/3 | <input type="checkbox"/> SDTR-60-16/3 | <input type="checkbox"/> SDTR-96-16/3 |
| <input type="checkbox"/> SDTR-30-14/3 | <input type="checkbox"/> SDTR-60-14/3 | <input type="checkbox"/> SDTR-96-14/3 |
| <input type="checkbox"/> SDTL-36-16/4 | <input type="checkbox"/> SDTL-72-16/4 | <input type="checkbox"/> SDTL-108-16/4 |
| <input type="checkbox"/> SDTL-36-16/3 | <input type="checkbox"/> SDTL-72-16/3 | <input type="checkbox"/> SDTL-108-16/3 |
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| <input type="checkbox"/> SDTR-36-14/3 | <input type="checkbox"/> SDTR-72-14/3 | <input type="checkbox"/> SDTR-108-14/3 |
| <input type="checkbox"/> SDTL-48-16/4 | <input type="checkbox"/> SDTL-84-16/4 | <input type="checkbox"/> SDTL-120-16/4 |
| <input type="checkbox"/> SDTL-48-16/3 | <input type="checkbox"/> SDTL-84-16/3 | <input type="checkbox"/> SDTL-120-16/3 |
| <input type="checkbox"/> SDTL-48-14/3 | <input type="checkbox"/> SDTL-84-14/3 | <input type="checkbox"/> SDTL-120-14/3 |
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| <input type="checkbox"/> SDTR-48-14/3 | <input type="checkbox"/> SDTR-84-14/3 | <input type="checkbox"/> SDTR-120-14/3 |

Design and Construction Features

- 16 or 14 gauge stainless steel.
- 30" (762mm)-wide table with choice of eight lengths.
- Left or right hand operation.
- 20" x 20" x 5" (508 x 508 x 127mm) prerinse sink punched for standard basket drain.
- Hole supplied for deck-mount prerinse.
- Adjustable non-marking feet with up to 1" (25mm) adjustment.
- 1½" (41mm)-diameter galvanized legs with welded 1" (25mm)-diameter crossbrace.
- All Spec-Master® 14 gauge type 304 dishtables come standard with stainless steel crossbraced legs and gussets, complete with stainless steel feet.
- Scrap block automatically provided on left-hand models 48" (1219mm) and longer, and right-hand models 60" (1524mm) and longer. To specify no scrap block desired, add suffix "-NSB" to model number.
Example: SDTL-48-16/4-NSB

Certifications / Approvals



AutoQuotes



EG50.02 Rev. 11/17

Spec sheets available for viewing, printing or downloading from our online literature library at www.eaglegrp.com

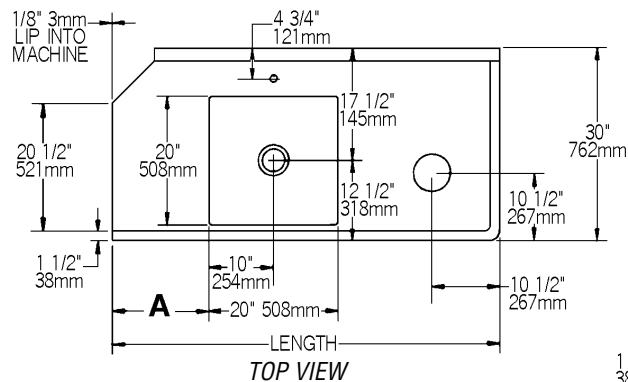
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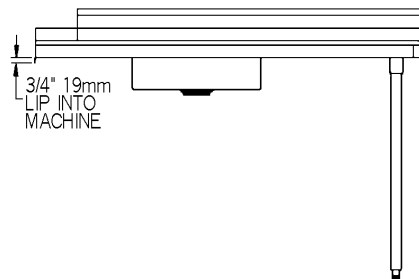
Profit from the Eagle Advantage®

Item No.: _____
 Project No.: _____
 S.I.S. No.: _____

Soiled Dishtables—Straight Design

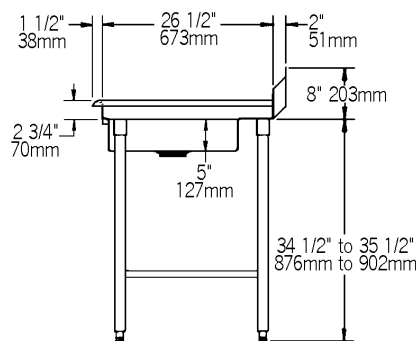


TOP VIEW



FRONT VIEW

(right-hand model shown)



SIDE VIEW

Dimension A

- 3 1/2" – for 30" & 36" tables L or R, and 48" left only.
- 15" – for 48" right and 60" & 72" both L or R.
- 23 1/2" – for 84" & 96" tables.

Please review dishwasher for size and location of control box.

16 gauge type 430 model #	16 gauge type 304 model #	Spec-Master® 14 gauge type 304 model #	description	length		weight	
				in.	mm	lbs.	kg
SDTL-30-16/4	SDTL-30-16/3	SDTL-30-14/3	left-hand model	30"	762	42	19.1
SDTR-30-16/4	SDTR-30-16/3	SDTR-30-14/3	right-hand model	30"	762	42	19.1
SDTL-36-16/4	SDTL-36-16/3	SDTL-36-14/3	left-hand model	36"	914	49	22.2
SDTR-36-16/4	SDTR-36-16/3	SDTR-36-14/3	right-hand model	36"	914	49	22.2
SDTL-48-16/4*	SDTL-48-16/3*	SDTL-48-14/3*	left-hand model	48"	1219	63	29.6
SDTR-48-16/4	SDTR-48-16/3	SDTR-48-14/3	right-hand model	48"	1219	63	29.6
SDTL-60-16/4*	SDTL-60-16/3*	SDTL-60-14/3*	left-hand model	60"	1524	77	34.9
SDTR-60-16/4*	SDTR-60-16/3*	SDTR-60-14/3*	right-hand model	60"	1524	77	34.9
SDTL-72-16/4*	SDTL-72-16/3*	SDTL-72-14/3*	left-hand model	72"	1829	91	41.3
SDTR-72-16/4*	SDTR-72-16/3*	SDTR-72-14/3*	right-hand model	72"	1829	91	41.3
SDTL-84-16/4*	SDTL-84-16/3*	SDTL-84-14/3*	left-hand model	84"	2134	105	47.6
SDTR-84-16/4*	SDTR-84-16/3*	SDTR-84-14/3*	right-hand model	84"	2134	105	47.6
SDTL-96-16/4*	SDTL-96-16/3*	SDTL-96-14/3*	left-hand model	96"	2438	119	54.0
SDTR-96-16/4*	SDTR-96-16/3*	SDTR-96-14/3*	right-hand model	96"	2438	119	54.0
SDTL-108-16/4*	SDTL-108-16/3*	SDTL-108-14/3*	left-hand model	108"	2743	129	58.5
SDTR-108-16/4*	SDTR-108-16/3*	SDTR-108-14/3*	right-hand model	108"	2743	129	58.5
SDTL-120-16/4*	SDTL-120-16/3*	SDTL-120-14/3*	left-hand model	120"	3048	147	66.7
SDTR-120-16/4*	SDTR-120-16/3*	SDTR-120-14/3*	right-hand model	120"	3048	147	66.7

* Scrap block provided with these models. To order one of these models with no scrap block, add suffix "-NSB" on end of model number. Example: SDTL-60-14/3-NSB

EAGLE GROUP

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Phone: 302-653-3000 • Fax: 302-653-2065

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Rev. 11/17

Submittal Sheet

12/20/2017

ITEM# 49.1 - PRE-RINSE FAUCET ASSEMBLY (1 EA REQ'D)

T&S Brass B-0133-B

EasyInstall Pre-Rinse Unit, wall mount. base faucet with spring check cart. & lever handles, 2" dia. flanges with 1/2" NPT female eccentric flanged inlets, 35-1/2"H, 15" overhang, 8-1/4" clearance, 18" riser, B-0107 spray valve, B-0044-H flex stainless steel hose, 6" wall bracket

ACCESSORIES

Mfr	Qty	Model	Spec
T&S Brass	1	B-0230-K	Installation Kit , (2) 1/2" NPT nipples, lock nuts and washers, (2) short "El" 1/2" NPT female x male

WATER

	HOT SIZE	HOT AFF	HOT GPH	COLD SIZE	COLD AFF	FILTERED SIZE	FILTERED AFF	CONDENSER INLET SIZE	CONDENSER OUTLET SIZE
1	1/2"			1/2"					

WASTE

	INDIRECT SIZE	DIRECT SIZE
1		



T&S BRASS AND BRONZE WORKS, INC.

2 Saddleback Cove / P.O. Box 1088
Travelers Rest, SC 29690

Travelers Rest, SC: 800-476-4103 • Simi Valley, CA: 800-423-0150 • Fax: 864-834-3518 • www.tsbrass.com

Model No.

B-0133-B

Item No.

This Space for Architect/Engineer Approval

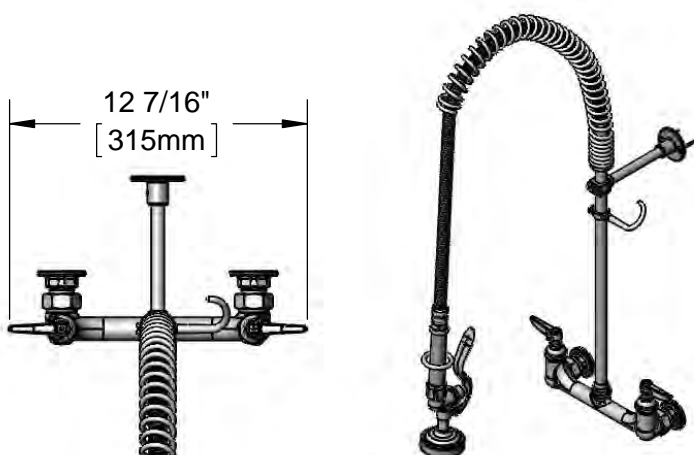
Job Name _____ Date _____

Model Specified _____ Quantity _____

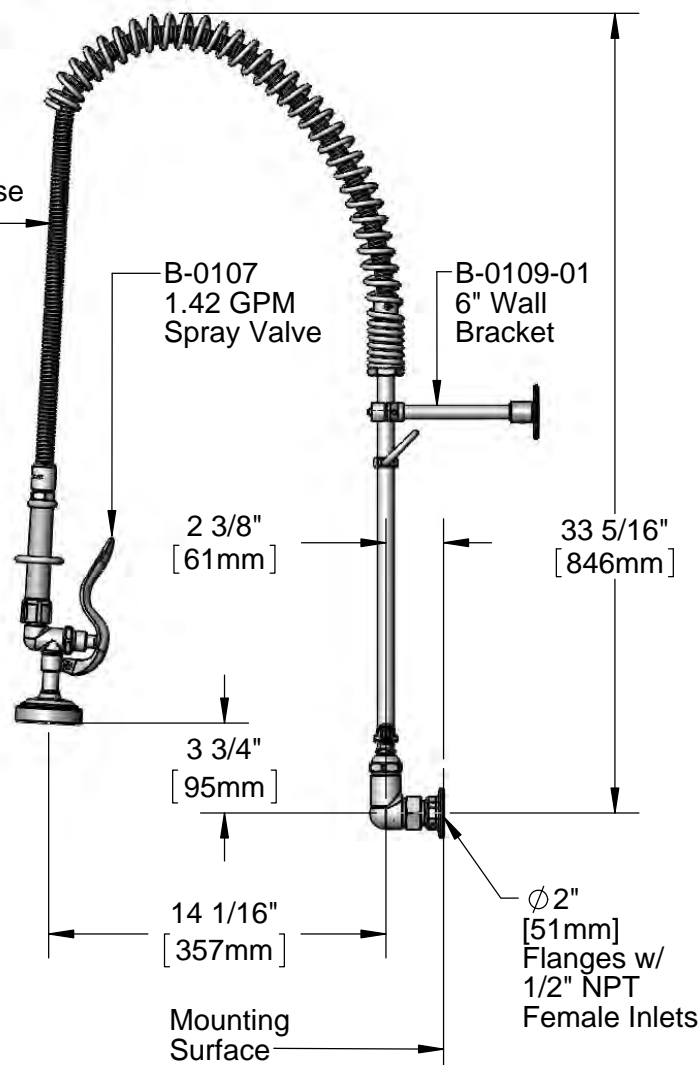
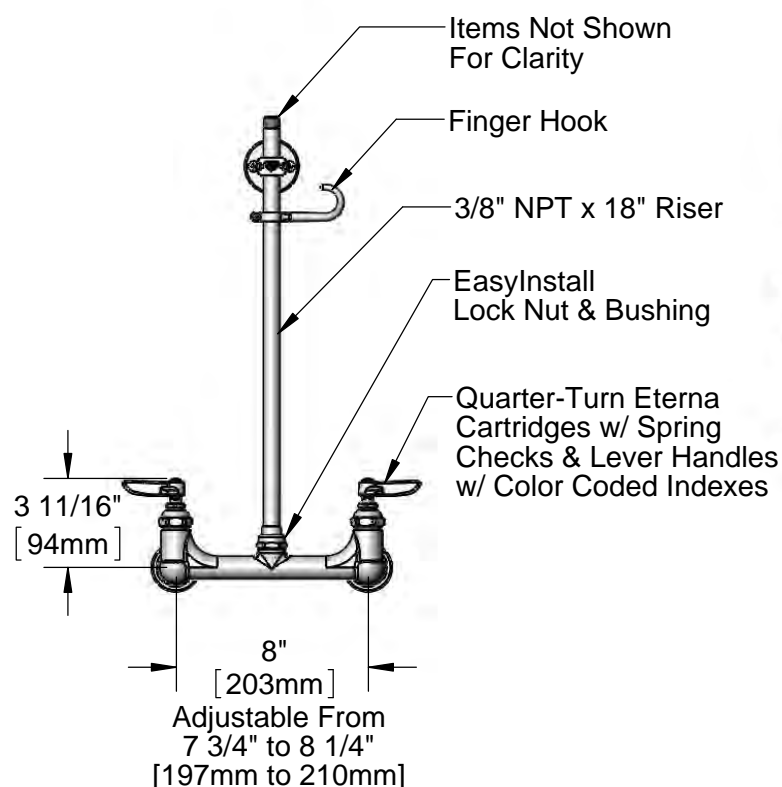
Customer/Wholesaler _____

Contractor _____

Architect/Engineer _____



44" Flexible Stainless Steel Hose
w/ Spring & Spray Valve



Product Specifications:

Pre-Rinse Unit: EasyInstall 8" Wall Mount Mixing Faucet, Eterna Cartridges w/ Spring Checks, Lever Handles, 44" Flexible Stainless Steel Hose, 1.42 GPM Spray Valve, 6" Wall Bracket & 1/2" NPT Female Inlets

Product Compliance:

ASME A112.18.1 / CSA B125.1
NSF 61 - Section 9
NSF 372 (Low Lead Content)
EPA 2005 (PRSV)

Drawn: DHL

Checked: JRM

Approved: JHB

Date: 08/27/15

Scale:

1:8

Sheet: 1 of 2



T&S BRASS AND BRONZE WORKS, INC.

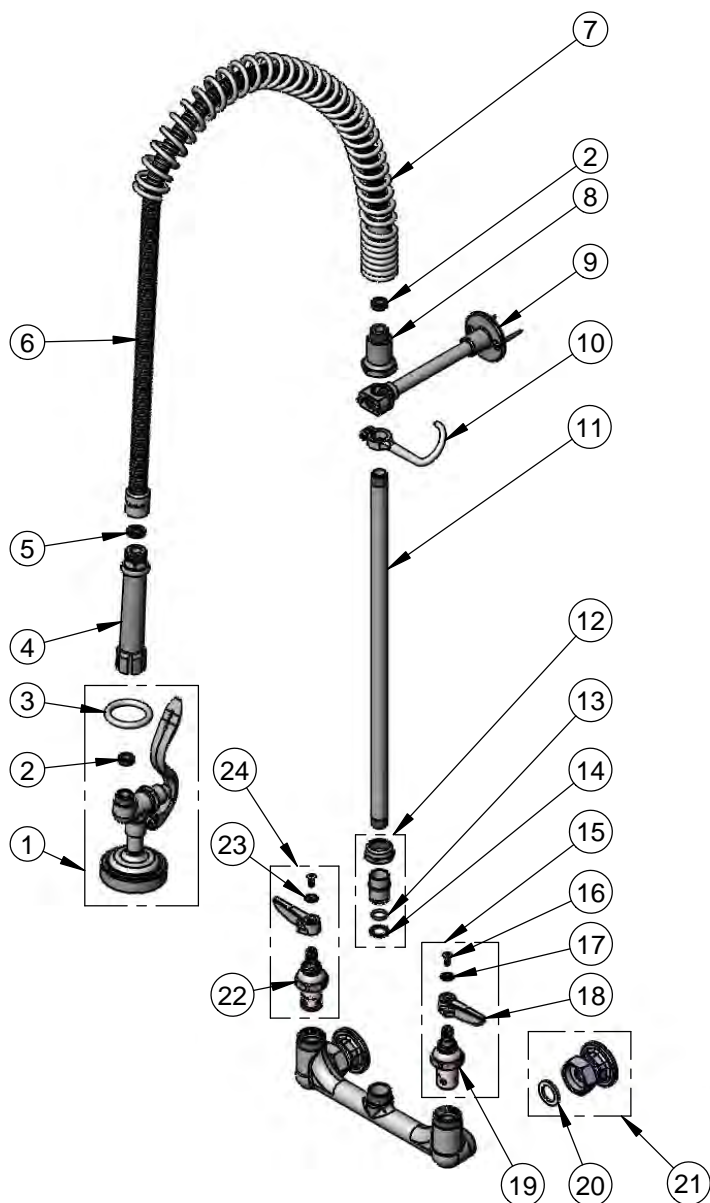
2 Saddleback Cove / P.O. Box 1088
Travelers Rest, SC 29690

Model No.

B-0133-B

Item No.

Travelers Rest, SC: 800-476-4103 • Simi Valley, CA: 800-423-0150 • Fax: 864-834-3518 • www.tsbrass.com



ITEM NO.	SALES NO.	DESCRIPTION
1	B-0107	1.42 GPM Spray Valve
2	010476-45	#27 Washer
3	000907-45	Spray Valve Hold Down Ring
4	002987-40	Grip Handle
5	001014-45	Washer, B-0100 Hose Barrel
6	B-0044-H2A	44" Flexible Stainless Steel, Less Handle
7	000888-45	EasyInstall Overhead Spring
8	000821-40	Spring Body
9	B-0109-01	6" Wall Bracket
10	004R	Finger Hook
11	000369-40	3/8" NPT x 18" Riser
12	EZ-K	EasyInstall Kit: Nut, Bushing, O-ring & Lock Washer
13	001065-45	O-Ring
14	014200-45	Star Washer, Anti-Rotation
15	002711-40	Quarter-Turn Eterna Cartridge, LTC w/ Spring Check, Handle, Index & Screw
16	000922-45	Lever Handle Screw
17	001660-45	Blue Index-CW
18	001638-45	Lever Handle
19	012442-40	Quarter-Turn Eterna Cartridge, LTC w/ Spring Check
20	001019-45	Coupling Nut Washer
21	00AA	1/2" NPT Female Eccentric Flange
22	012443-40	Quarter-Turn Eterna Cartridge, RTC w/ Spring Check
23	001661-45	Red Index-HW
24	002712-40	Quarter-Turn Eterna Cartridge, RTC w/ Spring Check, Handle, Index & Screw

Product Specifications:

Pre-Rinse Unit: EasyInstall 8" Wall Mount Mixing Faucet, Eterna Cartridges w/ Spring Checks, Lever Handles, 44" Flexible Stainless Steel Hose, 1.42 GPM Spray Valve, 6" Wall Bracket & 1/2" NPT Female Inlets

Product Compliance:

ASME A112.18.1 / CSA B125.1
NSF 61 - Section 9
NSF 372 (Low Lead Content)
EPA 2005 (PRSV)

Drawn: DHL

Checked: JRM

Approved: JHB

Date: 08/27/15

Scale: NTS

Sheet: 2 of 2


T&S BRASS AND BRONZE WORKS, INC.

2 Saddleback Cove / P.O. Box 1088
Travelers Rest, SC 29690

Model No.

B-0230-K

Item No.

Travelers Rest, SC: 800-476-4103 • Simi Valley, CA: 800-423-0150 • Fax: 864-834-3518 • www.tsbrass.com

This Space for Architect/Engineer Approval

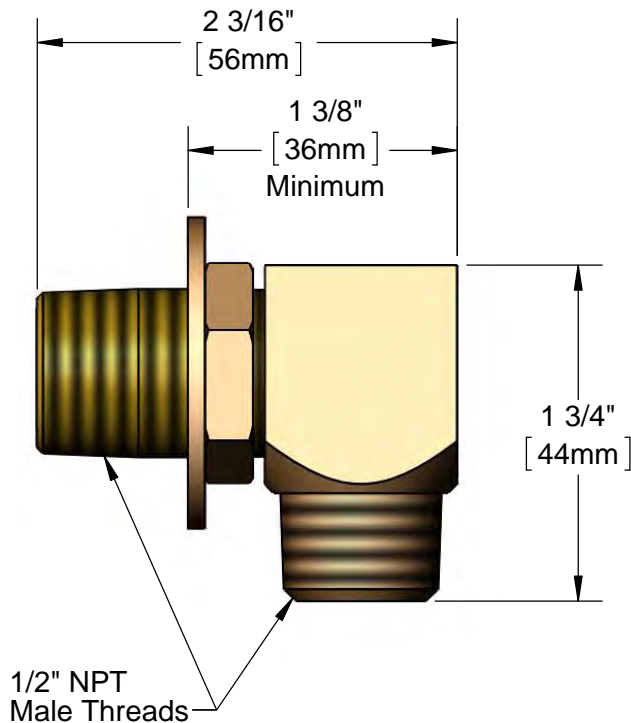
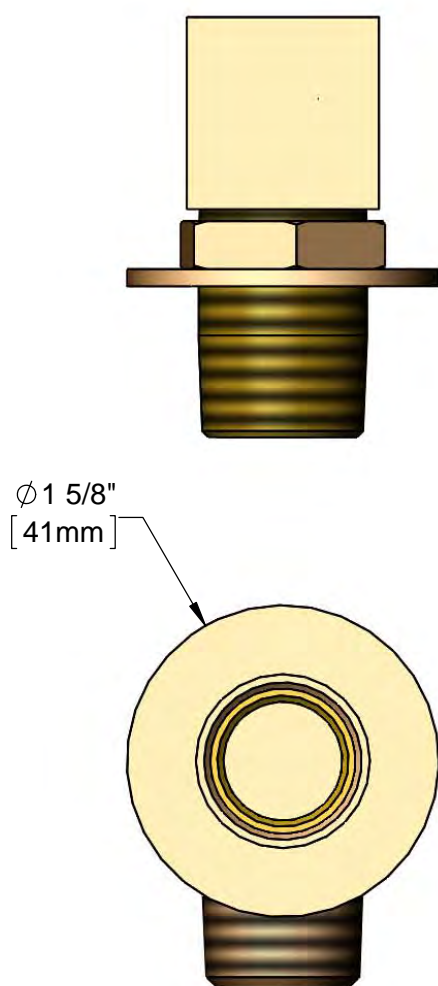
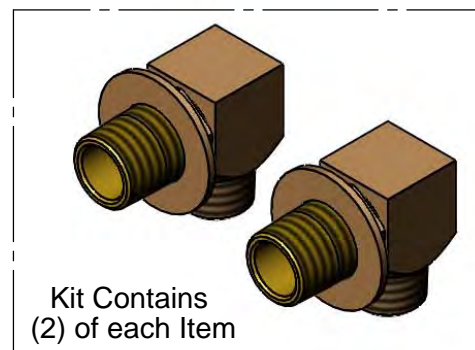
Job Name _____ Date _____

Model Specified _____ Quantity _____

Customer/Wholesaler _____

Contractor _____

Architect/Engineer _____


Product Specifications:

1/2" NPT Male Elbow Kit w/ Lock Nut & Washer

Product Compliance:

ASME A112.18.1 / CSA B125.1
NSF 61 - Section 9
NSF 372 (Low Lead Content)

Drawn: DHL

Checked: JRM

Approved: JHB

Date: 03/13/14

Scale:

1:1

Sheet: 1 of 2


T&S BRASS AND BRONZE WORKS, INC.

 2 Saddleback Cove / P.O. Box 1088
 Travelers Rest, SC 29690

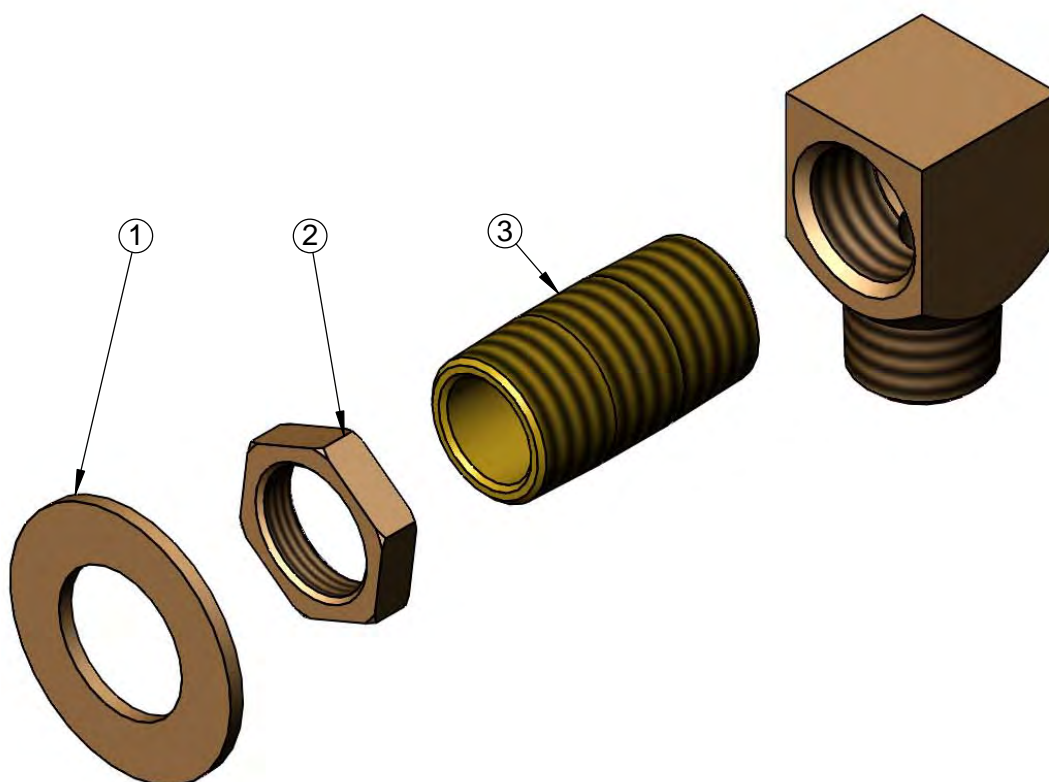
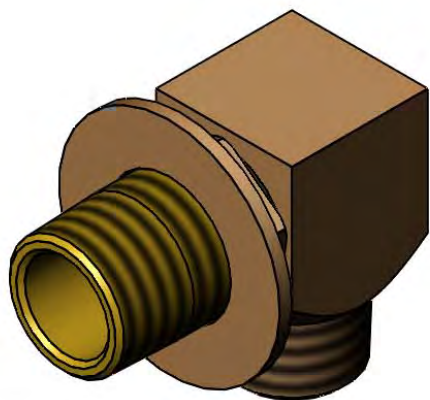
Model No.

B-0230-K

Item No.

Travelers Rest, SC: 800-476-4103 • Simi Valley, CA: 800-423-0150 • Fax: 864-834-3518 • www.tsbrass.com

ITEM NO.	SALES NO.	DESCRIPTION
1	000999-45	Brass Lock Washer
2	002954-45	Shank Lock Nut
3	013357-20	1/2" NPT x 1-5/8" Lg. Close Nipple


 Product Specifications:
 1/2" NPT Male Elbow Kit w/ Lock Nut & Washer

 Product Compliance:
 ASME A112.18.1 / CSA B125.1
 NSF 61 - Section 9
 NSF 372 (Low Lead Content)

Submittal Sheet

12/20/2017

ITEM# 50 - DISHTABLE SORTING SHELF (1 EA REQ'D)

Eagle Group 605381

Slanted Rack Shelf, solid, wall mount, 42"W x 21"D x 21-3/8"H, drip tube on left side, 16/304 stainless steel



Profit from the Eagle Advantage®

Specification Sheet

Short Form Specifications

Eagle Wall-Mounted Slanted Rack Shelf, model _____ constructed of 16/304 stainless steel, with stainless steel wall brackets and drip tube.

Eagle Table-Mounted Double Sided Shelf, model _____ for use with landing shelf of dishtable, or with soiled dishtables with center island design. 1" O.D. 16/304 stainless steel tubular uprights on one end, and one end wall-mounted. Available as solid "Rack" shelf with type 304 stainless steel construction, or as "Sorting" Shelf with 1 1/2" diameter full-length tubing.

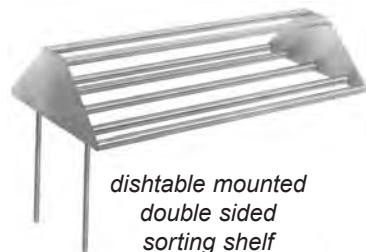
Eagle Wall-Mounted Tubular Rack Shelf, model _____ with ends constructed of 14/304 stainless steel, and 1 1/2" diameter full-length tubing. Available with all-welded or knocked-down construction.



wall mounted
slanted rack shelf



dishtable mounted
double rack shelf



dishtable mounted
double sided
sorting shelf



tubular rack shelf

Dishtable Rack Shelves

MODELS:

☐ 605380

☐ 605381

☐ 605382

☐ 606294

☐ 606641

☐ 606642

☐ 606643

☐ 606644

☐ 605383

☐ 606295

☐ 606300

☐ 606301

☐ 606302

☐ 606303

☐ 606296

☐ 606297

☐ 606298

☐ 606299

Slanted Rack Shelves

- Shelves provide extra rack storage.
- 16 gauge stainless steel construction.
- Wall mounting brackets included.
- Complete with drip tube on left or right side.

Double Rack Shelf

- For use with soiled dishtable with landing shelf and soiled dishtables with center island design.
- 60" (1524mm) long.
- Please note that one end is wall-mounted.
- Drip tubes on wall-mounted end.

Double Sided Sorting Shelf

- For use with soiled dishtables with landing shelf and soiled dishtables with center island design.
- 60" (1524mm) long.
- Features 1 1/2" (41mm)-diameter full-length tubing.
- Please note that one end is wall-mounted.

Tubular Design Rack Shelves

- Wall mounted.
- Features 1 1/2" (41mm)-diameter full-length tubing.
- Models #606300-606303 feature all-welded construction.
- Models #606296-606299 feature knock-down construction.

EAGLE GROUP

100 Industrial Boulevard, Clayton, DE 19938-8903 USA

Phone: 302-653-3000 • Fax: 302-653-2065

www.eaglegrp.com

Foodservice Division: Phone 800-441-8440

MHC/Retail Display Divisions: Phone 800-637-5100

For custom configuration or fabrication needs, contact our SpecFAB® Division.

Phone: 302-653-3000 • Fax: 302-653-3091 • e-mail: specfab@eaglegrp.com



EG50.06 Rev. 06/09

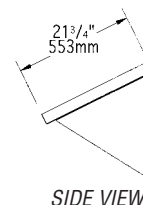
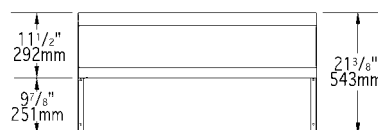
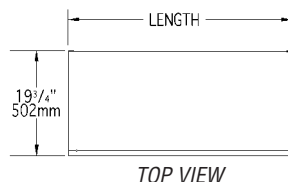
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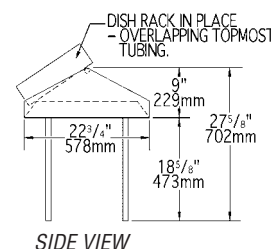
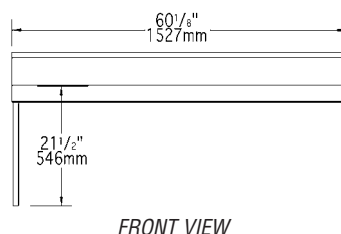
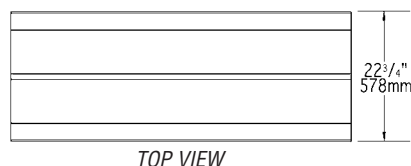
Item No.: _____
 Project No.: _____
 S.I.S. No.: _____

Slanted Rack Shelves



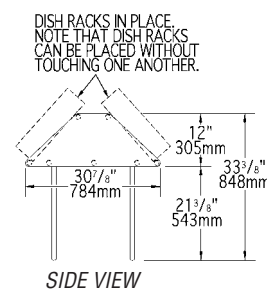
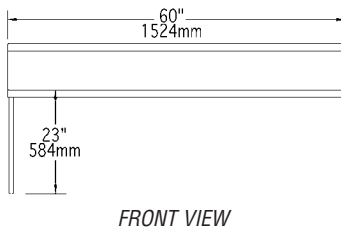
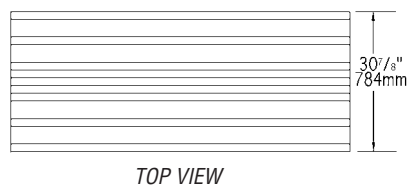
TUBE ON LEFT		TUBE ON RIGHT		width		length		weight	
model #		model #		in.	mm	in.	mm	lbs.	kg
605380		606641		21"	533	21"	533	20	9.0
605381		606642		21"	533	42"	1067	30	13.6
605382		606643		21"	533	63"	1600	40	18.1
606294		606644		21"	533	84"	2134	50	22.7

Double Rack Shelf



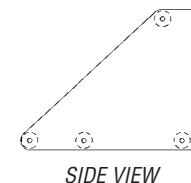
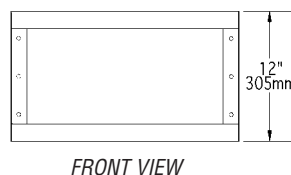
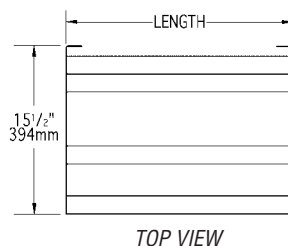
model #	weight	
	lbs.	kg
605383	61	27.7

Double Sided Sorting Shelf



model #	weight	
	lbs.	kg
606295	75	34.0

Tubular Design Rack Shelves



ALL-WELDED MODELS			KNOCK-DOWN MODELS			length	
model #	lbs.	kg	model #	lbs.	kg	in.	mm
606300	16	7.3	606296	17	7.7	21"	533
606301	25	11.3	606297	26	11.8	42"	1067
606302	34	15.4	606298	35	15.9	63"	1600
606303	43	19.5	606299	44	20.0	84"	2134

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Submittal Sheet

12/20/2017

ITEM# 51 - DISHWASHER, CONVEYOR TYPE (1 EA REQ'D)**Champion 66 DRPW**

E-Series DualRinse Dishwasher, conveyor type, high temperature, 44" single tank with 22" prewash, (208) racks/hour, automatic tank fill, stainless steel base and legs, insulated hinged access doors, door safety switch, door activated drain closure, vent fan control, stainless steel front and end enclosure panels, standard vertical clearance accommodates 18" x 26" sheet pans, energy sentinel (idle pump shut off), rinse saver device, splash proof top mounted controls, includes: , (2) peg racks & (1) flat rack, NSF, cULus, ENERGY STAR® (consult factory for pricing & availability)

ACCESSORIES

Mfr	Qty	Model	Spec
Champion	1		1 year limited warranty, standard
Champion	1		Complimentary factory authorized performance test included, upon equipment start-up. Consult local Champion sales representative for coordination of the start-up. If customer is beyond 60 miles from Champion authorized service agent, consult factory.
Champion	1		Single-point electrical connection, standard
Champion	1		Electric tank heat with thermostat & low-water cutoff, 18 kw, standard
Champion	1		Booster heater, 12 kw electric, built-in, 40 degree rise
Champion	1		208v/60/3-ph, 108.0 amps (dishwasher & 12 kw booster)
Champion	1		Drain water tempering kit (mounted & inter-wired)
Champion	1		Heat recovery system (separate electrical connection for booster heater required)
Champion	1		Right to left operation
Champion	1		Table limit switch (unmounted)(recommended on all conveyor models)

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1								18			
2	208	60	3				108	12			

WATER

	HOT SIZE	HOT AFF	HOT GPH	COLD SIZE	COLD AFF	FILTERED SIZE	FILTERED AFF	CONDENSER INLET SIZE	CONDENSER OUTLET SIZE
1	3/4"								

WASTE

	INDIRECT SIZE	DIRECT SIZE
1	1-1/2"	

VENTILATION

EXHAUST						MAKE UP				
WIDTH	DEPTH	DIAM	CFM	SPWG		WIDTH	DEPTH	DIAM	CFM	SPWG
1	15-7/8"	3-7/8"		400	1/4"					

VENTILATION 1 REMARKS

Unload End

Champion®

The Dishwashing Machine Specialists

Project _____
Item No. _____
Quantity _____

STANDARD FEATURES

- **ENERGY STAR® Qualified**
- *Exclusive DualRinse Technology*
- Dual-pawl cradle drive system
- One-piece cast stainless steel upper & lower spray arm assemblies
- Internal removable scrap basket and two-piece scrap screen
- Standard vertical opening accommodates 18" x 26" sheet pans
- Wide leakproof swing out insulated hinged doors on wash tank
- Anti-jam conveyor drive system
- Energy Sentinel (Idle pump shut-off)
- Convenient top-mounted controls
- Automatic tank fill
- Door safety switch
- Never leak, ball valve drain closure
- Enclosure panels (front and sides)
- Stainless steel heavy-gauge construction, including base and feet
- Electric tank heat
- Wash pump 2 Hp motor
- Stainless steel pump and impeller
- Single-point electrical connection
- Self-diagnostic controls
- Vent fan control switch
- Stainless steel rear manifolds

PREWASH MODELS ONLY

- External prewash scrap basket
- Prewash pump 1 Hp motor
- 22" Prewash
- 26" Prewash
- 36" Prewash

*The DualRinse feature offers the
Lowest Water/Utility/Chemical Consumption
while circulating a generous
300+ gallons of water for
Consistently Good Results*

Champion Industries, Inc.
2674 N. Service Road,
Jordan Station, Ontario, Canada L0R 1S0
Tel: 905/562-4195 Fax: 905/562-4618

DualRinse™ 44 DR SERIES

44 DR, 66 DRPW, 70 DRFFPW, 80 DRHDPW

High-Temperature
Rack Conveyor Dishwashing Machine with
Dual Stage Rinse



Model 44 DR
Shown with Vent Cowl
and Damper Option

*Photo is for general visual
representation only. Please
refer to specifications for
the latest detailed product
information.*

SPECIFIER STATEMENT

Specified unit will be Champion Model 44 DR Series high temperature dual rinse rack conveyor dishwashing machine. Features top mounted control cabinet; upper and lower one-piece stainless steel spray arm assemblies, removable internal scrap basket with two-piece scrap screen. Swing out insulated front access doors. Anti-jam conveyor drive system.

1 year parts and labor warranty.



Champion Industries, Inc.
3765 Champion Blvd., Winston-Salem, NC 27105
Tel: 336/661-1556 Fax: 336/661-1979
www.championindustries.com



44 DR SERIES

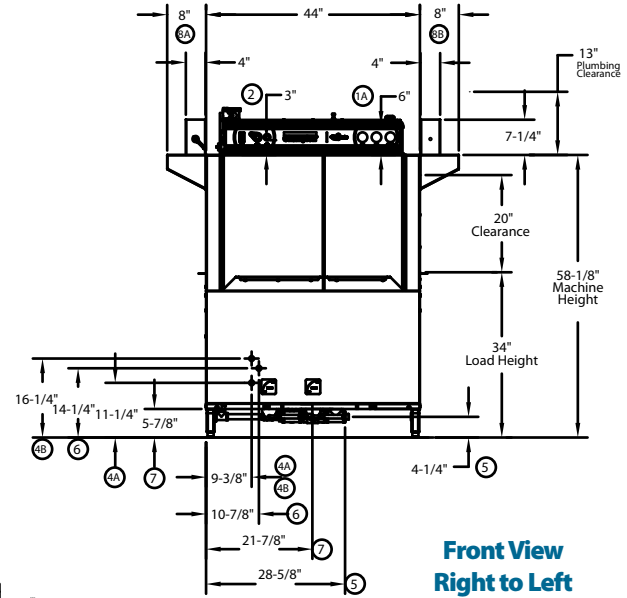
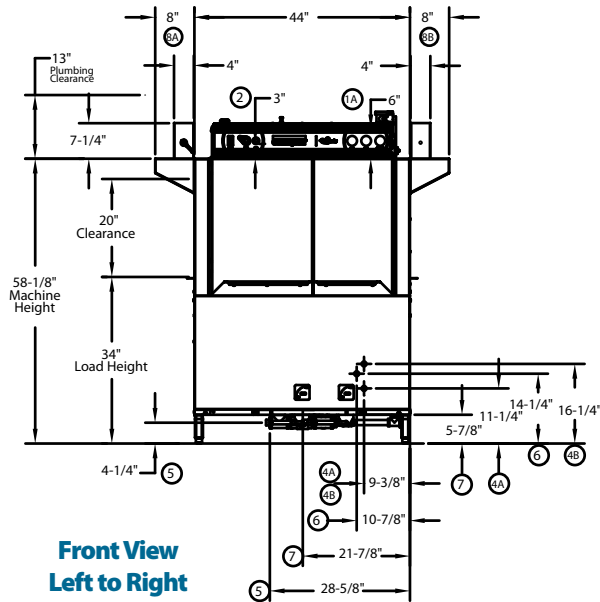
44 DR, 66 DRPW, 70 DRFFPW, 80 DRHDPW

High-Temperature
Rack Conveyor Dishwashing Machine with
Dual Stage Rinse

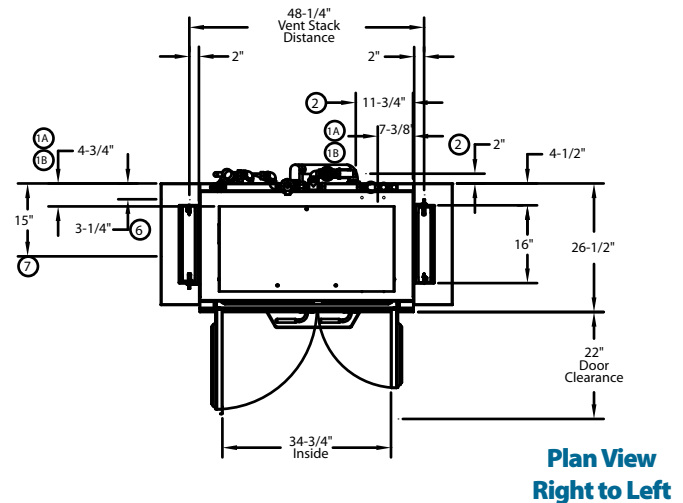
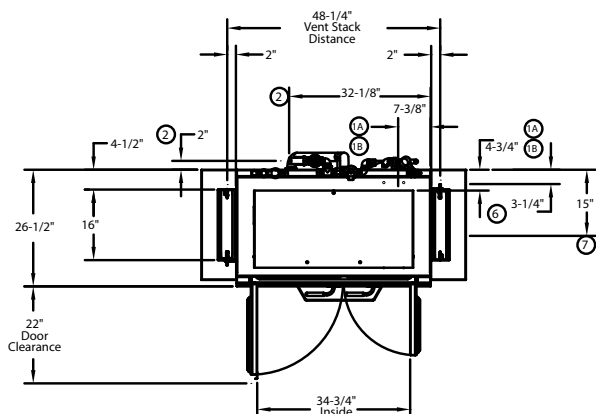
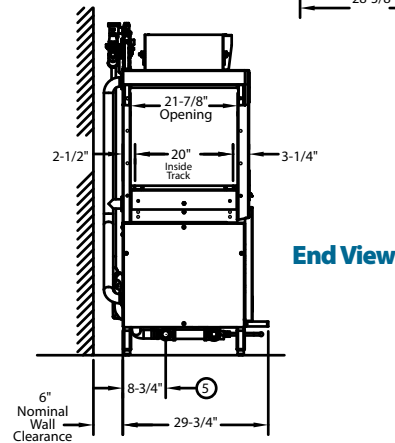
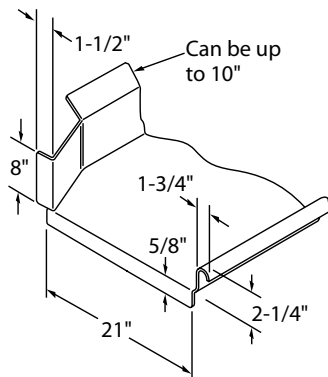
Champion®
The Dishwashing Machine Specialists

MODEL 44 DR Shipping weight crated: **600 lbs.**

Dimensions shown in inches [mm]



Suggested Table Construction



Due to an ongoing value analysis program at Champion, specifications contained in this catalog are subject to change without notice.

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44 DR SERIES

44 DR, 66 DRPW, 70 DRFFPW, 80 DRHDPW

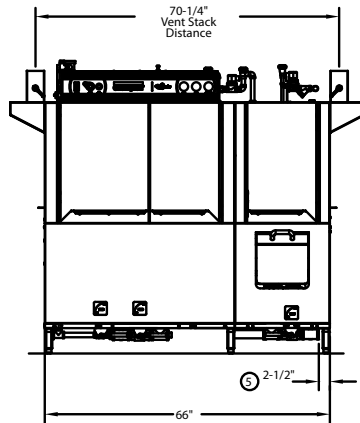
High-Temperature
Rack Conveyor Dishwashing Machine with
Dual Stage Rinse

Champion®
The Dishwashing Machine Specialists

Dimensions shown in inches [mm]

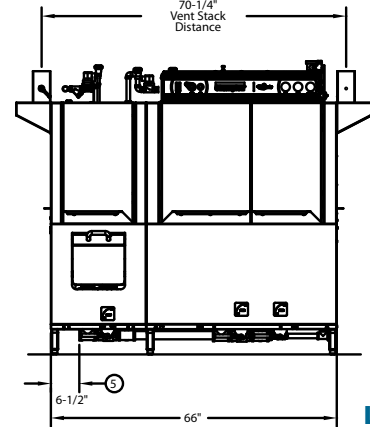
MODEL 66 DRPW WITH 22" PREWASH

Shipping weight crated: **800 lbs.**



Front View

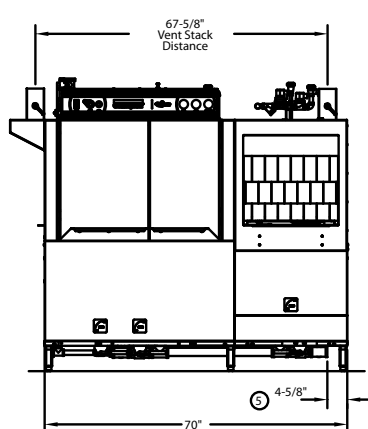
Right to Left



Left to Right

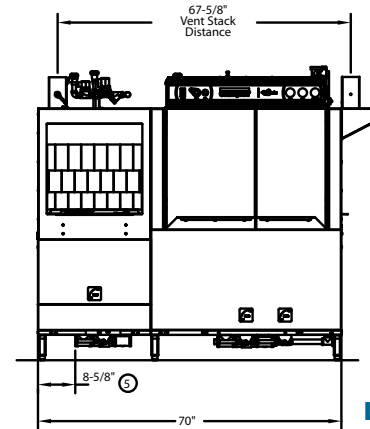
MODEL 70 DRFFPW WITH 26" FRONT FEED PREWASH

Shipping weight crated: **850 lbs.**



Front View

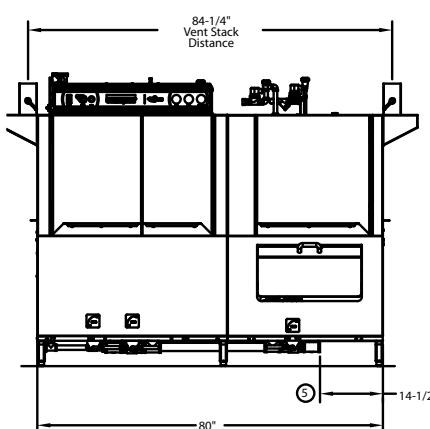
Right to Left



Left to Right

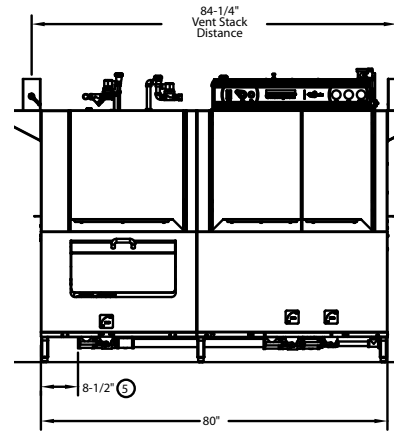
MODEL 80 DRHDPW WITH 36" HEAVY DUTY PREWASH

Shipping weight crated: **950 lbs.**



Front View

Right to Left



Left to Right

NOTE: For complete machine dimensions, plan view, end view, specifications and table construction see 44 DR drawing page.

44 DR SERIES

44 DR, 66 DRPW, 70 DRFFPW, 80 DRHDPW

High-Temperature
Rack Conveyor Dishwashing Machine with
Dual Stage Rinse

Champion®
The Dishwashing Machine Specialists

Dimensions shown in inches

Utilities	
1 Electrical Connection	A Machine electrical connection B Booster electrical connection
2 Hot Water	Main connection 3/4" NPT
3 Cold Water	Contact Factory
4 Hot Water Tank	A Heat inlet connection 1" NPT B Heat return connection 1" NPT
5 Drain	Connection 1 1/2" NPT
6 Steam	Inlet connection 1 1/4" NPT
7 Condensate	Connection 1" NPT return to boiler
8 Vents	A Stack connection - Load end 200 CFM @ 1/4" static pressure B Stack connection - Unload end 400 CFM @ 1/4" static pressure

Warning: Plumbing and electrical connections should be made by qualified personnel who will observe all the applicable plumbing, sanitary, safety codes and the National Electrical Code.

Note: Water Hammer Arrestor (meeting ASSE-1010 standard or equivalent) to be supplied (by others) in common water supply line at service connection.

Plumbing Notes: Because of the variation in house-supplied steam and water pressures, steam and water pressure regulating valves (PRVs) may be needed. (Water PRV is standard on machines with booster.) The PRVs can either be purchased from Champion or obtained locally.

Venting Notes: Fabricated duct size: 3-7/8" x 15-7/8" (Outside dimensions)

Contact factory for single phase information.

44 DR Only
TABLE A - Machine Connection

Machine only			
Elec. Specs.	Rated Amps	Minimum Supply Ckt. Conductor Ampacity	Minimum Overcurrent Protective Device
208/60/3	70	90	90
240/60/3	62	80	80
480/60/3	31	40	40
575/60/3	24	35	35

44 DR Only
TABLE B - Machine & Booster Connection

40°F/22°C Rise – 12kW Machine and Electric built-in booster			
Elec. Specs.	Rated Amps	Minimum Supply Ckt. Conductor Ampacity	Minimum Overcurrent Protective Device
208/60/3	104	150	150
240/60/3	91	125	125
480/60/3	46	60	60
575/60/3	37	50	50

70°F/39°C Rise – 22 kW
Machine and Electric built-in booster

Elec. Specs.	Rated Amps	Minimum Supply Ckt. Conductor Ampacity	Minimum Overcurrent Protective Device
208/60/3	131	175	175
240/60/3	115	150	150
480/60/3	58	80	80
575/60/3	47	60	60

Machine and steam built-in booster

Elec. Specs.	Rated Amps	Minimum Supply Ckt. Conductor Ampacity	Minimum Overcurrent Protective Device
208/60/3	25	35	35
240/60/3	22	30	30
480/60/3	12	15	15
575/60/3	9	15	15

12 kW Booster Only

Elec. Specs.	Rated Amps	Minimum Supply Ckt. Conductor Ampacity	Minimum Overcurrent Protective Device
208/60/3	33	45	45
240/60/3	29	40	40
480/60/3	14	20	20
575/60/3	12	15	15

66 DRPW, 70 DRFFPW, 80 DRHDPW
TABLE A - Machine Connection

Machine only			
Elec. Specs.	Rated Amps	Minimum Supply Ckt. Conductor Ampacity	Minimum Overcurrent Protective Device
208/60/3	74	100	100
240/60/3	65	90	90
480/60/3	33	45	45
575/60/3	25	35	35

66 DRPW, 70 DRFFPW, 80 DRHDPW
TABLE B - Machine & Booster Connection

40°F/22°C Rise – 12kW Machine and Electric built-in booster			
Elec. Specs.	Rated Amps	Minimum Supply Ckt. Conductor Ampacity	Minimum Overcurrent Protective Device
208/60/3	108	150	150
240/60/3	94	125	125
480/60/3	47	60	60
575/60/3	37	50	50

70°F/39°C Rise – 22 kW
Machine and Electric built-in booster

Elec. Specs.	Rated Amps	Minimum Supply Ckt. Conductor Ampacity	Minimum Overcurrent Protective Device
208/60/3	136	175	175
240/60/3	118	150	150
480/60/3	60	80	80
575/60/3	47	60	60

Machine and steam built-in booster

Elec. Specs.	Rated Amps	Minimum Supply Ckt. Conductor Ampacity	Minimum Overcurrent Protective Device
208/60/3	29	40	40
240/60/3	26	35	35
480/60/3	15	20	20
575/60/3	10	15	15

22 kW Booster Only

Elec. Specs.	Rated Amps	Minimum Supply Ckt. Conductor Ampacity	Minimum Overcurrent Protective Device
208/60/3	61	80	80
240/60/3	53	70	70
480/60/3	26	35	35
575/60/3	22	30	30

Due to an ongoing value analysis program at Champion, specifications contained in this catalog are subject to change without notice.

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Champion®

The Dishwashing Machine Specialists

44 DR SERIES

44 DR, 66 DRPW, 70 DRFFPW, 80 DRHDPW

High-Temperature
Rack Conveyor Dishwashing Machine with
Dual Stage Rinse

SPECIFICATIONS

Capacity

Racks per hr. (NSF rated)	208
Wash tank (US gal.)	21
Conveyor speed (ft./min.)	5.8

Motor Horsepower

Drive	1/6
Wash	2
Dual Rinse	1/10

Water Consumption

US Gal. per hr. (max. use)	112
US Gal. per rack	.54

Heating

Tank Heat, electric (kW)	15
DualRinse Tank Heat, electric (kW)	3
Tank heat, steam (lbs./hr. required at 15 PSI flow pressure)	75
Electric booster (built-in) (kW supplied for 40°F rise)	12
Electric booster (built-in) (kW supplied for 70°F rise)	22
Steam booster (lbs./hr. required for 40°F rise)	60
Steam booster (lbs./hr. required for 70°F rise)	110

*Booster heaters completely inter plumbed,
Controls are interwired*

Venting

Load end (minimum CFM)	200
Unload end (minimum CFM)	400

Standard 20" x 20" rack complement

Peg	2
Flat	1



NEW Exclusive Digital Gauges



NEW Durable Stainless Steel
Start/Stop Switches



One-Piece Cast Stainless Steel
Spray Assembly



Stainless Steel
Built-in Nested Booster



Two-Piece Scrap Screen



Built-in Scrap Basket for ease
of cleaning

LESS IS MORE WITH CHAMPION'S DUAL RINSE MODEL 44 DR SERIES

Check our NSF listings and you'll see the Dual Rinse offers the lowest water consumption in its class with less than .54 US gallons per rack. This ENERGY STAR® qualified product brings energy savings. Our 40°F rise booster only requires 12 kW and 70°F rise is only 22 kW.

What the numbers don't show you is the advantage that our Dual Rinse technology provides by making sure all wares are fully rinsed with more than 300 gallons per hour while actual fresh water consumption is only 112 gallons per hour.

www.championindustries.com

44 DR SERIES

44 DR, 66 DRPW, 70 DRFFPW, 80 DRHDPW

High-Temperature
Rack Conveyor Dishwashing Machine with
Dual Stage Rinse

Champion®

The Dishwashing Machine Specialists

OPTIONS & ACCESSORIES

- ☐ Tank heat: choice of steam coil, steam injector, hot water coil
- ☐ 2 Hp prewash motor
- ☐ 48" Blower-dryer - steam or electric
- ☐ Booster Heaters (completely interplumbed, controls are interwired)
 - ☐ Steam: 40°F or 70°F rise
 - ☐ Electric: 12 kW (40°F rise) (built-in only)
 - ☐ Electric: 22 kW (70°F rise) (built-in only)
- ☐ Heat Recovery

Cantilever sideloader (with or without hood) for 90° load operation

- ☐ 24" Sideload
- ☐ 30" Sideload (accepts sheet pans)
- ☐ Extended pawl bar (extended drive unit) for use with load tabling
- ☐ Racks: peg or flat racks (specify type)
- ☐ Steam pressure regulating valve (unmounted)
- ☐ Table limit switch, unmounted (recommended on all rack conveyor installations)
- ☐ Vent cowl, stainless steel with 7" stack and locking damper
- ☐ Extended vent hood, stainless steel with 7" stack and locking damper
- ☐ Water pressure regulating valve (unmounted) (standard with booster)
- ☐ Two-point electrical connection
- ☐ Water hammer kit
- ☐ Drain tempering kit
- ☐ Vertical clearance through machine: 24" (instead of standard 20") for larger ware
- ☐ Model CCT 180 (180° Corner Conveyor Table)
- ☐ Model CCT 90 (90° Corner Conveyor Table)
- ☐ Model RCT 64 or RCT 84 Roller Conveyor Table (See factory for custom length)
- ☐ Splash shields



NEW CCT 90

90° Corner Conveyor Table (shown)

NEW CCT 180

180° Corner Conveyor Table
also available



**Cantilever
Sideloader**
(No hood)



**Model RCT 64
or RCT 84**

Roller
Conveyor Table

Due to an ongoing value analysis program at Champion, specifications contained in this catalog are subject to change without notice.
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2674 N. Service Road, Jordan Station, Ontario, Canada L0R 1S0 • 905/562-4195 • Fax: 905/562-4618

Submittal Sheet

12/20/2017

ITEM# 52 - CLEAN DISHTABLE (1 EA REQ'D)

Eagle Group CDTL-60-14/3

Spec-Master® Clean Dishtable, straight design, 60"W x 30"D x 43-1/2"H, right-to-left operation, 14/304 stainless steel top, 8"H backsplash, raised rolled edges on front & side, stainless steel legs & crossbracing, adjustable metal feet, NSF



Profit from the Eagle Advantage®

Specification Sheet

Short Form Specifications

Eagle Clean Dishtables, model _____. Top to be 16/430, 16/304, or 14/304 stainless steel, with all seams welded, ground smooth, and polished. Front and ends to have 3"-high upturn with 1½"-diameter rolled edge. Galvanized hat channels welded to underside. Backsplash is 8"-high. 20½" standard opening for dishwasher. Legs to be 1½" O.D. galvanized tubing, 1" diameter crossbracing and adjustable bullet feet (14/304 models come standard with stainless steel hat channels welded to underside of table, stainless steel crossbraced legs, and adjustable metal feet).



right-hand model shown with optional undershelf *
(dishwasher not included)

Options / Accessories *

- ☐ Undershelf
- ☐ Stainless steel legs
- ☐ Stainless steel gussets
- ☐ Stainless steel feet

* See Spec Sheet #EG50.07 for full line of options and accessories.

EAGLE GROUP

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Phone: 302-653-3000 • Fax: 302-653-2065

www.eaglegrp.com

Foodservice Division: Phone 800-441-8440

MHC/Retail Display Divisions: Phone 800-637-5100

For custom configuration or fabrication needs, contact our SpecFAB® Division.

Phone: 302-653-3000 • Fax: 302-653-2065 • e-mail: quotes@eaglegrp.com

Item No.: _____
Project No.: _____
S.I.S. No.: _____

Clean Dishtables— Straight Design

MODELS:

- | | | |
|---------------------------------------|---------------------------------------|--|
| <input type="checkbox"/> CDTL-24-16/4 | <input type="checkbox"/> CDTR-48-14/3 | <input type="checkbox"/> CDTR-84-16/3 |
| <input type="checkbox"/> CDTL-24-16/3 | <input type="checkbox"/> CDTR-48-16/4 | <input type="checkbox"/> CDTR-84-14/3 |
| <input type="checkbox"/> CDTL-24-14/3 | <input type="checkbox"/> CDTR-48-16/3 | <input type="checkbox"/> CDTL-96-16/4 |
| <input type="checkbox"/> CDTR-24-16/4 | <input type="checkbox"/> CDTR-48-14/3 | <input type="checkbox"/> CDTL-96-16/3 |
| <input type="checkbox"/> CDTR-24-16/3 | <input type="checkbox"/> CDTL-60-16/4 | <input type="checkbox"/> CDTL-96-14/3 |
| <input type="checkbox"/> CDTR-24-14/3 | <input type="checkbox"/> CDTL-60-16/3 | <input type="checkbox"/> CDTR-96-16/4 |
| <input type="checkbox"/> CDTL-30-16/4 | <input type="checkbox"/> CDTL-60-14/3 | <input type="checkbox"/> CDTR-96-16/3 |
| <input type="checkbox"/> CDTL-30-16/3 | <input type="checkbox"/> CDTR-60-16/4 | <input type="checkbox"/> CDTR-96-14/3 |
| <input type="checkbox"/> CDTL-30-14/3 | <input type="checkbox"/> CDTR-60-16/3 | <input type="checkbox"/> CDTL-108-16/4 |
| <input type="checkbox"/> CDTR-30-16/4 | <input type="checkbox"/> CDTR-60-14/3 | <input type="checkbox"/> CDTL-108-16/3 |
| <input type="checkbox"/> CDTR-30-16/3 | <input type="checkbox"/> CDTL-72-16/4 | <input type="checkbox"/> CDTL-108-14/3 |
| <input type="checkbox"/> CDTR-30-14/3 | <input type="checkbox"/> CDTL-72-16/3 | <input type="checkbox"/> CDTR-108-16/4 |
| <input type="checkbox"/> CDTL-36-16/4 | <input type="checkbox"/> CDTL-72-14/3 | <input type="checkbox"/> CDTR-108-16/3 |
| <input type="checkbox"/> CDTL-36-16/3 | <input type="checkbox"/> CDTR-72-16/4 | <input type="checkbox"/> CDTR-108-14/3 |
| <input type="checkbox"/> CDTR-36-14/3 | <input type="checkbox"/> CDTR-72-16/3 | <input type="checkbox"/> CDTL-120-16/4 |
| <input type="checkbox"/> CDTR-36-16/4 | <input type="checkbox"/> CDTR-72-14/3 | <input type="checkbox"/> CDTL-120-16/3 |
| <input type="checkbox"/> CDTR-36-16/3 | <input type="checkbox"/> CDTL-84-16/4 | <input type="checkbox"/> CDTL-120-14/3 |
| <input type="checkbox"/> CDTR-36-14/3 | <input type="checkbox"/> CDTL-84-16/3 | <input type="checkbox"/> CDTR-120-16/4 |
| <input type="checkbox"/> CDTL-48-16/4 | <input type="checkbox"/> CDTL-84-14/3 | <input type="checkbox"/> CDTR-120-16/3 |
| <input type="checkbox"/> CDTL-48-16/3 | <input type="checkbox"/> CDTR-84-16/4 | <input type="checkbox"/> CDTR-120-14/3 |

Design and Construction Features

- 14 or 16 gauge stainless steel.
- 30" (762mm)-wide table furnished in nine lengths.
- 1½" (38mm) raised rolled rim on front and end.
- 1½" (41mm)-diameter galvanized legs with welded 1" (25mm)-diameter crossbracing.
- 8" (203mm)-high backsplash.
- Adjustable non-marking bullet feet with up to 1" (25mm) adjustment.
- All Spec-Master® 14 gauge type 304 dishtables come standard with stainless steel crossbraced legs and gussets, complete with metal feet.

Certifications / Approvals



AutoQuotes



EG50.00 Rev. 11/17

Spec sheets available for viewing, printing or downloading from our online literature library at www.eaglegrp.com

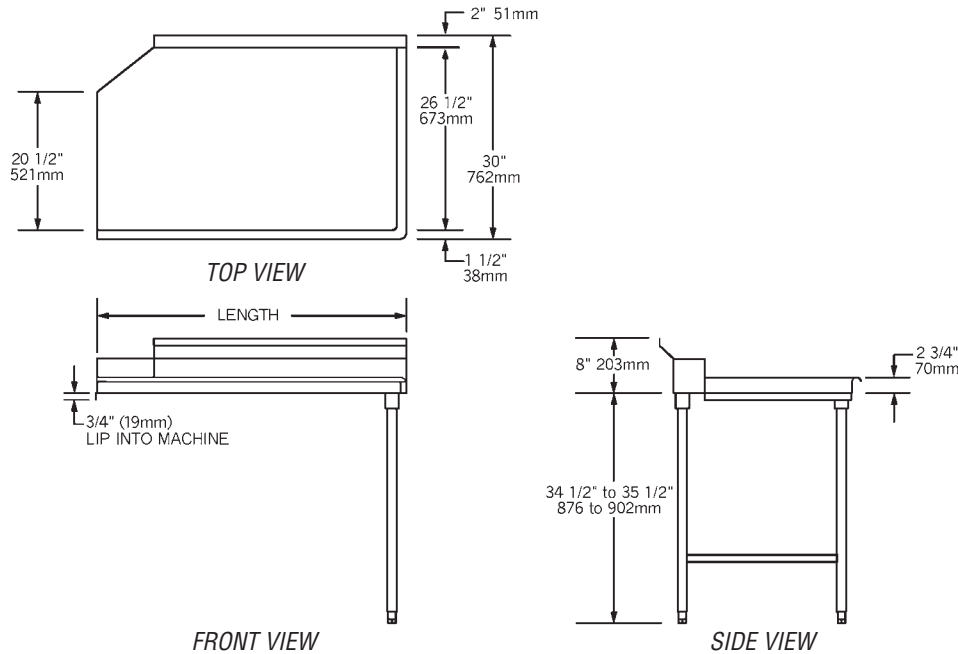
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Profit from the Eagle Advantage®

Item No.: _____
 Project No.: _____
 S.I.S. No.: _____

Clean Dishtables—Straight Design



16 gauge type 430 model #	16 gauge type 304 model #	Spec-Master® 14 gauge type 304 model #	description	length		weight	
				in.	mm	lbs.	kg
CDTL-24-16/4	CDTL-24-14/3	CDTL-24-16/3	left-hand model	24"	610	36	16.3
CDTR-24-16/4	CDTR-24-16/3	CDTR-24-14/3	right-hand model	24"	610	36	16.3
CDTL-30-16/4	CDTL-30-16/3	CDTL-30-14/3	left-hand model	30"	762	42	19.1
CDTR-30-16/4	CDTR-30-16/3	CDTR-30-14/3	right-hand model	30"	762	42	19.1
CDTL-36-16/4	CDTL-36-16/3	CDTL-36-14/3	left-hand model	36"	914	49	22.2
CDTR-36-16/4	CDTR-36-16/3	CDTR-36-14/3	right-hand model	36"	914	49	22.2
CDTL-48-16/4	CDTL-48-16/3	CDTL-48-14/3	left-hand model	48"	1219	63	29.6
CDTR-48-16/4	CDTR-48-16/3	CDTR-48-14/3	right-hand model	48"	1219	63	29.6
CDTL-60-16/4	CDTL-60-16/3	CDTL-60-14/3	left-hand model	60"	1524	77	34.9
CDTR-60-16/4	CDTR-60-16/3	CDTR-60-14/3	right-hand model	60"	1524	77	34.9
CDTL-72-16/4	CDTL-72-16/3	CDTL-72-14/3	left-hand model	72"	1829	91	41.3
CDTR-72-16/4	CDTR-72-16/3	CDTR-72-14/3	right-hand model	72"	1829	91	41.3
CDTL-84-16/4	CDTL-84-16/3	CDTL-84-14/3	left-hand model	84"	2134	105	47.6
CDTR-84-16/4	CDTR-84-16/3	CDTR-84-14/3	right-hand model	84"	2134	105	47.6
CDTL-96-16/4	CDTL-96-16/3	CDTL-96-14/3	left-hand model	96"	2438	119	54.0
CDTR-96-16/4	CDTR-96-16/3	CDTR-96-14/3	right-hand model	96"	2438	119	54.0
CDTL-108-16/4	CDTL-108-16/3	CDTL-108-14/3	left-hand model	108"	2743	134	60.8
CDTR-108-16/4	CDTR-108-16/3	CDTR-108-14/3	right-hand model	108"	2754	134	60.8
CDTL-120-16/4	CDTL-120-16/3	CDTL-120-14/3	left-hand model	120"	3048	147	66.7
CDTR-120-16/4	CDTR-120-16/3	CDTR-120-14/3	right-hand model	120"	3048	147	66.7

EAGLE GROUP

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Rev. 11/17

Submittal Sheet

12/20/2017

ITEM# 53 - WIRE SHELVING (8 EA REQ'D)

Metro 2460BR

Super Erecta® Shelf, wire, 60"W x 24"D, Bright (zinc) finish, plastic split sleeves are included in each carton, NSF
The spec sheet for this item can be viewed on item 02)

ACCESSORIES

Mfr	Qty	Model	Spec
Metro	8	63UP	Super Erecta® Post, 61-13/16"H, for use with stem casters, chrome plated finish
Metro	4	5MDA	Super Erecta® Stem Caster, swivel, 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity
Metro	4	5MDBA	Super Erecta® Stem Caster, brake (foot operated), 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity, brakes are foot operated

Submittal Sheet

12/20/2017

ITEM# 54 - THREE (3) COMPARTMENT SINK (1 EA REQ'D)

Eagle Group FN2860-3-30-14/3

Spec-Master® FN Series Sink, three compartment, 126"W x 35"D, 14/304 stainless steel top, 20" wide x 28" front-to-back x 14" deep compartments, 30" drainboards on left & right, 9-1/2"H backsplash with 1" upturn & tile edge, (2) sets of 8" O.C. splash mount faucet holes, rolled edges on front & sides, includes 3-1/2" basket drains, stainless steel crossbracing on all sides, stainless steel legs & adjustable bullet feet, NSF

ACCESSORIES

Mfr	Qty	Model	Spec
Eagle Group	1	336002	Twist Handle Drain, 2" NPS connection
Eagle Group	1	-TB	Twist bracket, per drain

WATER

	HOT SIZE	HOT AFF	HOT GPH	COLD SIZE	COLD AFF	FILTERED SIZE	FILTERED AFF	CONDENSER INLET SIZE	CONDENSER OUTLET SIZE
1									
2									

WASTE

	INDIRECT SIZE	DIRECT SIZE
1	(3) 1-1/2"	
2	(3) 2"	

PLUMBING 1 REMARKS

(2) sets of 1-1/8" faucet holes, 8" O.C.



Profit from the Eagle Advantage®

Specification Sheet

Short Form Specifications

Eagle Spec-Master® Three-Compartment Sinks, model _____, Unit constructed of 14/304, 18-8 stainless steel throughout. Sink bowls coved with a full $\frac{5}{8}$ " radius, and shall have a 14" water level. Drainboards, when required, shall be "V" creased for positive drainage. 9 $\frac{1}{2}$ " high backsplash with 1" upturn and tile edge. Legs to be 1 $\frac{1}{2}$ " O.D., stainless steel, with stainless steel gussets, stainless steel crossbracing and adjustable stainless steel bullet feet.



3-compartment sink
(faucets not included)

Options / Accessories

- | | |
|--|--|
| <input type="checkbox"/> Lever drain | <input type="checkbox"/> Faucets |
| <input type="checkbox"/> Lever drain with overflow | <input type="checkbox"/> Polyboard sink covers |
| <input type="checkbox"/> Twist handle drains | <input type="checkbox"/> Stainless steel sink covers |
| <input type="checkbox"/> Overflow hole | <input type="checkbox"/> Skirted front panel |
| <input type="checkbox"/> Sink kits | |

Assembly:

- Entire assembly is fuse-welded and planished, providing a one-piece seamless sink unit.
- Welded areas are high-speed belt blended to match adjacent surfaces with continuity of satin finish.
- All outside corners of assembly are bullnosed to provide safe, clean edges.
- Water supply is $\frac{1}{2}$ " (13mm) IPS for hot and cold lines.

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For custom configuration or fabrication needs, contact our SpecFAB® Division.

Phone: 302-653-3000 • Fax: 302-653-3091 • e-mail: specfab@eaglegrp.com

Item No.: _____
Project No.: _____
S.I.S. No.: _____

Spec-Master® FN Series Coved Corner Three-Compartment Sinks

MODELS:

- | | |
|-------------------------------------|-------------------------------------|
| <input type="checkbox"/> FN2048-3-* | <input type="checkbox"/> FN2472-3-* |
| <input type="checkbox"/> FN2054-3-* | <input type="checkbox"/> FN2860-3-* |
| <input type="checkbox"/> FN2060-3-* | |

* See table on back for complete model numbers.

Top:

- Drainboards, backsplash and rolled rims are 14 gauge type 304 stainless steel.
- Drainboards, when provided, are integrally welded.
- All rolled edges are highlighted for enhanced appearance.
- 9 $\frac{1}{2}$ " high backsplash with 1" upturn and tile edge.
- 1 $\frac{1}{2}$ " (29mm) faucet holes** punched on 8" (203mm) centers.

Base:

- Legs: 1 $\frac{1}{2}$ " (41mm)-diameter stainless steel tubing with stainless steel gussets and fully adjustable stainless steel bullet feet.
- Crossbracing: Adjustable, 1 $\frac{1}{4}$ " (32mm)-diameter stainless steel; running left-to-right and front-to-back.
- Leg locations fall directly under sink bowls, providing increased stability and maximum weight support.
- Leg gussets welded to a die-cut heavy-gauge stainless steel reinforcing corner plate.
- Legs are crossbraced on all sides for increased stability.

Sink Bowls:

- 14 gauge type 304 stainless steel.
- 14" (356mm) water level, 17" (432mm) flood level.
- Sink compartments are coved on a full $\frac{5}{8}$ " (41mm) radius and constructed using state-of-the-art seamless welding techniques.
- Basket-type waste drain fits sink bowls' 3 $\frac{1}{2}$ " (89mm) opening and features 1 $\frac{1}{2}$ " (38mm) outlet.

** Three-compartment sinks with 20" x 16" (508 x 406mm) bowls have one set of faucet holes. All others feature two sets of faucet holes.

Certifications / Approvals



Spec sheets available for viewing, printing or downloading from our online literature library at www.eaglegrp.com

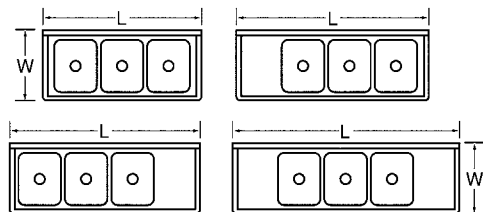
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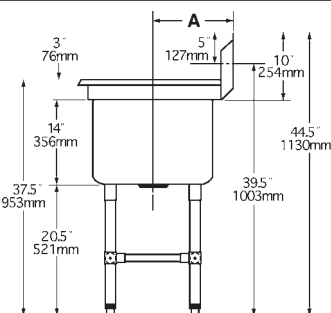
Item No.: _____
 Project No.: _____
 S.I.S. No.: _____

Spec-Master® FN Series Coved Corner Three-Compartment Sinks



Drain location for rough-in

bowl width in. mm	bowl length in. mm	Dimension A
20" 508	16" 406	14" 356
20" 508	18" 457	14" 356
20" 508	20" 508	14" 356
24" 610	24" 610	16" 406
28" 711	20" 508	18" 457



model #	BOWL DIMENSIONS				DRAINBOARD			OVERALL DIMENSIONS				weight	
	width in. mm	length in. mm	width in. mm	length in. mm	quantity	length in. mm	length in. mm	width in. mm	length in. mm	width in. mm	length in. mm	lbs.	kg
FN2048-3-14/3	20"	508	16"	406	0	-	-	27"	686	57"	1448	99	44.9
FN2048-3-18R or L-14/3	20"	508	16"	406	1	18"	457	27"	686	73½"	1867	118	53.5
FN2048-3-18-14/3	20"	508	16"	406	2	18"	457	27"	686	90"	2286	137	61.7
FN2048-3-24R or L-14/3	20"	508	16"	406	1	24"	610	27"	686	79½"	2019	124	56.2
FN2048-3-24-14/3	20"	508	16"	406	2	24"	610	27"	686	102"	2591	149	67.6
FN2048-3-30R or L-14/3	20"	508	16"	406	1	30"	762	27"	686	85½"	2172	129	58.5
FN2048-3-30-14/3	20"	508	16"	406	2	30"	762	27"	686	114"	2896	159	72.1
FN2048-3-36R or L-14/3	20"	508	16"	406	1	36"	914	27"	686	91½"	2324	134	60.8
FN2048-3-36-14/3	20"	508	16"	406	2	36"	914	27"	686	126"	3200	169	76.7
FN2054-3-14/3 *	20"	508	18"	457	0	-	-	27"	686	63"	1600	102	46.3
FN2054-3-18R or L-14/3 *	20"	508	18"	457	1	18"	457	27"	686	79½"	2019	121	54.9
FN2054-3-18-14/3 *	20"	508	18"	457	2	18"	457	27"	686	96"	2438	140	63.5
FN2054-3-24R or L-14/3 *	20"	508	18"	457	1	24"	610	27"	686	85½"	2172	127	57.6
FN2054-3-24-14/3 *	20"	508	18"	457	2	24"	610	27"	686	108"	2743	158	71.6
FN2054-3-30R or L-14/3 *	20"	508	18"	457	1	30"	762	27"	686	91½"	2324	132	59.9
FN2054-3-30-14/3 *	20"	508	18"	457	2	30"	762	27"	686	120"	3048	162	73.5
FN2054-3-36R or L-14/3 *	20"	508	18"	457	1	36"	914	27"	686	97½"	2477	137	62.1
FN2054-3-36-14/3 *	20"	508	18"	457	2	36"	914	27"	686	132"	3358	172	78.0
FN2060-3-14/3 *	20"	508	20"	508	0	-	-	27"	686	69"	1753	114	51.7
FN2060-3-18R or L-14/3 *	20"	508	20"	508	1	18"	457	27"	686	85½"	2172	133	60.3
FN2060-3-18-14/3 *	20"	508	20"	508	2	18"	457	27"	686	102"	2591	152	68.9
FN2060-3-24R or L-14/3 *	20"	508	20"	508	1	24"	610	27"	686	91½"	2324	139	63.1
FN2060-3-24-14/3 *	20"	508	20"	508	2	24"	610	27"	686	114"	2896	164	74.4
FN2060-3-30R or L-14/3 *	20"	508	20"	508	1	30"	762	27"	686	97½"	2477	144	65.3
FN2060-3-30-14/3 *	20"	508	20"	508	2	30"	762	27"	686	126"	3200	174	78.9
FN2060-3-36R or L-14/3 *	20"	508	20"	508	1	36"	914	27"	686	103½"	2629	149	67.6
FN2060-3-36-14/3 *	20"	508	20"	508	2	36"	914	27"	686	138"	3505	184	83.5
FN2472-3-14/3 *	24"	610	24"	610	0	-	-	31"	787	81"	2057	127	57.6
FN2472-3-18R or L-14/3 *	24"	610	24"	610	1	18"	457	31"	787	97½"	2477	146	66.2
FN2472-3-18-14/3 *	24"	610	24"	610	2	18"	457	31"	787	114"	2896	165	74.8
FN2472-3-24R or L-14/3 *	24"	610	24"	610	1	24"	610	31"	787	103½"	2629	152	68.9
FN2472-3-24-14/3 *	24"	610	24"	610	2	24"	610	31"	787	126"	3200	177	80.3
FN2472-3-30R or L-14/3 *	24"	610	24"	610	1	30"	762	31"	787	109½"	2769	157	71.2
FN2472-3-30-14/3 *	24"	610	24"	610	2	30"	762	31"	787	138"	3505	187	84.8
FN2472-3-36R or L-14/3 *	24"	610	24"	610	1	36"	914	31"	787	115½"	2934	162	73.5
FN2472-3-36-14/3 *	24"	610	24"	610	2	36"	914	31"	787	150"	3810	197	89.4
FN2860-3-14/3 *	28"	711	20"	508	0	-	-	35"	889	69"	1753	130	59.0
FN2860-3-18R or L-14/3 *	28"	711	20"	508	1	18"	457	35"	889	85½"	2172	149	67.6
FN2860-3-18-14/3 *	28"	711	20"	508	2	18"	457	35"	889	102"	2591	168	76.2
FN2860-3-24R or L-14/3 *	28"	711	20"	508	1	24"	610	35"	889	91½"	2324	155	70.3
FN2860-3-24-14/3 *	28"	711	20"	508	2	24"	610	35"	889	114"	2896	180	81.6
FN2860-3-30R or L-14/3 *	28"	711	20"	508	1	30"	762	35"	889	97½"	2477	160	72.6
FN2860-3-30-14/3 *	28"	711	20"	508	2	30"	762	35"	889	126"	3200	190	86.2
FN2860-3-36R or L-14/3 *	28"	711	20"	508	1	36"	914	35"	889	103½"	2629	165	74.8
FN2860-3-36-14/3 *	28"	711	20"	508	2	36"	914	35"	889	138"	3505	200	90.7

* Features two sets of faucet holes.

EAGLE GROUP

100 Industrial Boulevard, Clayton, DE 19938-8903 USA

Phone: 302-653-3000 • Fax: 302-653-2065

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Rev. 04/10

Submittal Sheet

12/20/2017

ITEM# 54.1 - WALL / SPLASH MOUNT FAUCET (2 EA REQ'D)

T&S Brass B-0231

Sink Mixing Faucet, 12" swing nozzle, wall mounted, 8" centers on sink faucet with 1/2" IPS eccentric flanged female inlets, lever handles

ACCESSORIES

Mfr	Qty	Model	Spec
T&S Brass	2	B-0230-K	Installation Kit , (2) 1/2" NPT nipples, lock nuts and washers, (2) short "El" 1/2" NPT female x male

WATER

	HOT SIZE	HOT AFF	HOT GPH	COLD SIZE	COLD AFF	FILTERED SIZE	FILTERED AFF	CONDENSER INLET SIZE	CONDENSER OUTLET SIZE
1	1/2"			1/2"					

WASTE

	INDIRECT SIZE	DIRECT SIZE
1		



T&S BRASS AND BRONZE WORKS, INC.

2 Saddleback Cove / P.O. Box 1088
Travelers Rest, SC 29690

Travelers Rest, SC: 800-476-4103 • Simi Valley, CA: 800-423-0150 • Fax: 864-834-3518 • www.tsbrass.com

Model No.

B-0231

Item No.



ADA Compliant

This Space for Architect/Engineer Approval

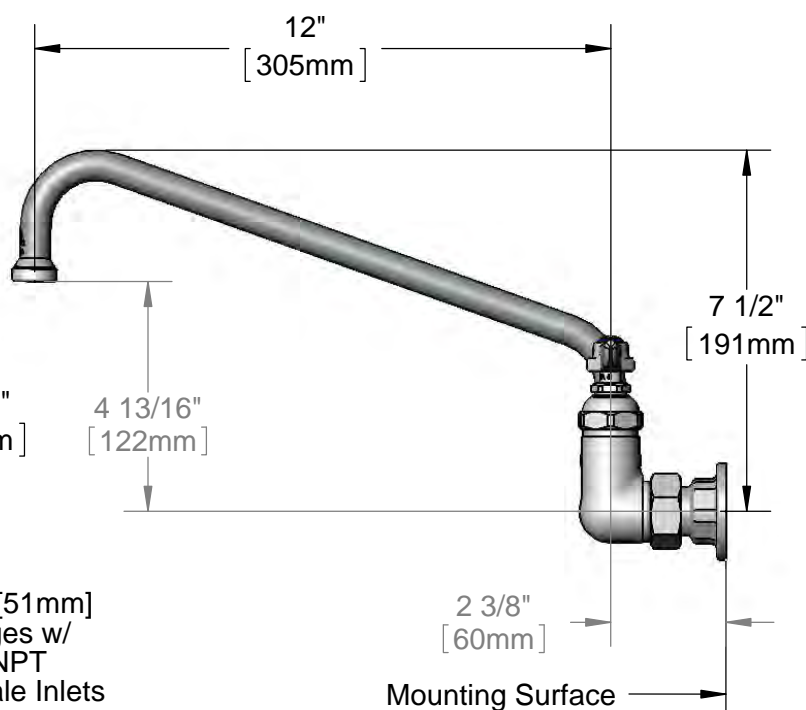
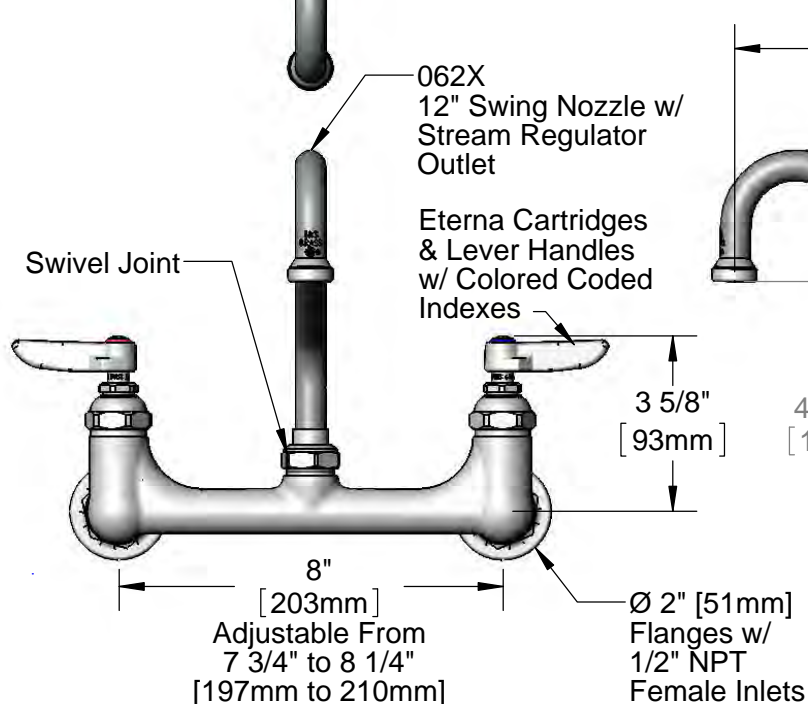
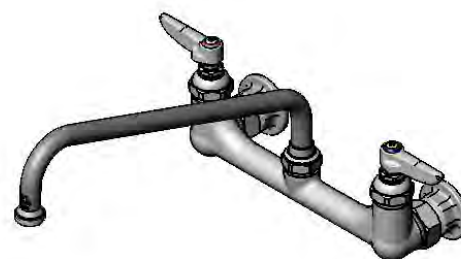
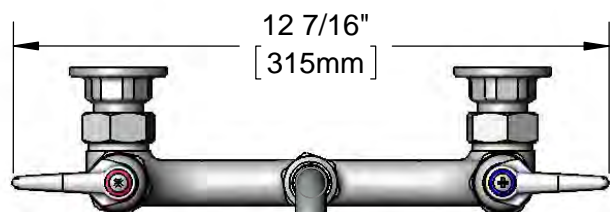
Job Name _____ Date _____

Model Specified _____ Quantity _____

Customer/Wholesaler _____

Contractor _____

Architect/Engineer _____



Product Specifications:

8" Wall Mount Mixing Faucet w/ Eterna Cartridges, Lever Handles, 12" Swing Nozzle & 1/2" NPT Female Inlets

Product Compliance:

ASME A112.18.1 / CSA B125.1
NSF 61 - Section 9
NSF 372 (Low Lead Content)
ANSI A117.1 (ADA)



T&S BRASS AND BRONZE WORKS, INC.

2 Saddleback Cove / P.O. Box 1088
Travelers Rest, SC 29690

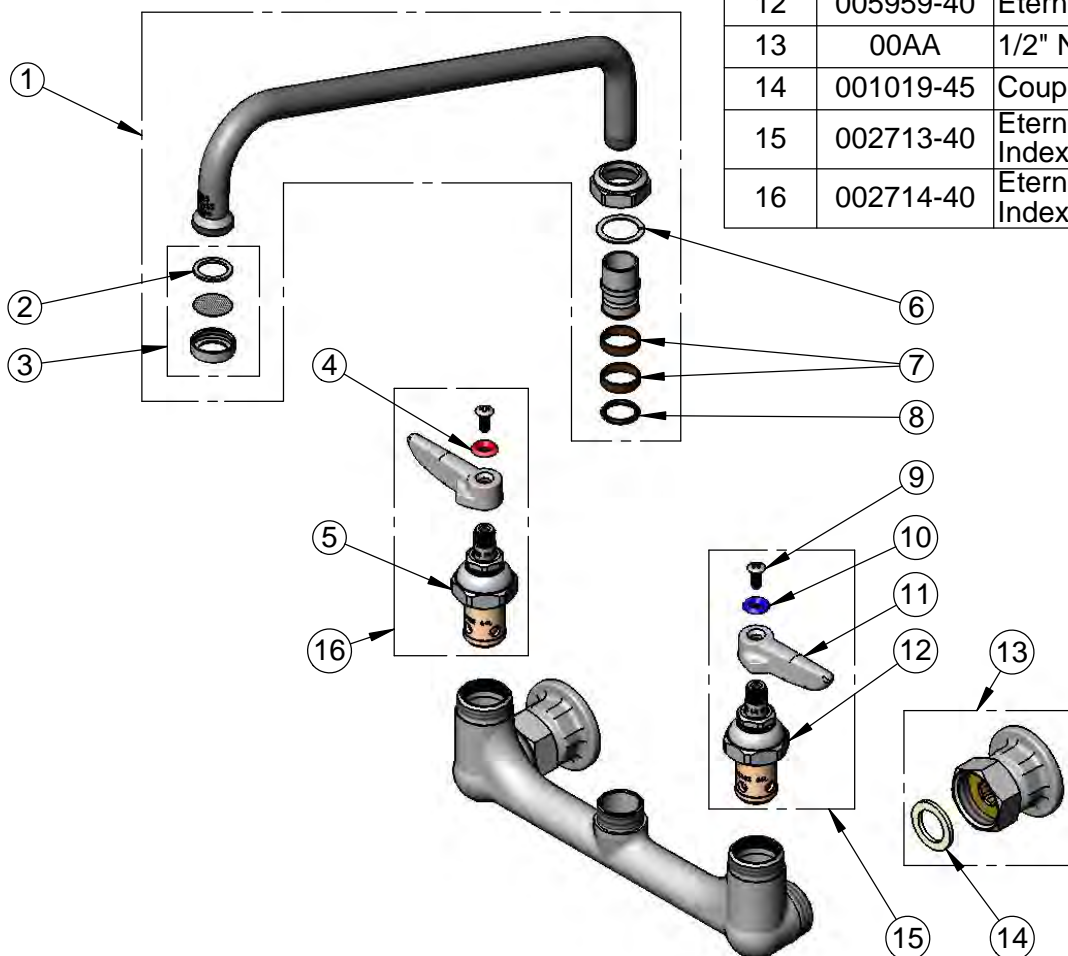
Model No.

B-0231

Item No.

Travelers Rest, SC: 800-476-4103 • Simi Valley, CA: 800-423-0150 • Fax: 864-834-3518 • www.tsbrass.com

ITEM NO.	SALES NO.	DESCRIPTION
1	062X	12" Swing Nozzle
2	001048-45	Nozzle Tip Washer
3	B-PT	Stream Regulator Outlet
4	001661-45	Red Index-HW
5	005960-40	Eterna Cartridge, RTC
6	009538-45	Swivel Washer
7	011429-45	Swivel Sleeves (2)
8	001074-45	O-Ring
9	000922-45	Lever Handle Screw
10	001660-45	Blue Index-CW
11	001638-45	Lever Handle
12	005959-40	Eterna Cartridge, LTC
13	00AA	1/2" NPT Female Eccentric Flange
14	001019-45	Coupling Nut Washer
15	002713-40	Eterna Cartridge, LTC w/ Handle, Index & Screw
16	002714-40	Eterna Cartridge, RTC w/ Handle, Index & Screw



Product Specifications:

8" Wall Mount Mixing Faucet w/ Eterna Cartridges, Lever Handles,
12" Swing Nozzle & 1/2" NPT Female Inlets

Product Compliance:

ASME A112.18.1 / CSA B125.1
NSF 61 - Section 9
NSF 372 (Low Lead Content)
ANSI A117.1 (ADA)

Drawn: DHL Checked: JRM Approved: JHB Date: 03/17/14

Scale: NTS

Sheet: 2 of 2

Submittal Sheet

12/20/2017

ITEM# 55 - SHELVING, WALL-MOUNTED (4 EA REQ'D)

Metro 12WS52C

Regular Erecta® Wall Shelf Kit, 50-1/4"W x 13"D x 21"H, includes: (2) 48"W x 12"D shelves, shelf supports & mounting brackets (wall bolts & screws not included), chrome, NSF

The spec sheet for this item can be viewed on item 22)

Submittal Sheet

12/20/2017

ITEM# 56 - WIRE SHELVING (4 EA REQ'D)

Metro 2442BR

Super Erecta® Shelf, wire, 42"W x 24"D, Bright (zinc) finish, plastic split sleeves are included in each carton, NSF
The spec sheet for this item can be viewed on item 02)

ACCESSORIES

Mfr	Qty	Model	Spec
Metro	4	63UP	Super Erecta® Post, 61-13/16"H, for use with stem casters, chrome plated finish
Metro	2	5MDA	Super Erecta® Stem Caster, swivel, 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity
Metro	2	5MDBA	Super Erecta® Stem Caster, brake (foot operated), 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity, brakes are foot operated

Submittal Sheet

12/20/2017

ITEM# 57 - WIRE SHELVING (4 EA REQ'D)

Metro 2460BR

Super Erecta® Shelf, wire, 60"W x 24"D, Bright (zinc) finish, plastic split sleeves are included in each carton, NSF
 The spec sheet for this item can be viewed on item 02)

ACCESSORIES

Mfr	Qty	Model	Spec
Metro	4	63UP	Super Erecta® Post, 61-13/16"H, for use with stem casters, chrome plated finish
Metro	2	5MDA	Super Erecta® Stem Caster, swivel, 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity
Metro	2	5MDBA	Super Erecta® Stem Caster, brake (foot operated), 5" diameter, 1-1/4" face, high modulus donut wheel tread, with donut bumpers, 250 lb. capacity, brakes are foot operated

Submittal Sheet

12/20/2017

ITEM# 58 - HAND SINK (2 EA REQ'D)

Eagle Group HSA-10-F

Hand Sink, wall mount, 13-1/2" wide x 9-3/4" front-to-back x 6-3/4" deep bowl, 304 stainless steel construction, splash mount gooseneck faucet, basket drain, deep-drawn seamless design-positive drain, inverted "V" edge, NSF

The spec sheet for this item can be viewed on item 24)

ACCESSORIES

Mfr	Qty	Model	Spec
Eagle Group	2	303987	Gooseneck Faucet, standard, splash mount, 4" O.C., NSF
Eagle Group	2	307120	Wrist Handles, for 303987 faucet, NSF

WATER

	HOT SIZE	HOT AFF	HOT GPH	COLD SIZE	COLD AFF	FILTERED SIZE	FILTERED AFF	CONDENSER INLET SIZE	CONDENSER OUTLET SIZE
1									
2	1/2"			1/2"					

WASTE

	INDIRECT SIZE	DIRECT SIZE
1		1-1/2"
2		

Submittal Sheet

12/20/2017

ITEM# 59 - EQUIPMENT STAND, FOR MIXER / SLICER (1 EA REQ'D)

Eagle Group MMT3030S

Mixer Stand, mobile, 30"W x 30"D, 14/300 series stainless steel top with marine edge, 400 lbs capacity, pan rack slides for (6) 18" x 26" pans, Uni-Lok® gusset system, stainless steel crossbracing on sides & rear, stainless steel legs, (2) swivel & (2) swivel/brake 4" casters



Profit from the Eagle Advantage®

Specification Sheet

Short Form Specifications

Eagle Mobile Mixer Stand, model _____. Top to be 14 gauge 300 series stainless steel with no-drip counter top edge. Constructed with uni-lok® patented gusset system, with the gussets recessed into the hat channels to reduce lateral movement. Stainless steel pan rack slides hold six 18" x 26" bun pans. Galvanized or stainless steel tubular base: 1 1/2" O.D. tubular legs with 1 1/4" O.D. tubular cross rails, and 4" swivel casters—two with brake.

Eagle Mobile Equipment Stand, model MET2430S. Top to be 14 gauge 300 series stainless steel with no-drip counter top edge. Constructed with uni-lok® patented gusset system, with the gussets recessed into the hat channels to reduce lateral movement. Heavy gauge stainless steel adjustable undershelf, 1" diameter stainless steel handle welded to brackets and stand. 1 1/2" O.D. stainless steel tubular legs and two 4" casters with brake.



mobile mixer stand



mobile equipment stand

Options / Accessories

☐ Drawers

Item No.:	_____
Project No.:	_____
S.I.S. No.:	_____

Mobile Mixer/Equipment Stands

MODELS:

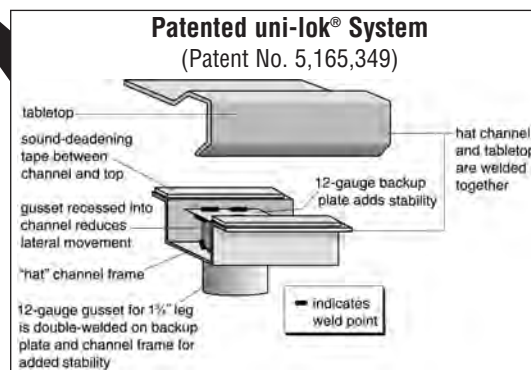
☐ MMT3030G ☐ MMT3036G ☐ MET2430S
☐ MMT3030S ☐ MMT3036S

Mobile Mixer Stands

- Uni-lok® gusset system (patent #5,165,349): gusset is recessed into hat channel underside tabletop, reducing lateral movement.
- Highly-polished 14 gauge 300 series stainless steel top with no-drip countertop edge.
- Stainless steel crossbracing on three sides.
- 1 1/2" (41mm)-diameter legs with four 4" (102mm) casters, two with brake.
- Pan rack slides hold six 18" x 26" (457 x 660mm) pans.
- 400 lb. (181.4 kg) total weight capacity - evenly distributed static load.

Mobile Equipment Stand

- Uni-lok® gusset system (patent #5,165,349): gusset is recessed into hat channel underside tabletop, reducing lateral movement.
- Highly-polished 14 gauge 300 series stainless steel top with no-drip countertop edge.
- Stainless steel undershelf.
- 1 1/2" (41mm)-diameter legs with two 4" (102mm) casters with brake.
- 1" (25mm)-diameter stainless steel handle is welded to heavy duty brackets and stand.



EAGLE GROUP

100 Industrial Boulevard, Clayton, DE 19938-8903 USA

Phone: 302-653-3000 • Fax: 302-653-2065

www.eaglegrp.com

Foodservice Division: Phone 800-441-8440

MHC/Retail Display Divisions: Phone 800-637-5100

For custom configuration or fabrication needs, contact our SpecFAB® Division.

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AUTOQUOTES



EG10.26B Rev. 05/15

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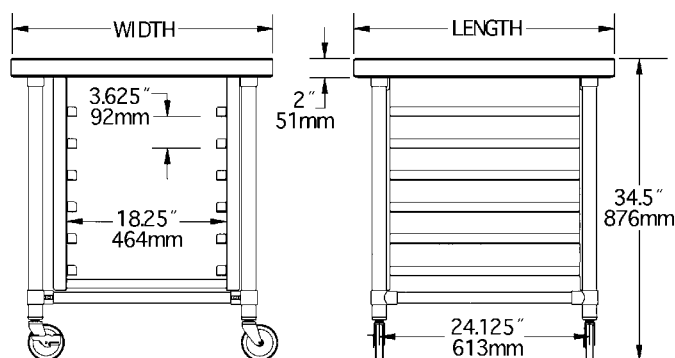


Profit from the Eagle Advantage®

Item No.: _____
 Project No.: _____
 S.I.S. No.: _____

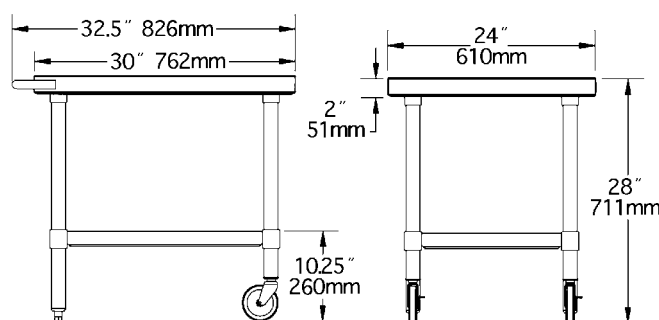
Mobile Mixer/Equipment Stands

Mobile Mixer Stands



galvanized model #	stainless steel model #	weight		width		length	
		lbs.	kg	in.	mm	in.	mm
MMT3030G	MMT3030S	55	24.9	30"	762	30"	762
MMT3036G	MMT3036S	60	27.2	30"	762	36"	914

Mobile Equipment Stand



model #	weight		width		length	
	lbs.	kg	in.	mm	in.	mm
MET2430S	47	21.3	24"	610	30"	762

EAGLE GROUP

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Rev. 05/15

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Submittal Sheet

12/20/2017

ITEM# 60 - PLANETARY MIXER (1 EA REQ'D)

Hobart HL200-1STD

100-120/50/60/1; Bench type mixer; with bowl, beater, whip & spiral dough arm, US/EXP configuration

Legacy Planetary Mixer, Bench, 20 quart, (3) fixed speeds plus stir speed, gear-driven transmission, 15-minute SmartTimer™, #12 taper hub, manual bowl lift, stainless steel bowl, aluminum "B" beater, stainless steel "D" wire whip, aluminum "ED" spiral dough arm, stainless steel bowl guard, 1/2 hp, cord with plug

ACCESSORIES

Mfr	Qty	Model	Spec
Hobart	1		Standard warranty - 1-Year parts, labor & travel time during normal working hours within the USA

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1	100-120		1	Cord & Plug							



701 S Ridge Avenue, Troy, OH 45374
1-888-4HOBART • www.hobartcorp.com

LEGACY® HL200 MIXER

HOBART

STANDARD FEATURES

- Heavy-Duty ½ H.P. Motor
- Gear Transmission
- Three Fixed Speeds Plus Stir Speed
- Shift-on-the-Fly™ Controls
- Patented soft start Agitation Technology
- 15-Minute SmartTimer™
- Automatic Time Recall
- Large, Easy-To-Reach Controls
- Single Point Bowl Installation
- Ergonomic Swing-Out Bowl
- #12 Taper Attachment Hub
- Open Base
- Stainless Steel Bowl Guard
- Metallic Gray Hybrid Powder Coat Finish

MODELS

- ☐ HL200 – 20-Quart All Purpose Mixer
- ☐ HL200C – 20-Quart All Purpose Mixer with Maximum Security Correctional Package

Specifications, Details and Dimensions on Inside and Back.



ACCESSORY PACKAGE - featuring Hobart Quick Release™ Agitators

- ☐ **HL200-1STD Standard Accessory Package**
Includes:
 - 20 Quart Stainless Steel Bowl
 - 20 Quart “B” Beater
 - 20 Quart “D” Whip
 - 20 Quart “ED” Dough Hook

**LEGACY® HL200 MIXER**

LEGACY®

HL200 MIXER



701 S Ridge Avenue, Troy, OH 45374
1-888-4HOBART • www.hobartcorp.com

SOLUTIONS/BENEFITS

½ H.P. Motor

Durability

- Heavy-duty to meet the most demanding operations

Gear Transmission

Durability, Reliability

- Ensures consistent performance and minimum downtime under heavy loads

Three Fixed Speeds plus Stir Speed

Flexibility, Reliability, Consistency

- For incorporating, blending, mixing ingredients
- Supports consistent results and thorough mixing

Shift-on-the-Fly™ Controls

Flexibility

- Allows operator to change speeds while mixer is running

Patented soft start Agitation Technology

Sanitation

- Each speed has a soft transition into a higher speed to reduce the chances of product splash-out

15-Minute SmartTimer™

Convenience, Ease of Use, Consistency

- Supports recipe mixing times
- Provides accurate results and eliminates overmixing

Automatic Time Recall

Productivity, Consistency

- Remembers the last time set for each speed
- Great for multiple batches

Ergonomic Swing-Out Bowl

Ease of Use, Convenience

- Easy loading and unloading of products
- Single Point Bowl Installation allows for simple mounting and removal of bowl
- Bowl Interlock ensures mixer bowl is properly in place for mixer to operate

Stainless Steel Bowl Guard

Protection

- Safety interlock prevents operation when front portion of guard is out of position

Hobart Accessories

Durability, Flexibility, Simplicity

- Hobart Quick Release™ agitators allow for simple installation and removal from agitator shaft
- Hobart accessories are designed for long-term usage under heavy-duty conditions
- Large array of accessories provide multiple uses for recipe and product processing

HL200 MIXER CAPACITY CHART

Recommended Maximum Capacities - dough capacities based on 70°F. water and 12% flour moisture.

PRODUCT	AGITATORS SUITABLE FOR OPERATION	HL200
CAPACITY OF BOWL (QTS. LIQUID)		20
Egg Whites	D	1 qt.
Mashed Potatoes	B & C	15 lbs.
Mayonnaise (Qts. of Oil)	B or C or D	10 qts.
Meringue (Qts. of Water)	D	1½ pts.
Waffle or Hot Cake Batter	B	8 qts.
Whipped Cream	D or C	4 qts.
Cake, Angel Food (8-10 oz. cake)	C or I	15
Cake, Box or Slab	B or C	20 lbs.
Cake, Cup	B or C	20 lbs.
Cake, Layer	B or C	20 lbs.
Cake, Pound	B	21 lbs.
Cake, Short (Sponge)	C or I	15 lbs.
Cake, Sponge	C or I	12 lbs.
Cookies, Sugar	B	15 lbs.
Dough, Bread or Roll (Lt.-Med.) 60% AR	§	ED 25 lbs.□
Dough, Heavy Bread 55% AR	§	ED 15 lbs.□
Dough Pie	B & P	18 lbs.
Dough, Thin Pizza 40% AR (max. mix time 5 min.)	§‡	ED 9 lbs.□
Dough, Med. Pizza 50% AR	§‡	ED 10 lbs.□
Dough, Thick Pizza 60% AR	§‡	ED 20 lbs.□
Dough, Raised Donut 65% AR	ED	9 lbs.*
Dough, Whole Wheat 70% AR	ED	20 lbs.□
Eggs & Sugar for Sponge Cake	B & C or I	8 lbs.
Icing, Fondant	B	12 lbs.
Icing, Marshmallow	C or I	2 lbs.
Shortening & Sugar, Creamed	B	16 lbs.
Pasta, Basic Egg Noodle (max. mix time 5 min.)	ED	5 lbs.

NOTE: % AR (% Absorption Ratio) - Water weight divided by flour weight. Capacity depends on moisture content of dough. Above capacities based on 12% flour moisture at 70°F water temperature.

□ 1st Speed

* 2nd Speed

‡ 3rd Speed

§ If high gluten flour is used, reduce above dough batch size by 10%.

‡ 2nd Speed should never be used on 50% AR or lower products.

USE OF ICE REQUIRES A 10% REDUCTION IN BATCH SIZE.

1 gallon of water weighs 8.33 lbs.

NOTE: Attachment hub should not be used while mixing.



701 S Ridge Avenue, Troy, OH 45374
1-888-4HOBART • www.hobartcorp.com

LEGACY® HL200 MIXER

SPECIFICATIONS

MOTOR:

½ H.P. high torque motor.

100-120/50/60/1 8.0 Amps

200-240/50/60/1 5.0 Amps

ELECTRICAL:

100-120/50/60/1, 200-240/50/60/1 – UL Listed.

CONTROLS:

Magnetic contactor with thermal overload protection. Internally sealed “Start-Stop” push buttons. A 15-minute SmartTimer™ is standard. SmartTimer™ includes **Automatic Time Recall**, which remembers the last time set for each speed.

TRANSMISSION:

Gear-driven. Gears are constant mesh heat-treated hardened alloy steel along with anti-friction ball bearings. Grease lubricants furnished to all gears and shafts.

SPEEDS:

	Agitator (RPM)	Attachment (RPM)
Stir	59	33
First (Low)	107	61
Second (Intermediate)	198	113
Third (High)	365	207

BOWL GUARD:

Heavy-duty stainless steel wire front and solid rear portion. Front portion of guard rotates easily to add ingredients and install or remove agitator. It detaches in seconds for cleaning in dishwasher or sink. Rear portion of guard can be quickly cleaned in position. Guard must be in closed position before mixer will operate. Bowl support interlock provides further protection.

BOWL LIFT:

Ergonomic style, hand crank operated, self-locking in top and bottom position.

FINISH:

Metallic Gray Hybrid Powder Coat finish.

ATTACHMENT HUB:

Comes with front-mounted Hobart standard #12 taper attachment hub for use with Hobart #12 size attachments.

ATTACHMENTS AND ACCESSORIES:

The following are available at extra cost:

Stainless Steel Bowl
“B” Flat Beater
“C” Wing Whip
“D” Wire Whip
“E” Dough Hook
“ED” Dough Hook
“P” Pastry Knife
Bowl Splash Cover
Bowl Scraper
Ingredient Chute
12 Quart Accessories
9" Vegetable Slicer
Meat Chopper Attachment
Attachment Tray Support



Hobart Bowl Scraper

Hobart Ingredient Chute



Listed by Underwriters Laboratories Inc. and certified by NSF International.

LEGACY® HL200 MIXER

HOBART

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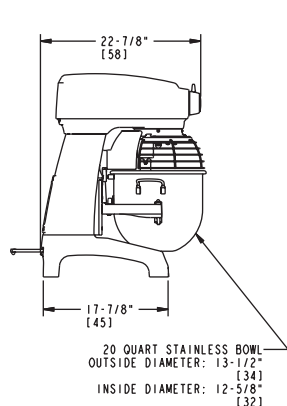
SPECIFICATIONS

ELECTRICAL SPECIFICATIONS: 100-120/50/60/1,
 200-240/50/60/1 – UL Listed.

WEIGHT: 189 lbs. net; 204 lbs. domestic shipping.

WARRANTY: Unit has full one-year warranty on
 parts, labor and mileage against manufacturer's
 defects. Service contracts are available.

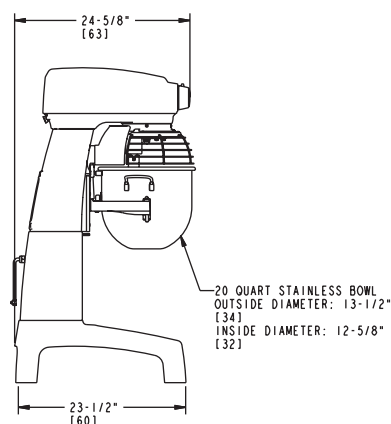
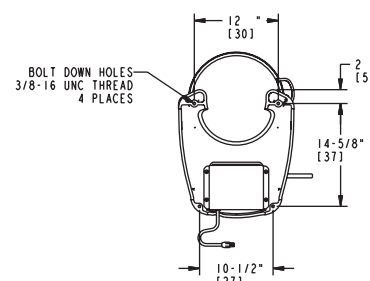
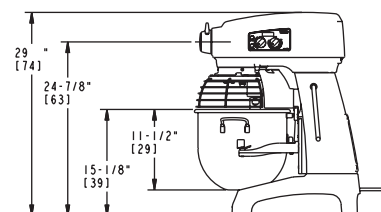
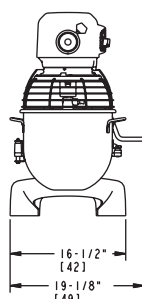
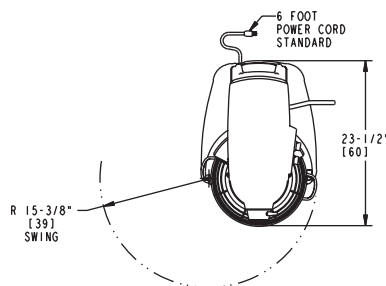
DETAILS AND DIMENSIONS



WARNING

 ELECTRICAL AND GROUNDING CONNECTIONS MUST
 COMPLY WITH THE APPLICABLE PORTIONS OF
 THE NATIONAL ELECTRICAL CODE AND/OR
 OTHER CODES IN FORCE

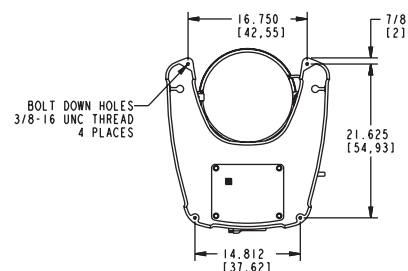
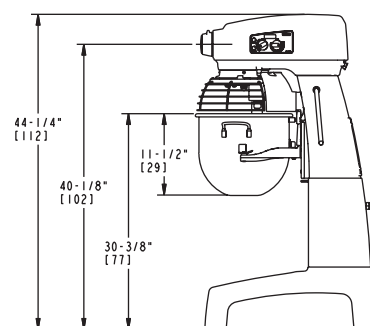
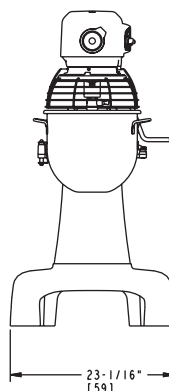
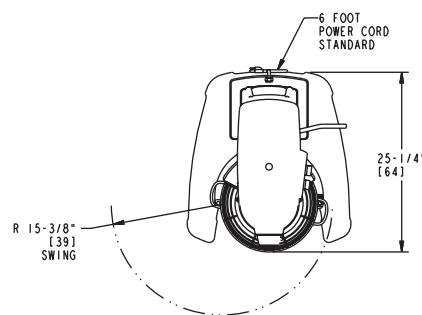
NOTE

 MACHINE WEIGHT (LESS BOWL)----- 189 LBS
 SHIPPING WEIGHT----- 204 LBS
 BOWL WEIGHT----- 9 LBS


WARNING

 ELECTRICAL AND GROUNDING CONNECTIONS MUST
 COMPLY WITH THE APPLICABLE PORTIONS OF
 THE NATIONAL ELECTRICAL CODE AND/OR
 OTHER CODES IN FORCE

NOTE

 MACHINE WEIGHT (LESS BOWL)----- 265 LBS
 SHIPPING WEIGHT----- 280 LBS
 BOWL WEIGHT----- 9 LBS


As continued product improvement is a policy of Hobart, specifications are subject to change without notice.

Submittal Sheet

12/20/2017

ITEM# 61 - INGREDIENT BIN (2 EA REQ'D)

Cambro IBS27148

Ingredient Bin, mobile, 27 gallon capacity, 1-pc seamless polyethylene bin, 2-pc sliding polycarbonate lid, S-hook on front (scoop NOT included), (4) 3" heavy duty casters (2 front swivel, 2 fixed), white with clear cover, NSF

CAMBRO®**Ingredient Bins****Slant Top**

Models IBS20 – 21 gallon (81 L)
 IBS27 – 27 gallon (102 L)
 IBS37 – 37 gallon (140 L)

**Features & Benefits**

- Stores and transports a wide variety of dry ingredients such as flour, sugar, rice or grains. Perfect for restaurants, food manufacturers or commissaries.
- Available in 21, 27 and 37 gallon (81, 102, 140 L) capacity to meet standard industry requirements for storage and transportation of bulk foods.
- One-piece, seamless single-wall polyethylene bin construction is extremely durable. Won't rust or corrode. Liquids and dry foods will not stick or seep between seams.
- FDA accepted material. Meets all food contact requirements and eliminates need for liners.
- Smooth interior and exterior are easy to clean.
- Injection molded Camwear® polycarbonate lids are transparent, break resistant and offer quick and easy identification of contents. Slide-back feature means easy access.
- Working height permits storage under standard work tables.
- Heavy-duty 3" (7,6 cm) casters, 2 front swivel, 2 fixed.
- No assembly required.
- Available in White (148) only with Clear (135) cover.

Item No. _____**Specifier Identification No.** _____**Model No.** _____**Quantity** _____**IBS20****IBS27****IBS37**

Scoops not Included
Approvals

**CAMBRO®**

© Cambro Manufacturing Company 5801 Skylab Road, Huntington Beach, CA 92647-2056, U.S.A.
 Telephone 714 848 1555 Toll Free 800 854 7631 Customer Service Department 800 833 3003

Ingredient Bins

Slant Top

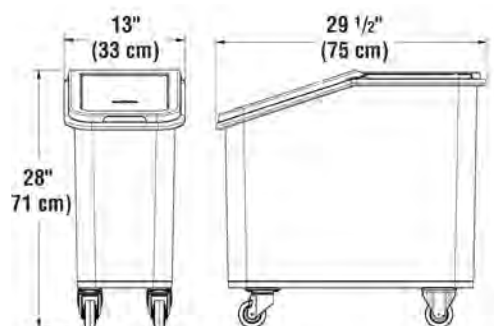
Models IBS20 – 21 gallon (81 L)
 IBS27 – 27 gallon (102 L)
 IBS37 – 37 gallon (140 L)

Item No. _____

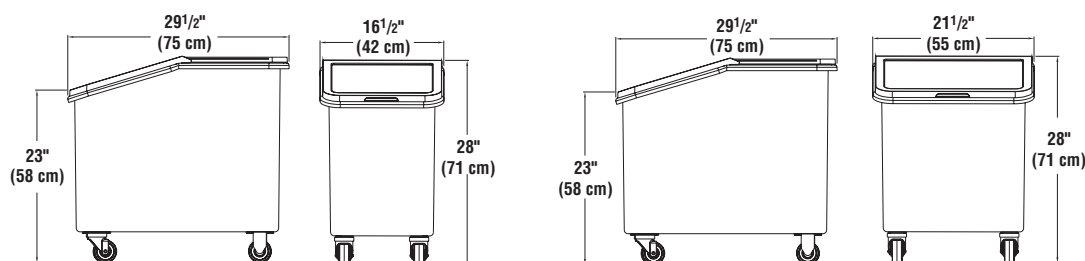
Specifier Identification No. _____

Model No. _____

Quantity _____



IBS20



IBS27

IBS37

Specifications

Dimension Tolerance: +/- 1/4" (0,64 cm)

Code	Description	Volume Capacity	Load Capacity		Exterior Dimensions W x D x H	Case lbs./cube Kg/m ³
			Sugar	Flour		
IBS20	21 gal. Ingredient Bin (81 L)	2.87 Cubic feet (0,081) Cubic meters	170 lbs. (77 kg.)	140 lbs. (63 kg.)	13" x 29 1/2" x 28" (33 x 75 x 71 cm)	28 (6,57) 13 (0,19)
IBS27	27 gal. Ingredient Bin (102 L)	3.98 Cubic feet (0,113) Cubic meters	226 lbs. (103 kg.)	150 lbs. (68 kg.)	16 1/2" x 29 1/2" x 28" (42 x 75 x 71 cm)	24 (7,50) 11 (0,22)
IBS37	37 gal. Ingredient Bin (140 L)	5.55 Cubic feet (0,157) Cubic meters	314 lbs. (142 kg.)	225 lbs. (102 kg.)	21 1/2" x 29 1/2" x 28" (55 x 75 x 71 cm)	28 (10,10) 13 (0,29)

Architect Specs

The Ingredient Bins shall be Cambro Model..., manufactured by Cambro Mfg. Co., Huntington Beach, CA 92648 U.S.A. Each unit shall be one piece, seamless, single-wall molded construction made of FDA Approved white polyethylene. Unit capacity shall range from 21 - 37 gallons (81 - 140 L) and/or 2.87 - 5.55 cu. ft. (0,081 - 0,157 cubic meters).

It shall have four each 3" (7,6 cm) casters with 1 1/4" (3,2 cm) wide tread, 2 front swivel and 2 fixed. It shall have an injection molded, transparent, slide-back polycarbonate lid. It shall not exceed 29" (73,6 cm) in height so that it can store under standard work tables. It shall be available in white only with a clear cover.

Approvals



CAMBRO

© Cambro Manufacturing Company 5801 Skylab Road, Huntington Beach, CA 92647-2056, U.S.A.
 Telephone 714 848 1555 Toll Free 800 854 7631 Customer Service Department 800 833 3003

Submittal Sheet

12/20/2017

ITEM# 62 - ONE (1) COMPARTMENT SINK (1 EA REQ'D)

Eagle Group FN2018-1-36R14/3

Spec-Master® FN Series Sink, one compartment, 57-1/2"W x 27"D, 14/304 stainless steel top, 18" wide x 20" front-to-back x 14" deep compartment, 36" drainboard on right, 9-1/2"H backsplash with 1" upturn & tile edge, 8" O.C. splash mount faucet holes, rolled edges on front & sides, includes 3-1/2" basket drain, stainless steel crossbracing on all sides, stainless steel legs & adjustable bullet feet, NSF

The spec sheet for this item can be viewed on item 21)

ACCESSORIES

Mfr	Qty	Model	Spec
Eagle Group	1	340380	T&S Faucet, splash-mounted, 8" centers, 10" swing nozzle, extra heavy-duty
Eagle Group	1	341189	Twist Handle Drain, 1-1/2 or 2" NPS connection
Eagle Group	1	-TB	Twist bracket, per drain

WATER

	HOT SIZE	HOT AFF	HOT GPH	COLD SIZE	COLD AFF	FILTERED SIZE	FILTERED AFF	CONDENSER INLET SIZE	CONDENSER OUTLET SIZE
1									
2	1/2"			1/2"					
3									

WASTE

	INDIRECT SIZE	DIRECT SIZE
1	1-1/2"	
2		
3	2"	

PLUMBING 1 REMARKS

(1) set of 1-1/8" faucet holes, 8" O.C.

Submittal Sheet

12/20/2017

ITEM# 63 - WORK TABLE, WOOD TOP (1 EA REQ'D)

John Boos HNS16

Work Table, wood top, 48"W x 36"D, 1-3/4" thick laminated Hard Rock maple flat top, galvanized legs & adjustable undershelf, bullet feet, NSF, KD

ACCESSORIES

Mfr	Qty	Model	Spec
John Boos	1		Table comes standard with flat undershelf
John Boos	1	CAS01-R	Casters, 5", heavy duty, locking, for 1-5/8" diameter legs (set of 4)



"HNS" Maple Top Work Tables

w/ 1 3/4" thick Hard Rock Maple Top
w/ Galvanized Base and Undershelf



AUTOQUOTES



1-3/4" MAPLE TOP w/ UNDERSHELF					
24"WIDE	Qty	30"WIDE	Qty	36"WIDE	Qty
HNS01		HNS08		HNS15	
HNS02		HNS09		HNS16	
HNS03		HNS10		HNS17	
HNS04		HNS11		HNS18	
HNS05		HNS12		HNS19	
HNS06		HNS13		HNS20	
HNS06A		HNS13A		HNS20A	
HNS07		HNS14		HNS21	

FEATURES:

- * 1 3/4" Thick Hard Rock Maple Top
top style "SC" flat top
- * Maple top is finished with penetrating oil
with optional natural clear Varnique Finish
- * Galvanized base and undershelf,
- * Adjustable Lower Shelf
- * Adjustable bullet feet
- * Shipped knocked-down, easy - to - assemble
- * Optional drawers, casters, pot racks, etc. available
- * All models are approved by the National Sanitation Foundation

MATERIAL:

Top: Laminated Hard Rock Maple
Shelf: 18 gauge Galvanized Steel
** 6 ft. table only, 16 gauge galvanized steel
Legs: 16 gauge Galvanized Steel
Gussets: Galvanized Steel
Feet: 1" adjustable galvanized bullet feet

OPTIONAL ACCESSORIES

	MODEL #	Qty
DRAWER		
DRAWER LOCK		
ADJUSTABLE SHELF		
CASTERS		
OVERSHELVES		
POT RACK		

John Boos & Co

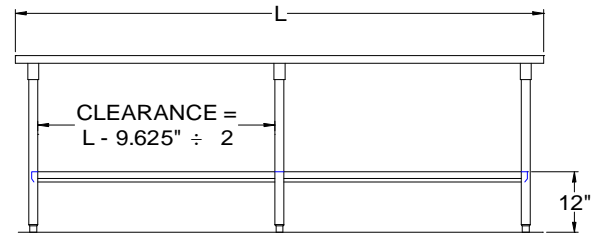
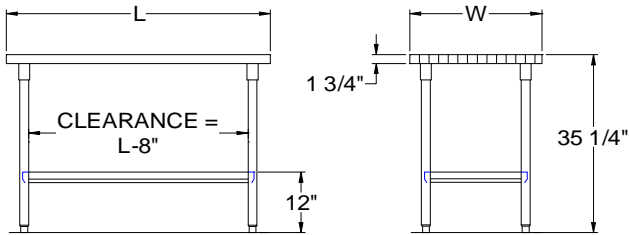
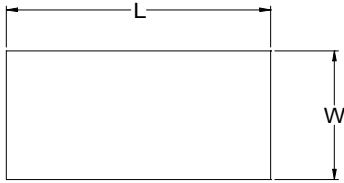
3601 S. Banker Street - Effingham, IL 62401

Phone: 217-347-7701 - Fax: 217-347-7705

Email: sales@johnboos.com - Web-site:www. johnboos.com

A-3

DETAILED SPECIFICATIONS



All units ship unassembled for reduced shipping cost.

Units 7 ft. and larger are furnished with six legs.

All dimensions are typical.

Tolerance +/- .500".

Finished size of undershelf.

Shelf length = length minus 4.875"

Shelf width = width minus 4.25"

1-3/4" MAPLE TOP & UNDERSHELF

L	24" WIDE	WT.	30" WIDE	WT.	36" WIDE	WT.
36	HNS01	84	HNS08	102	HNS15	118
48	HNS02	106	HNS09	129	HNS16	151
60	HNS03	129	HNS10	158	HNS17	185
72	HNS04	157	HNS11	191	HNS18	226
84	HNS05	184	HNS12	224	HNS19	271
96	HNS06	206	HNS13	251	HNS20	297
108	HNS06A	228	HNS13A	279	HNS20A	330
120	HNS07	249	HNS14	306	HNS21	363

John Boos & Co

3601 S. Banker Str - Effingham, IL 62401 Phone: 217-347-7701 - Fax: 217-347-7705

Email: sales@johnboos.com - Web-site: www.johnboos.com



December 2016

John Boos is constantly engaged in a program of improving products and therefore reserves the right to change specification without prior notice



**John
BOOS**
Since 1887

ITEM #: _____ QTY: _____
MODEL #: _____
PROJECT NAME: _____

072117

3601 S. Banker St. Effingham, IL 62401 • P.O. BOX 609 • Ph: (888) 431-2667 • Fax: (800) 433-2667

"CAS" CASTERS & FEET

CASTERS & FEET

MODEL #	QTY	ITEM	DESCRIPTION	SET OF
CAS01-R		CASTERS	5", HEAVY DUTY, LOCKING, FOR 1-5/8" DIAMETER LEGS	4
CAS02-R		CASTERS	5", HEAVY DUTY, LOCKING, FOR 1-5/8" DIAMETER LEGS	6
CAS03		CASTERS	2-1/2", HEAVY DUTY, LOCKING	EACH
CAS-RN		CASTERS	3", BLACK, LOCKING	EACH
CUCCAS-DLGS		CASTERS	5", SWIVEL LOCKING PLATE CASTER	4
CAS05		FLANGE FEET	ADJUSTABLE, STAINLESS STEEL	4
CAS05H		FLANGE FEET	ADJUSTABLE WITH HOLES FOR ATTACHMENT TO FLOOR, STAINLESS STEEL	4
		CASTERS	LOCKING W/ BUMPERS	4
CAS06		FLANGE FEET	ADJUSTABLE, STAINLESS STEEL	6
CAS06H		FLANGE FEET	ADJUSTABLE WITH HOLES FOR ATTACHMENT TO FLOOR, STAINLESS STEEL	6
CAS07		BULLET FOOT	ADJUSTABLE, STAINLESS STEEL	EACH
CAS07-4		BULLET FOOT	ADJUSTABLE, STAINLESS STEEL, ONE (1) EACH PER LEG OF TABLE	4
CAS07-6		BULLET FOOT	ADJUSTABLE, STAINLESS STEEL, FOR 1-5/8" DIA. LEG	6
CAS08		BULLET FOOT	ADJUSTABLE, STAINLESS STEEL, FOR 1-1/2" SQUARE LEG	EACH
CAS08-4		BULLET FOOT	ADJUSTABLE, STAINLESS STEEL, FOR 1-1/2" SQUARE LEG	4
CAS08-6		BULLET FOOT	ADJUSTABLE, STAINLESS STEEL, FOR 1-1/2" SQUARE LEG	6
CAS12-1		FLANGE FEET	ADJUSTABLE, STAINLESS STEEL, (W/ MOUNTING HOLES)	EACH
CAS15		FLANGE FEET	ADJUSTABLE, STAINLESS STEEL	4
CAS16		FLANGE FEET	ADJUSTABLE, STAINLESS STEEL, 3-1/2" DIA.	4
CAS17		FLANGE FEET	ADJUSTABLE, STAINLESS STEEL, 3-1/2" DIA., (TABLES 84" & LONGER WITH 6 LEGS)	6



CAS01-R



CAS03



CAS-RN



CASWS05-4



CAS07

SOME UNITS SHIP UNASSEMBLED FOR REDUCED SHIPPING COST. ALL DIMENSIONS ARE TYPICAL. TOLERANCE +/- .500"

John Boos & Co. is constantly engaged in a program of improving products and therefore reserves the right to change specifications without prior notice.

Submittal Sheet

12/20/2017

ITEM# 64 - ONE (1) COMPARTMENT SINK (1 EA REQ'D)

Eagle Group FN2018-1-36L14/3

Spec-Master® FN Series Sink, one compartment, 57-1/2"W x 27"D, 14/304 stainless steel top, 18" wide x 20" front-to-back x 14" deep compartment, 36" drainboard on left, 9-1/2"H backsplash with 1" upturn & tile edge, 8" O.C. splash mount faucet holes, rolled edges on front & sides, includes 3-1/2" basket drain, stainless steel crossbracing on all sides, stainless steel legs & adjustable bullet feet, NSF

The spec sheet for this item can be viewed on item 21)

ACCESSORIES

Mfr	Qty	Model	Spec
Eagle Group	1	340380	T&S Faucet, splash-mounted, 8" centers, 10" swing nozzle, extra heavy-duty
Eagle Group	1	341189	Twist Handle Drain, 1-1/2 or 2" NPS connection
Eagle Group	1	-TB	Twist bracket, per drain

WATER

	HOT SIZE	HOT AFF	HOT GPH	COLD SIZE	COLD AFF	FILTERED SIZE	FILTERED AFF	CONDENSER INLET SIZE	CONDENSER OUTLET SIZE
1									
2	1/2"			1/2"					
3									

WASTE

	INDIRECT SIZE	DIRECT SIZE
1	1-1/2"	
2		
3	2"	

PLUMBING 1 REMARKS

(1) set of 1-1/8" faucet holes, 8" O.C.

Submittal Sheet

12/20/2017

ITEM# 65 - PLANETARY MIXER (1 EA REQ'D)

Hobart HL300-1STD

200-240/50/60/3 Mixer; with bowl, beater, & "D" whip; US/EXP configuration

Legacy Planetary Mixer, 3/4 hp, 30 quart capacity, (3) fixed speeds, gear-driven transmission, 15-Minute

SmartTimer™, #12 taper attachment hub, manual bowl lift, bowl guard, stainless steel bowl, "B" beater, "D" whip

ACCESSORIES

Mfr	Qty	Model	Spec
Hobart	1		Standard warranty: 1-Year parts, labor & travel time during normal working hours within the USA

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1	200-240		3	Direct							



701 S Ridge Avenue, Troy, OH 45374
1-888-4HOBART • www.hobartcorp.com

LEGACY® HL300 MIXER

HOBART

STANDARD FEATURES

- Heavy-Duty $\frac{3}{4}$ H.P. Motor
- Gear Transmission
- Three Fixed Speeds Plus Stir Speed
- Shift-on-the-Fly™ Controls
- Patented soft start Agitation Technology
- 15-Minute SmartTimer™
- Automatic Time Recall
- Large, Easy-To-Reach Controls
- Single Point Bowl Installation
- Ergonomic Swing-Out Bowl
- #12 Taper Attachment Hub
- Open Base
- Stainless Steel Bowl Guard
- Metallic Gray Hybrid Powder Coat Finish
- Rubber Foot Pads Provided

MODELS

- ☐ HL300 – 30-Quart All Purpose Mixer
- ☐ HL300C – 30-Quart All Purpose Mixer with Maximum Security Correctional Package

Specifications, Details and Dimensions on Inside and Back.



ACCESSORY PACKAGE - featuring Hobart Quick Release™ Agitators

- ☐ **Standard Accessory Package Includes:**
 - 30 Quart Stainless Steel Bowl
 - 30 Quart “B” Beater
 - 30 Quart “D” Wire Whip

**LEGACY® HL300 MIXER**

LEGACY® HL300 MIXER



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SOLUTIONS/BENEFITS

¾ H.P. Motor

Durability

- Heavy-duty to meet the most demanding operations

Gear Transmission

Durability, Reliability

- Ensures consistent performance and minimum downtime under heavy loads

Three Fixed Speeds plus Stir Speed

Flexibility, Reliability, Consistency

- For incorporating, blending, mixing ingredients
- Supports consistent results and thorough mixing

Shift-on-the-Fly™ Controls

Flexibility

- Allows operator to change speeds while mixer is running

Patented soft start Agitation Technology

Sanitation

- Each speed has a soft transition into a higher speed to reduce the chances of product splash-out

15-Minute SmartTimer™

Convenience, Ease of Use, Consistency

- Supports recipe mixing times
- Provides accurate results and eliminates overmixing

Automatic Time Recall

Productivity, Consistency

- Remembers the last time set for each speed
- Great for multiple batches

Ergonomic Swing-Out Bowl

Ease of Use, Convenience

- Easy loading and unloading of products
- Single Point Bowl Installation allows for simple mounting and removal of bowl
- Bowl Interlock ensures mixer bowl is properly in place for mixer to operate

Stainless Steel Bowl Guard

Protection

- Safety interlock prevents operation when front portion of guard is out of position

Hobart Accessories

Durability, Flexibility, Simplicity

- Hobart Quick Release™ agitators allow for simple installation and removal from agitator shaft
- Hobart accessories are designed for long-term usage under heavy-duty conditions
- Large array of accessories provide multiple uses for recipe and product processing

HL300 MIXER CAPACITY CHART

Recommended Maximum Capacities - dough capacities based on 70°F. water and 12% flour moisture.

PRODUCT	AGITATORS SUITABLE FOR OPERATION	HL300
CAPACITY OF BOWL (QTS. LIQUID)		30
Egg Whites	D	1½ qts.
Mashed Potatoes	B & C	23 lbs.
Mayonnaise (Qts. of Oil)	B or C or D	12 qts.
Meringue (Qts. of Water)	D	1 qt.
Waffle or Hot Cake Batter	B	12 qts.
Whipped Cream	D or C	6 qts.
Cake, Angel Food (8-10 oz. cake)	C or I	22
Cake, Box or Slab	B or C	30 lbs.
Cake, Cup	B or C	30 lbs.
Cake, Layer	B or C	30 lbs.
Cake, Pound	B	30 lbs.
Cake, Short (Sponge)	C or I	23 lbs.
Cake, Sponge	C or I	18 lbs.
Cookies, Sugar	B	23 lbs.
Dough, Bread or Roll (Lt.-Med.) 60% AR	§	ED 45 lbs.□
Dough, Heavy Bread 55% AR	§	ED 30 lbs.□
Dough Pie	B & P	27 lbs.
Dough, Thin Pizza 40% AR (max. mix time 5 min.)	§‡	ED 14 lbs.□
Dough, Med. Pizza 50% AR	§‡	ED 20 lbs.□
Dough, Thick Pizza 60% AR	§‡	ED 40 lbs.□
Dough, Raised Donut 65% AR	ED	15 lbs.*
Dough, Whole Wheat 70% AR	ED	40 lbs.□
Eggs & Sugar for Sponge Cake	B & C or I	12 lbs.
Icing, Fondant	B	18 lbs.
Icing, Marshmallow	C or I	3 lbs.
Shortening & Sugar, Creamed	B	24 lbs.
Pasta, Basic Egg Noodle (max. mix time 5 min.)	ED	8 lbs.

NOTE: % AR (% Absorption Ratio) - Water weight divided by flour weight. Capacity depends on moisture content of dough. Above capacities based on 12% flour moisture at 70°F water temperature.

□ 1st Speed

* 2nd Speed

§ If high gluten flour is used, reduce above dough batch size by 10%.

‡ 2nd Speed should never be used on 50% AR or lower products.

USE OF ICE REQUIRES A 10% REDUCTION IN BATCH SIZE.

1 gallon of water weighs 8.33 lbs.

NOTE: Attachment hub should not be used while mixing.



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1-888-4HOBART • www.hobartcorp.com

LEGACY® HL300 MIXER

SPECIFICATIONS

MOTOR:

$\frac{3}{4}$ H.P. high torque motor.

100-120/50/60/1	9.5 Amps
200-240/50/60/1	5.7 Amps
200-240/50/60/3	2.8 Amps
380-460/50/60/3	1.4 Amps

ELECTRICAL:

100-120/50/60/1, 200-240/50/60/1, 200-240/50/60/3 and 380-460/50/60/3 – UL Listed.

CONTROLS:

Magnetic contactor with thermal overload protection. Internally sealed “Start-Stop” push buttons. A 15-minute SmartTimer™ is standard. SmartTimer™ includes **Automatic Time Recall**, which remembers the last time set for each speed.

TRANSMISSION:

Gear-driven. Gears are constant mesh heat-treated hardened alloy steel along with anti-friction ball bearings. Grease lubricants furnished to all gears and shafts.

SPEEDS:

	Agitator (RPM)	Attachment (RPM)
Stir	58	34
First (Low)	94	54
Second (Intermediate)	174	100
Third (High)	317	183

BOWL GUARD:

Heavy-duty stainless steel wire front and solid rear portion. Front portion of guard rotates easily to add ingredients and install or remove agitator. It detaches in seconds for cleaning in dishwasher or sink. Rear portion of guard can be quickly cleaned in position. Guard must be in closed position before mixer will operate. Bowl support interlock provides further protection.

BOWL LIFT:

Ergonomic style, hand crank operated, self-locking in top and bottom position.

FINISH:

Metallic Gray Hybrid Powder Coat finish.

ATTACHMENT HUB:

Comes with front-mounted Hobart standard #12 taper attachment hub for use with Hobart #12 size attachments.

ATTACHMENTS AND ACCESSORIES:

The following are available at extra cost:

Stainless Steel Bowl
“B” Flat Beater
“C” Wing Whip
“D” Wire Whip
“ED” Dough Hook
“P” Pastry Knife
“I” Heavy Duty Wire Whip
Bowl Splash Cover
Bowl Scraper
Ingredient Chute
20 Quart Accessories
9" Vegetable Slicer
Meat Chopper Attachment
Stainless Steel Foot Pads
Bowl Truck



Hobart Bowl Scraper

Hobart Ingredient Chute



Listed by Underwriters Laboratories Inc. and certified by NSF International.

LEGACY® HL300 MIXER

HOBART

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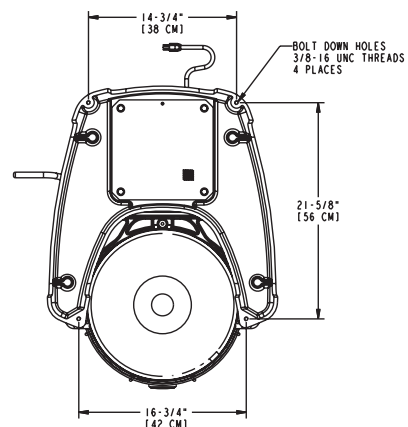
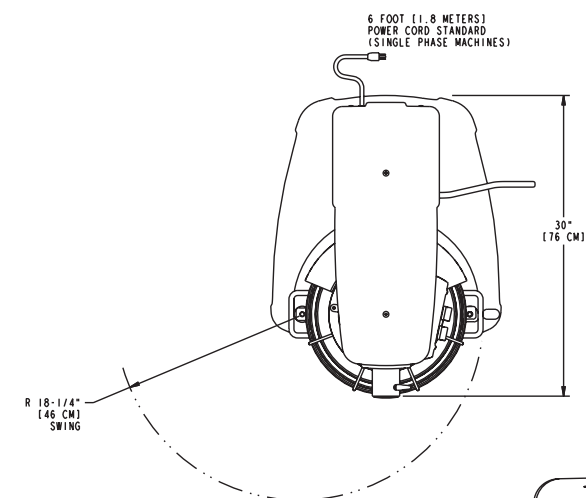
SPECIFICATIONS

ELECTRICAL SPECIFICATIONS: 100-120/50/60/1, 200-240/50/60/1, 200-240/50/60/3 and 380-460/50/60/3 – UL Listed.

WEIGHT: 394 lbs. net; 411 lbs. domestic shipping.

WARRANTY: Unit has full one-year warranty on parts, labor and mileage against manufacturer's defects. Service contracts are available.

DETAILS AND DIMENSIONS

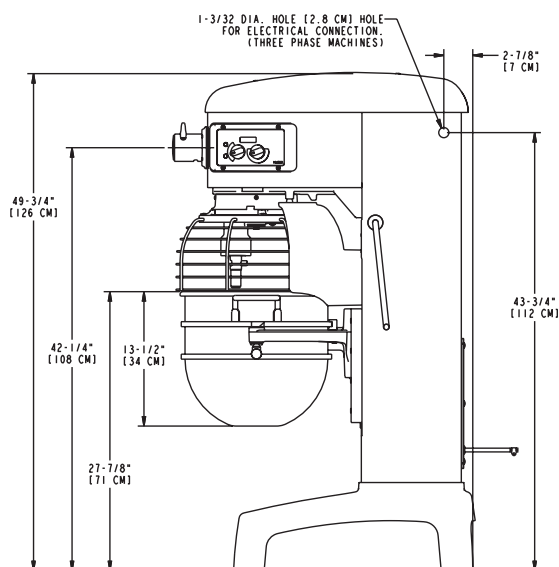
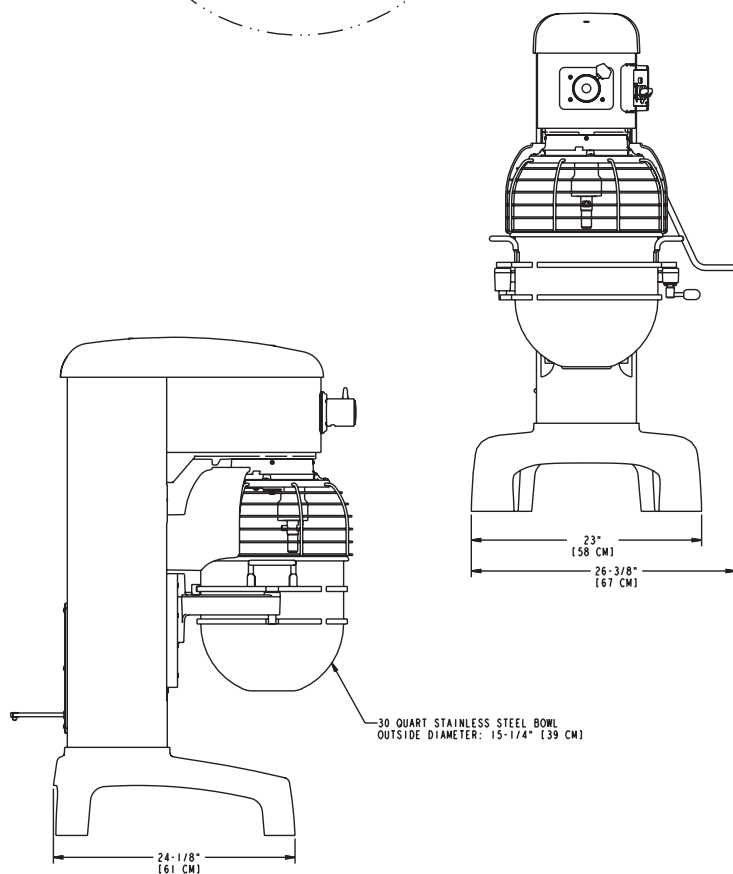


WARNING

ELECTRICAL AND GROUNDING CONNECTIONS MUST COMPLY WITH THE APPLICABLE PORTIONS OF THE NATIONAL ELECTRICAL CODE AND/OR OTHER CODE IN FORCE

NOTE

MACHINE WEIGHT (LESS BOWL).....387 LBS (175 KG)
SHIPPING WEIGHT.....453 LBS (205 KG)
BOWL WEIGHT.....18 LBS (8.1 KG)



As continued product improvement is a policy of Hobart, specifications are subject to change without notice.

Submittal Sheet

12/20/2017

ITEM# 66 - PROOFER CABINET, MOBILE (1 EA REQ'D)

Metro C539-CDC-U

C5™ 3 Series Heated Holding & Proofing Cabinet, with Red Insulation Armour™, mobile, full height, insulated, Dutch clear polycarbonate doors, removable bottom mount control module, thermostat to 200°F, universal wire slides on 3" centers, adjustable on 1-1/2" increments (18) 18" x 26" or (34) 12" x 20" x 2-1/2" pan capacity, 5" casters (2 with brakes), aluminum, 120v/60/1-ph, 2000 watts, 16.7 amps, NEMA 5-20P, cULus, NSF

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1	120	60	1	Cord & Plug		5-20P	16.7	2.0			



Item # _____

Job _____

Metro C5 3 Series Insulation Armour™ Heated Holding and Proofing Cabinets

- **Insulation Armour™:** Patented insulation technology retains heat, saves energy, and provides a cool-to-touch exterior. Durable polymer construction is dent, impact, and stain resistant. Molded-in hand holds create vertical handles for mobile applications.
- **Colors:** Insulation Armour is available in Red, Blue, or Gray standard and in other colors on a promotional basis or upon request.
- **Control:** Three modules are available: Holding, Moisture, and Combination Proof and Hold. All feature an easy-to-read digital thermometer, recessed control dials, a master on/off switch, and power indicator lights. All are removable without tools for easy cleaning, and allow for future upgrades without replacing entire cabinet body.
- **Performance:** All modules provide fast heat-up and recovery through a thermostatically controlled, forced convection system.
- **Sizes:** C5 3 Series cabinets are available in Full Height (71", 1803mm), $\frac{3}{4}$ Height (59", 1499mm), and $\frac{1}{2}$ Height (44", 1118mm) sizes.
- **Doors:** Solid insulated aluminum or clear polycarbonate doors are available. Full Height cabinets can be configured with full length or dutch-style doors. Clear doors provide visibility of the contents of the cabinet without the heat loss associated with opening the door.
- **Capacity:** Three slide styles provide maximum holding capacity. Choose from Universal Wire, Lip Load, or Fixed Wire.
- **Reliability:** Reliability and durability are designed into every C5. High-quality components provide a long life of worry free use.
- **Power Options:** Choose between standard high wattage or low wattage models based on the specific needs of the application.



Red Full
Height Dutch
Clear Doors



Blue $\frac{1}{2}$
Height Full
Solid Door

Gray $\frac{3}{4}$
Height Full
Clear Door

Red Full
Height Dutch
Solid Doors

Blue Full
Height Full
Clear Door



C5 3 Series Insulation Armour™ Heated Holding and Proofing Cabinets

13-93



3 Series Removable Control Modules

- **Holding Module:** Hot holding at higher temperatures without moisture control.
- **Moisture Module:** Hot holding and proofing. Moisture control at any temperature.
- **Combination Module:** Hot holding and proofing. Moisture control at lower temperatures (proofing).



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Wilkes-Barre, PA 18705
www.metro.com



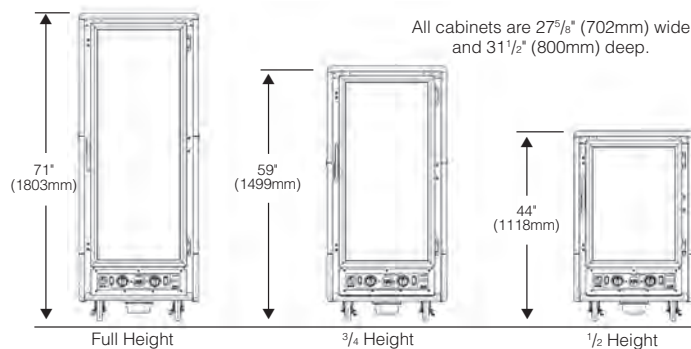
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C5 3 Series Insulation Armour™ Heated Holding and Proofing Cabinets



C5 3 Series Insulation Armour™ Heated Holding and Proofing Cabinets

Specifications



- Cabinet Material:** .063" (1.8mm) aluminum, natural interior with .125" (3.2mm) aluminum chassis.
 - Insulation Armour™:** High Density Polyethylene (HDPE).
 - Castors:** Four casters with 5" (127mm) donut neoprene wheel, double ball bearing swivel, ball bearing axel, nickel plated, two with brake.
 - Solid Doors:** Fully insulated with 1" (25.4mm) fiberglass, double panel .063" (1.8mm) aluminum, brushed exterior, natural interior.
 - Clear Doors:** Extruded aluminum powder coated frame with .090" (2.3mm) polycarbonate window.
 - Hinges:** Field reversible, double hinged, 180° swing, with long-life nylon bearings.
 - Gaskets:** High temperature, door mounted, Santoprene gaskets.
 - Latches:** Polymer high-strength magnetic pull latch with lever-action release.
 - Hand Holds:** Molded into the Insulation Armour™ on all four corners.
 - Universal Slides:** 1/4" (6.4mm) dia. nickel-chrome electroplated wire, adjustable on 1 1/2" (38mm) increments.
 - Lip Load Slides:** 1 1/2" x 1/2" x .063" (38x38x1.8mm) extruded aluminum channel slides, 1 1/2" (38mm) fixed spacing.
 - Fixed Wire Slides:** 1/4" (6.4mm) dia. nickel-chrome electroplated wire, welded on 3" (76mm) spacing.
 - Drip Trough:** Smooth polymer drip trough with catch pan.
 - Holding Modules:** Removable without tools, digital thermometer, recessed control dials, master on/off switch, "Power On" light, water pan, ball bearing blower forced air system, 7 1/2' cord, UL, CUL, and NSF Listed.
- Electrical and Performance:**
- Holding Module:** 2000 Watt, 120 Volts, 60 Hz., single phase, 16.7 Amps. 80°F to 200°F operating temperature range. NEMA 5-20P plug.
 - Moisture Module:** 2000 Watt, 120 Volts, 60 Hz., single phase, 16.7 Amps. 80°F to 200°F operating temperature range. 35% RH at 160°F, 95% RH at 95°F. NEMA 5-20P plug.
 - Proofing Module:** 1440 Watt, 120 Volts, 60 Hz., single phase, 12 Amps. 80°F to 120°F operating temperature range. 95% RH at 95°F. NEMA 5-15P plug.
 - Combination Module:** 2000 Watt, 120 Volts, 60 Hz., single phase, 16.7 Amps. 80°F to 200°F operating temperature range. 95% RH at 95°F. NEMA 5-20P plug.
 - Clearance Requirements:** 18" (46cm) away from any cooking equipment. AVOID contact with surfaces that exceed 200°F (90°C). Minimum clearance from enclosures is 1 1/2" (38mm) on sides, back and top.
 - Slide Capacities:**

Cabinet Size	Universal Wire Pan Capacity**				Lip Load Pan Capacity		Fixed Wire Pan Capacity	
	Slide Pairs		18"x26"	12"x20"x2.5" GN 1/1	18"x26"	12"x20"x2.5" GN 1/1	18"x26"	12"x20"x2.5" GN 1/1
	Provided	Max.*						
Full Height	18	37	18	34	35	34	18	34
Full Height Dutch	18	35	17	32	34	32	17	32
3/4 Height	14	29	14	26	27	26	14	26
1/2 Height	8	17	8	16	17	16	8	16

*Maximum number of slide pairs @ 1 1/2" spacing. Additional slide pairs ordered separately.

**Capacity based on standard number of slide pairs provided.

Cabinet Height
9 = Full Height
7 = 3/4 Height
5 = 1/2 Height

Module Type
C = Combination
M = Moisture
H = Heated Holding

Slide Type
U = Universal Wire
4 = Fixed Wire
L = Lip Load Aluminum

C539-CDC-U



For Standard Wattage Cabinets
(120V, 16A, 60Hz, 2000W)

Door Style

FS = Full Length Solid
FC = Full Length Clear

DS = Dutch Solid *
DC = Dutch Clear *

*Please note: Dutch doors only available on full-height models.
Cabinets ordered without a color designation default to Red.

Low Watt Model Number Description

C539-CLDC-U



Add "L" for Lower Wattage Combination or Holding Module Cabinets
(120V, 12A, 60Hz, 1440W)

Export Model Number Description

C539-CXDC-U



Add "X" for Export Cabinets
(220-240V, 7.6-8.3A, 50/60Hz, 1681-2000W)

Blue or Gray Model Description

C539-CDC-U-BU

** Cabinets ordered without a color designation default to Red.

Color **
No Suffix = Red
BU = Blue
GY = Gray

Models with Accessories or Options

C539-CDC-UA

C539-CDC-U-BUA

An "A" suffix indicates that accessories need to be factory assembled to the cabinet. Order accessories separately.

Options/Accessories*

- Small Item Shelf (C5-SHELF-S)
- Stainless Steel Legs (C5-SSLEGS)
- Universal Slide Pair, Chrome (C5-USLIDEPR-C)
- 6" Casters (C5-6CASTER)
- Rear Rigid Casters (C5-5RDGCSTR)
- Travel Latch (C5-TRVL)
- Flush Door Latch (C5-LATCHFLUSH-1)*
- Straight Plug, 20 Amp, 120V (C5-STRPLG-20)
- Straight Plug, 15 Amp, 120V (C5-STRPLG-15)
- Factory Left-Hand Hinging (DD3768)
- Stainless Steel Universal Slides (please call)

*Please note: (2) handles required for dutch door models

Metro Heated cabinets are for
hot food holding applications only.

All Metro Catalog Sheets are available on our website: www.metro.com



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Information and specifications are subject to change without notice. Please confirm at time of order

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Submittal Sheet

12/20/2017

ITEM# 67 - ROLL-IN REFRIGERATOR (1 EA REQ'D)

Continental Refrigerator DL1RI

Designer Line Refrigerator, roll-in, one-section, self-contained refrigeration, stainless steel front, aluminum interior & ends, standard depth cabinet, full-height solid door, electronic controller w/ digital display, removable stainless steel ramp, 1/3 hp

ACCESSORIES

Mfr	Qty	Model	Spec
Continental Refrigerator	1		Standard warranty (for the United States & Canada Only): 3 year parts and labor; 5 year compressor
Continental Refrigerator	1		115v/60/1-ph, 9.6 amps, cord & plug, standard
Continental Refrigerator	1		Door hinged on right, standard

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1									1/3		
2	115	60	1	Cord & Plug			9.6				

DESIGNER LINE ROLL-IN REFRIGERATOR

Model: **DL1RI**

1-Section Roll-In Refrigerator with 66¼" Cart Capacity

Standard - Stainless steel front, aluminum end panels and interior
 Suffix SA- Stainless steel exterior, aluminum interior
 Suffix SS - Stainless steel exterior and interior



Designer Line

Options and Accessories

(upcharge and lead times may apply)

Stainless steel case back	Roll-Thru
Epoxy-coated steel shelves	Hinged glass door
Chrome or stainless steel shelves	Increased refrigeration systems
Rehinging of door (consult factory)	Special electrical req. (consult factory)
Expansion valve system	Correctional Facility Options
Dial thermometer	• One way security screws
Remote models	• Locking hasp (lock not included)
Custom laminates	• Stainless steel mesh cover
Half doors	• Coverless hinges

Consult factory for other model configurations, options and accessories.

Continental
Refrigerator

Toll-Free: 800-523-7138
 Phone: 215-244-1400
 Fax: 215-244-9579

539 Dunksferry Road
 Bensalem, PA 19020
www.continentalrefrigerator.com

Project Name:

Model Specified:

Location:

Item No:

Quantity:

AIA #:

SIS #:

Standard Model Features

REFRIGERATION SYSTEM

Environmentally-safe R-134a refrigerant
 Self contained, performance-rated
 "plug" refrigeration system
 Automatic hot gas condensate evaporator
 Unique air flow distribution ducts evenly distributes
 air to all pan levels
 Refrigeration system is accessible on top of cabinet,
 separate from the food zone

CABINET ARCHITECTURE

Removable stainless steel rack guides
 Removable stainless steel ramp
 Reinforced stainless steel floor
 3" non-CFC polyurethane foam insulation
 Chrome-plated flow line handle
 Cam action, lift off hinges
 Magnetic snap-in door gasket
 Cylinder lock in door
 Self-closing door
 66 1/2" high door opening (66 1/4"H rack capacity*)

Standard Finish

Stainless steel front, aluminum end panels and interior

-SA Finish

Stainless steel exterior, aluminum interior

-SS Finish

Stainless steel exterior and interior

MODEL FEATURES

External digital thermometer
 Energy saving switch for door heater

* Rack not supplied

IMPORTANT NOTE: Cabinet upper side panels and refrigeration "plug" system can be easily removed and reinstalled at installation site where space limitations are confining.

APPROVAL:

Model Specifications

DIMENSIONAL DATA

Net Capacity (cu. ft.)	32 (906 cu l)
Width, Overall (in.)	35 1/4 (895 mm)
Depth, Overall (incl. handles) (in.)	35 3/8 (899 mm)
Depth [less door] (in.)	32 (813 mm)
Depth [door open 90°] (in.)	65 (1651 mm)
Clear Door Width (in.)	27 3/8 (695 mm)
Clear Full Door Height (in.)	66 1/2 (1676 mm)
Height, Overall (in.)	86 (2184 mm)
No. of Door(s)	1
Rack Capacity**	1 ea.

REFRIGERANT DATA

Condensing Unit Size (H.P.)	1/3
Capacity (BTU/Hr)*	2560

ELECTRICAL DATA

Voltage (int'l)	115/60/1 (220/50/1)
Feed Wires (incl. ground)	3
Total Amps (int'l)	9.6 (5.1)
10 ft. Cord/Plug [attached] (int'l)	Yes (No)

SHIPPING DATA

Height - Crated (in.)	90 (2286 mm)
Width - Crated (in.)	43 (1092 mm)
Depth - Crated (in.)	42 (1067 mm)
Volume - Crated (cu. ft.)	94 (2661 cu l)
Weight Std - Crated (lbs.)	415 (188 kg)
Weight SS - Crated (lbs.)	505 (229 kg)
Weight Std - Uncrated (lbs.)	330 (150 kg)
Weight SS - Uncrated (lbs.)	405 (184 kg)

* Rating @ +25°F evaporator, 90°F ambient

** Maximum rack size including wheels - 27"W x 29"D x 66 1/4"H

Figures in parentheses reflect metric equivalents rounded to the nearest whole millimeter.



Equipped with one NEMA-5-15P Plug
(varies by country)

Continental

Refrigerator

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Phone: 215-244-1400
Fax: 215-244-9579

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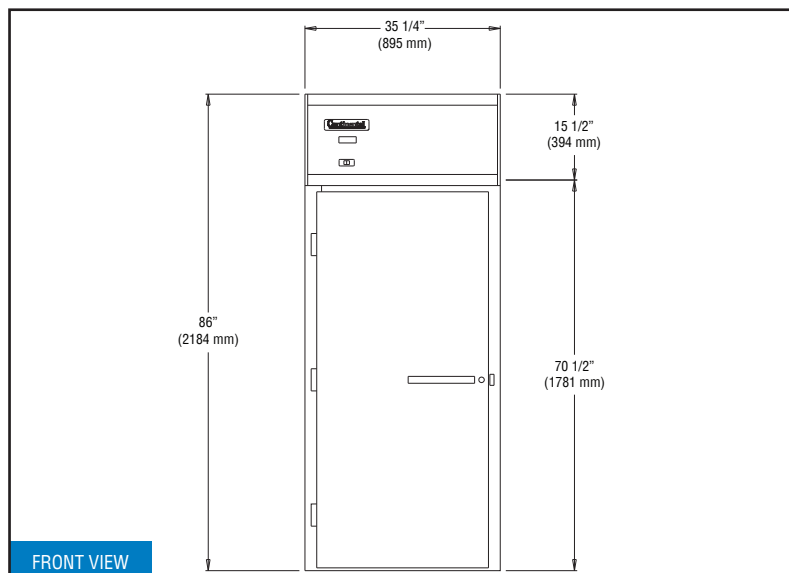
Due to our continued efforts in developing innovative products, specifications subject to change without notice.



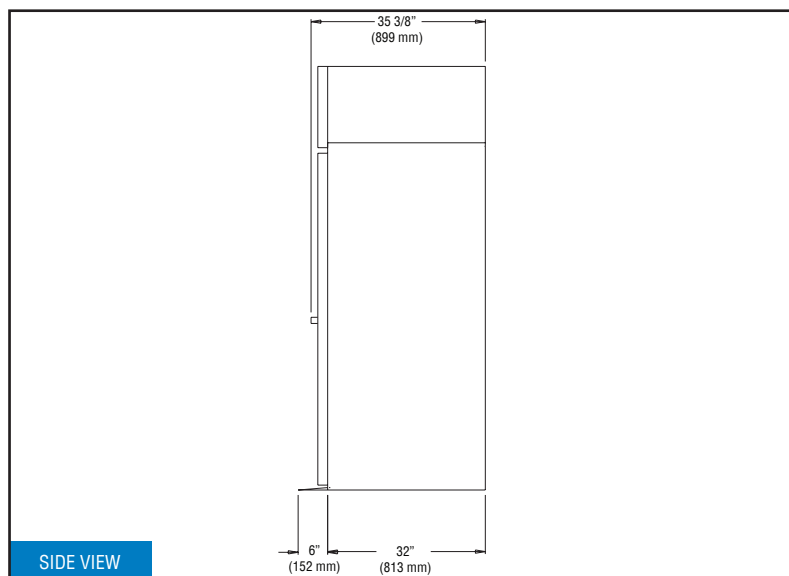
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Model Plan Views



FRONT VIEW



SIDE VIEW

IMPORTANT NOTE: If the cabinet is located directly against a wall and/or under a low ceiling, a minimum clearance of 12\"

REFRIGERATION SYSTEM

A "performance rated", air-cooled, hermetically sealed, capillary-type refrigeration system is installed on the top of each refrigerator. Plasticized fin coil and air circulation fans are contained within a concealed "plug"-type insulated housing, readily accessible on top of the cabinet and separate from the food zone to increase food storage capacity. The entire "plug" system is fully charged with environmentally safe R-134a refrigerant and mounted on a sturdy steel, rail-type base which can be easily removed if freezer conversion is desired. Refrigerators are designed to maintain 38°F-40°F (3°-5° Centigrade) while operating with an unrestricted air supply in a maximum ambient temperature of 100°F. All condensate water is evaporated by an automatic, non-electric, corrosion-resistant condensate evaporator. A strict quality-assurance team inspects all materials and components to certify that each model conforms to the most exacting standards. All models are factory performance-tested for a minimum of 16 hours prior to crating.

INSULATION

All cabinet walls, top and bottom have high density, foamed-in-place, non-CFC polyurethane insulation.

CABINET CONSTRUCTION

All materials are of top quality, assembled to conform with strict quality-assurance requirements. The cabinet front is constructed of heavy-gauge polished stainless steel for durability. All cabinet joints and seams are sealed vapor-tight. Case is of all metal, welded construction and internally supported and braced for a rigid unit construction.

Cabinet design eliminated overlapping panels with raw edges. Cabinet body is insulated with non-CFC, foamed-in-place polyurethane foam with an average thickness of 3 inches to ensure increased energy efficiency. Full-length louvered air grille located above the doors allows equal air circulation to the condensing unit. Easily removable, low-wattage, anti-sweat door heaters concealed by a non-metallic, non-conductive, high-impact thermal breaker strip eliminate condensate build-up on the cabinet front. Automatic interior lighting is controlled by door openings. Cabinets are equipped with an easily removable, stainless steel ramp and interior rack guides.

DOOR CONSTRUCTION

Solid hinged door shells are constructed of heavy-gauge stainless steel and are internally braced and urethane-foam-insulated for rigidity. Door corners are welded construction and polished. Replaceable snap-in door gaskets are self-adjusting, heavy-duty, magnetic type. Door handles and hinges are chrome-plated and non-corrosive. Doors are provided with built-in cylinder locks which are keyed alike. Hinges are cam action, lift-off type featuring positive safety stop at 120 degrees.

Submittal Sheet

12/20/2017

ITEM# 68 - EQUIPMENT STAND, REFRIGERATED BASE (1 EA REQ'D)

Continental Refrigerator DL72G

Refrigerator Griddle Stand, two-section, (4) drawers - two drawers accommodates (1) 12" x 20" x 6" & (1) 6" x 20" x 6", two drawers accommodates (2) 12" x 20" x 6", dial thermometer, stainless steel top with drip guard marine edge, stainless steel exterior and interior, 4" casters, self-contained refrigeration, 1/4 hp, 10' cord, cETLus, NSF, Made in USA

ACCESSORIES

Mfr	Qty	Model	Spec
Continental Refrigerator	1		Standard warranty (for the United States & Canada Only): 3 year parts and labor; 5 year compressor
Continental Refrigerator	1		115v/60/1-ph, 6.1 amps, cord, NEMA 5-15P, standard
Continental Refrigerator	1		Condensing unit on the right, standard
Continental Refrigerator	1		4" Casters, standard

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1									1/4		
2	115	60	1	Cord & Plug		5-15P	6.1				

GRIDDLE STAND REFRIGERATOR

Model: **DL72G**

72" Griddle Stand Refrigerator

Stainless steel exterior and interior.

Designed to maintain NSF-7 temperatures in 100°F ambient.



Options and Accessories

(upcharge and lead times may apply)

Flat top in lieu of marine edge	Adjustable legs
16-gauge stainless steel top (flat or marine)	Digital thermometer
Condensing unit left or right	Cylinder locks
Automatic, electric condensate evaporator	Stainless steel pans
Stainless steel top extensions (flat or marine)	Special electrical requirements (consult factory)
Integral heat shield	

Consult factory for other model configurations, options and accessories.

Continental
Refrigerator

Toll-Free: 800-523-7138
Phone: 215-244-1400
Fax: 215-244-9579

539 Dunksferry Road
Bensalem, PA 19020
www.continentalrefrigerator.com

Project Name:

Model Specified:

Location:

Item No:

Quantity:

AIA #:

SIS #:

Standard Model Features

REFRIGERATION SYSTEM

- Performance-rated refrigeration system
- Environmentally-safe R-134a refrigerant
- Side-mounted, automatic, energy saving non-electric condensate evaporator
- Non-corrosive, plasticized fin evaporator coil
- Easily serviceable, front slide-out condensing unit

CABINET ARCHITECTURE

- High density, non-CFC polyurethane foamed-in-place insulation
- Easy glide, fully extendable drawers designed to hold 6" deep pans side-by-side
- One-piece, snap-in magnetic drawer gaskets
- Heavy-duty drawer track with built-in drawer safety clips
- Drawers designed to hold 250 lb. capacity
- 4" casters on support plates
- Stainless steel case back
- Reinforced stainless steel work top with drip guard marine edge

MODEL FEATURES

- Capillary dial thermometer
- Front breathing

APPROVAL:

Model Specifications

DIMENSIONAL DATA

Net Capacity (cu. ft.)	16.4 (464 cu l)
Width, Overall (in.)	72 (1829 mm)
Depth, Overall (incl. handles) (in.)	34 3/4 (883 mm)
Height, Overall (in.) (incl. 4" casters)	26 3/8 (670 mm)
No. of Drawers	4

REFRIGERANT DATA

Condensing Unit Size (H.P.)	1/4
Capacity (BTU/Hr)*	1940

ELECTRICAL DATA

Voltage (int'l)	115/60/1 (220/50/1)
Fans	2
Feed Wires (incl. ground)	3
Total Amps (int'l)	6.1 (3.7)
10 ft. Cord/Plug [attached] (int'l)	Yes (No)

SHIPPING DATA

Weight (lbs.)	550 (249 kg)
Height - Crated (in.)	44 (1118 mm)
Width - Crated (in.)	90 (2286 mm)
Depth - Crated (in.)	39 (991 mm)

TOP WEIGHT CAPACITY

Max. Top Weight Capacity (lbs.)	1200 (544 kg)
---------------------------------	---------------

* Rating @ +25°F evaporator, 90°F ambient

Figures in parentheses reflect metric equivalents rounded to the nearest whole unit.



Equipped with one NEMA-5-15P Plug
(varies by country)

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Intertek

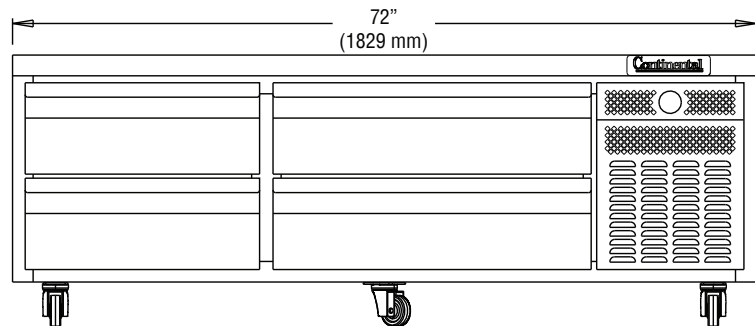
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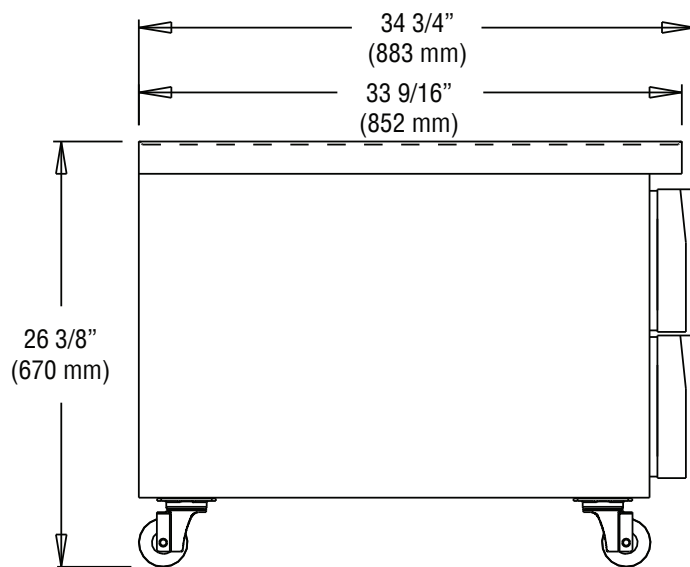


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Model Plan Views

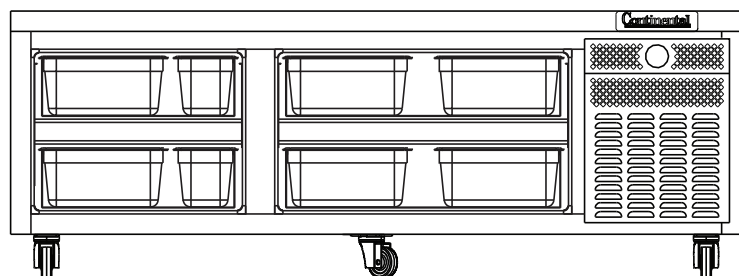


FRONT VIEW



SIDE VIEW

Shown with (6) 12 x 20 x 6 pans and (2) 6 x 20 x 6 pans (not furnished)



DRAWER PAN CONFIGURATION

Submittal Sheet

12/20/2017

ITEM# 69 - GAS COUNTERTOP GRIDDLE (1 EA REQ'D)

Southbend HDG-24

Griddle, countertop, gas, 24" W x 24" D cooking surface, 1" thick polished steel plate, thermostatic controls, battery spark ignition, stainless steel front, sides & 4" adjustable legs, 60,000 BTU, CSA, NSF

ACCESSORIES

Mfr	Qty	Model	Spec
Southbend	1		Domestic Shipping, inside of North America (Contact factory for price)
Southbend	1		Standard one year limited warranty
Southbend	1		Natural Gas
Southbend	1		400° thermostat control, standard

GAS

	SIZE	MBTU	KW
1	3/4"	60.0	

STEAM

	INLET SIZE	RETURN SIZE	LB/HR	PSIG (min)	PSIG (max)
1					



COUNTERLINE - GRIDDLE

Heavy Duty, Thermostatic and Manual, Gas

Standard Features

- Available in 18", 24", 36", 48", 60" and 72" widths
- 30,000 BTU (NAT or LP) burner per 12" Thermostatic Models
- 20,000 BTU (NAT or LP) burner per 12" Manual Models
- Electronic spark ignition (battery)
- Stainless steel front, vent and sides are standard, rear and bottom panels are aluminized steel.
- Reinforced, insulated double wall sides
- 1" thick polished rolled steel plate
- 5" high rear and 4" side splash guards
- 3/4" rear gas connection and pressure regulator
- Protected flue opening
- Exclusive "NO COLD" Zone -Uniform heat distribution across surface
- Each burner equipped with runner tube
- Grease drawers with large capacity
- Fully welded griddle plate with protected exhaust vent

Standard Features of Thermostatic Griddle Models

- "Insta-on" thermostatic controls for precise settings between 200°F and 400°F
- Imbedded load sensing thermostat
- Flame failure safety device

Thermostatic Griddles:

HDG-18, HDG-24, HDG-36, HDG-48, HDG-60, HDG-72

Manual Griddles:

HDG-18-M, HDG-24-M, HDG-36-M, HDG-48-M, HDG-60-M, HDG-72-M



(Model HDG-24)

Job

Item #

STANDARD CONSTRUCTION SPECIFICATIONS

Exterior Finish: Front, sides and vent are constructed of #3 polished 430 and 304 stainless steel. Bottom and rear are aluminized steel. Sides are reinforced and fully insulated. 5" rear and 4" side splash.

Griddle Plate: 18", 24", 36", 48", 60", 72" wide unit with one 30,000 BTU (NAT or LP) burners every 12" on thermostatic models and one 20,000 BTU (NAT or LP) burners every 12" on manual models. Fully welded, 1" thick polished steel griddle plate with side splash guards, and grease drawer.

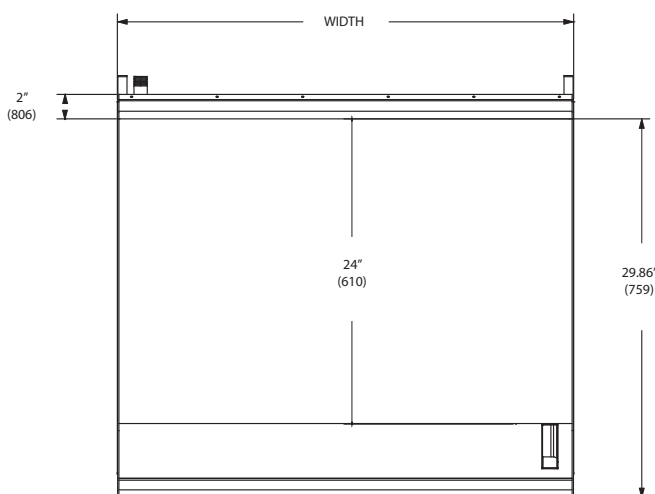
Griddle Controls: Independent, "Insta-on" thermostatic controls with uniform temperature range of 200°F to 400°F. (Thermostatic models ONLY)

Legs: Stainless steel 4" adjustable legs.

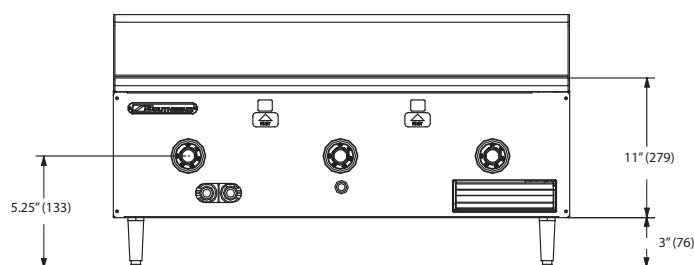
Gas Heat Control System: Each foot of griddle is heated by a "U" shaped burner. Each burner is controlled by a thermostatic control. For safety, each pilot has a flame failure device. A 3/4" rear gas connection is standard. Units over 48" wide are constructed of two bodies.(Thermostatic models ONLY)



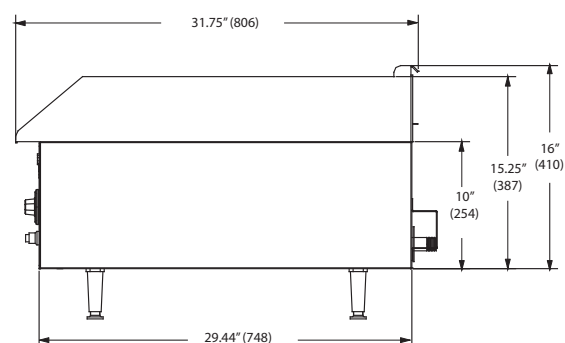
Models: ☐ HDG-18 ☐ HDG-24 ☐ HDG-36 ☐ HDG-48 ☐ HDG-60 ☐ HDG-72
☐ HDG-18-M ☐ HDG-24-M ☐ HDG-36-M ☐ HDG-48-M ☐ HDG-60-M ☐ HDG-72-M



(Model shown with thermostatic controls)



SHIPPING CRATE DIMENSIONS & WEIGHT					
MODEL	WIDTH	NUMBER OF BURNERS	CRATED WIDTH	CRATED DEPTH	CRATED WEIGHT
HDG-18/ HDG-18-M	18" (457)	1	31" (788)	39" (991)	270 lbs (122 kg)
HDG-24/ HDG-24-M	24" (610)	2	31" (788)	39" (991)	305 lbs (159 kg)
HDG-36/ HDG-36-M	36" (915)	3	55" (1398)	39" (991)	445 lbs (202 kg)
HDG-48/ HDG-48-M	48" (1220)	4	55" (1398)	39" (991)	545 lbs (247 kg)
HDG-60/ HDG-60-M	60" (1525)	5	67" (1703)	45.5" (1157)	705 lbs (320 kg)
HDG-72/ HDG-72-M	72" (1830)	6	110" (2796)	45.5" (1157)	840 lbs (378 kg)



UTILITY INFORMATION

GAS: Each unit has a 3/4" rear gas connection with a male NPT connector (female when regulator is added). Minimum supply pressure is 7" W.C. for natural gas and 11" W.C. for propane. All units require a regulated gas supply. pressure regulator included. If using a flexible hose gas connection, the I.D. of the hose must not be smaller than the connector on the unit and must comply with ANSI Z21.69, providing an adequate means of restraint to prevent undue strain on the gas connection.

MODEL	GAS (BTU/hr)	
	NATURAL	PROPANE
HDG-18/ HDG-18-M	30,000	30,000
	20,000	20,000
HDG-24/ HDG-24-M	60,000	60,000
	40,000	40,000
HDG-36/ HDG-36-M	90,000	90,000
	60,000	60,000
HDG-48/ HDG-48-M	120,000	120,000
	80,000	80,000
HDG-60/ HDG-60-M	150,000	150,000
	100,000	100,000
HDG-72/ HDG-72-M	180,000	180,000
	120,000	120,000

MISCELLANEOUS

- If casters are used with flex hose, a restraining device should be used to eliminate undue strain on the flex hose.
- Minimum clearance from noncombustible construction is zero. Minimum clearance from combustible construction is 12" on sides and 8" on rear.
- Install under vented hood.
- Check local codes for fire and sanitary regulations.

NOTICE:

Southbend has a policy of continuous product research and improvement. We reserve the right to change specifications and product design without notice. Such revisions do not entitle the buyer to corresponding changes, improvements, additions or replacements for previously purchased equipment.

OPTIONS AND ACCESSORIES

- ☐ Stainless steel stand
- ☐ Casters for stand
- ☐ Chrome plated griddle plates
- ☐ Stainless steel plate shelf with or without cutting board
- ☐ Grooved griddle plates
- ☐ 2" high insulator base for mounting on refrigerated base

**INTENDED FOR COMMERCIAL USE ONLY.
NOT FOR HOUSEHOLD USE.**



1100 Old Honeycutt Road, Fuquay-Varina, NC 27526
(919) 762-1000 www.southbendnc.com

Submittal Sheet

12/20/2017

ITEM# 70 - CHARBROILER, GAS, COUNTERTOP (1 EA REQ'D)

Southbend HDC-24

Charbroiler, gas, countertop, 24", cast iron radiants, stainless steel burners, two-position, two sided cooking grid, removable crumb tray, stainless steel front, sides & 4" adjustable legs, 80,000 BTU, CSA, NSF

ACCESSORIES

Mfr	Qty	Model	Spec
Southbend	1		Domestic Shipping, inside of North America (Contact factory for price)
Southbend	1		Standard one year limited warranty
Southbend	1		Natural Gas
Southbend	1		Battery spark ignition

GAS

	SIZE	MBTU	KW
1	3/4"	80.0	

STEAM

	INLET SIZE	RETURN SIZE	LB/HR	PSIG (min)	PSIG (max)
1					



COUNTERLINE - CHARBROILER

Gas Briquette or Radiant Countertop

Standard Features

- Available in 12", 24", 36", 48", and 60" widths
- 20,000 BTU (NAT or LP) stainless steel burner per 6"
- Stainless steel front and sides are standard, rear and bottom panels are aluminized steel.
- Reinforced, insulated double wall sides
- Cast iron radiants
- 3/4" rear gas connection and pressure regulator
- 5" high rear and side splash guards
- Field convertible from radiant to briquette cooking
- Two-position, two sided cooking grids
- 4" Spatula width grease trough
- Wide or narrow branding grates
- Stainless steel, full width crumb tray
- One year limited Parts and Labor Warranty
- HDCL units come standard with lava briquettes

Radiant Models:

HDC-12, HDC-24, HDC-36, HDC-48, HDC-60

Briquette Models:

HDCL-12, HDCL-24, HDCL-36, HDCL-48, HDCL-60



(Model HDC-36)

STANDARD CONSTRUCTION SPECIFICATIONS

Exterior Finish: Front and sides are constructed of #3 polished 430 and 304 stainless steel. Bottom and rear are aluminized steel. Sides are reinforced and fully insulated. 5" rear and side splash.

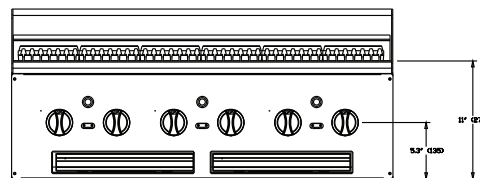
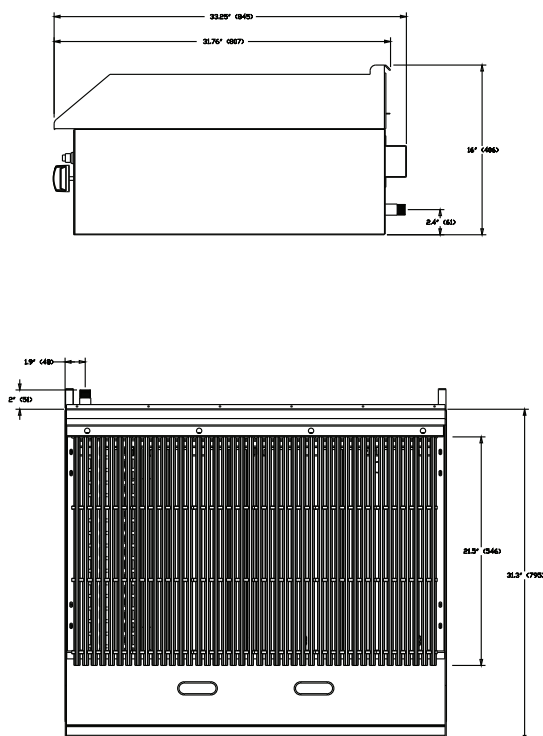
Charbroiler: 12", 24", 36", 48" and 60" (available in radiant or lava). Stainless steel, 20,000 BTU (NAT or LP) burners every 6". Removable two-sided cast-iron grates. Field convertible from radiant to briquette.

Gas Heat Control System: Each straight burner is controlled by a gas valve for independent control of flame. One standing pilot services each burner. A 3/4" rear gas connection is standard.

Legs: Stainless steel 4" adjustable legs.



Models: ☐HDC-12 ☐HDCL-12 ☐HDC-24 ☐HDCL-24 ☐HDC-36 ☐HDCL-36 ☐HDC-48 ☐HDCL-48 ☐HDC-60 ☐HDCL-60



SHIPPING CRATE DIMENSIONS & WEIGHT

MODEL	WIDTH	BURNERS @20,000 BTU	CRATED WIDTH	CRATED DEPTH	CRATED WEIGHT
HDC-12/ HDCL-12	12\" (305)	2	15.5\" (394)	39\" (991)	120 lbs (54 kg)
HDC-24/ HDCL-24	24\" (610)	4	31\" (788)	39\" (991)	240 lbs (108 kg)
HDC-36/ HDCL-36	36\" (915)	6	55\" (1398)	39\" (991)	350 lbs (159 kg)
HDC-48/ HDCL-48	48\" (1220)	8	55\" (1398)	39\" (991)	425 lbs (193 kg)
HDC-60/ HDCL-60	60\" (1525)	10	67\" (1703)	45.5\" (1157)	500 lbs (135 kg)

UTILITY INFORMATION

GAS: Each unit has a 3/4" rear gas connection with a male NPT connector. Minimum supply pressure is 7" W.C. for natural gas and 11" W.C. for propane. All units require a regulated gas supply. Pressure regulator included. If using a flexible hose gas connection, the I.D. of the hose must not be smaller than the connector on the unit and must comply with ANSI Z21.69, providing an adequate means of restraint to prevent undue strain on the gas connection.

MODEL	GAS (BTU/HR)	
	NATURAL	PROPANE
HDC12/ HDCL-12	40,000	40,000
HDC24/ HDCL-24	80,000	80,000
HDC36/ HDCL-36	120,000	120,000
HDC48/ HDCL-48	160,000	160,000
HDC60/ HDCL-60	200,000	200,000

MISCELLANEOUS

- If casters are used with flex hose, a restraining device should be used to eliminate undue strain on the flex hose.
- For use in non-combustible locations only.
- Minimum clearance from noncombustible construction is zero.
- Install under vented hood.
- Check local codes for fire and sanitary regulations.

NOTICE:

Southbend has a policy of continuous product research and improvement. We reserve the right to change specifications and product design without notice. Such revisions do not entitle the buyer to corresponding changes, improvements, additions or replacements for previously purchased equipment.

OPTIONS AND ACCESSORIES

- | | |
|--|---|
| <input type="checkbox"/> Stainless steel stand | <input type="checkbox"/> 2" high insulator base for mounting on refrigerated base |
| <input type="checkbox"/> Casters for stand | <input type="checkbox"/> Battery Spark Ignition |
| <input type="checkbox"/> Stainless steel plate shelf with or without cutting board | <input type="checkbox"/> Briquette kit to convert radiant to briquette |
| <input type="checkbox"/> Plated grids for fish | <input type="checkbox"/> Radiant kit to convert briquette to radiant |

**INTENDED FOR COMMERCIAL USE ONLY.
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1100 Old Honeycutt Road, Fuquay-Varina, NC 27526
(919) 762-1000 www.southbendnc.com

Submittal Sheet

12/20/2017

ITEM# 71 - HOTPLATE, COUNTERTOP, GAS (1 EA REQ'D)

Southbend HDO-24

Hotplate, gas, countertop, 24", (4) 33,000 BTU open burners, manual controls, removable cast iron grates & crumb tray, stainless steel front, sides & 4" adjustable legs, 132,000 BTU, CSA, NSF

ACCESSORIES

Mfr	Qty	Model	Spec
Southbend	1		Domestic Shipping, inside of North America (Contact factory for price)
Southbend	1		Standard one year limited warranty
Southbend	1		Natural Gas
Southbend	1		Battery spark ignition

GAS

	SIZE	MBTU	KW
1	3/4"	132.0	

STEAM

	INLET SIZE	RETURN SIZE	LB/HR	PSIG (min)	PSIG (max)
1					



COUNTERTOP RANGE

Gas Modular Countertop Ranges

Standard Features

- Available in 12", 24", 36" and 48" (24", 36" and 48" step-up units also available)
- 33,000 BTU NAT (24,000 BTU LP) open top non-clogging burner
- Hi/Low burner controls
- Stainless steel front and sides
- 3/4" rear gas connection and pressure regulator
- 12" cast flush top grates
- 4" stainless steel legs
- Stainless steel, full width crumb tray
- One year limited Parts and Labor Warranty

HDO-12, HDO-24, HDO-36, HDO-48
Step-up Models: HDO-24SU, HDO-36SU, HDO-48SU



Model HDO-36SU

Job #

STANDARD CONSTRUCTION SPECIFICATIONS

Exterior Finish: Stainless steel front and sides. Rear and bottom panels are constructed of aluminized steel.

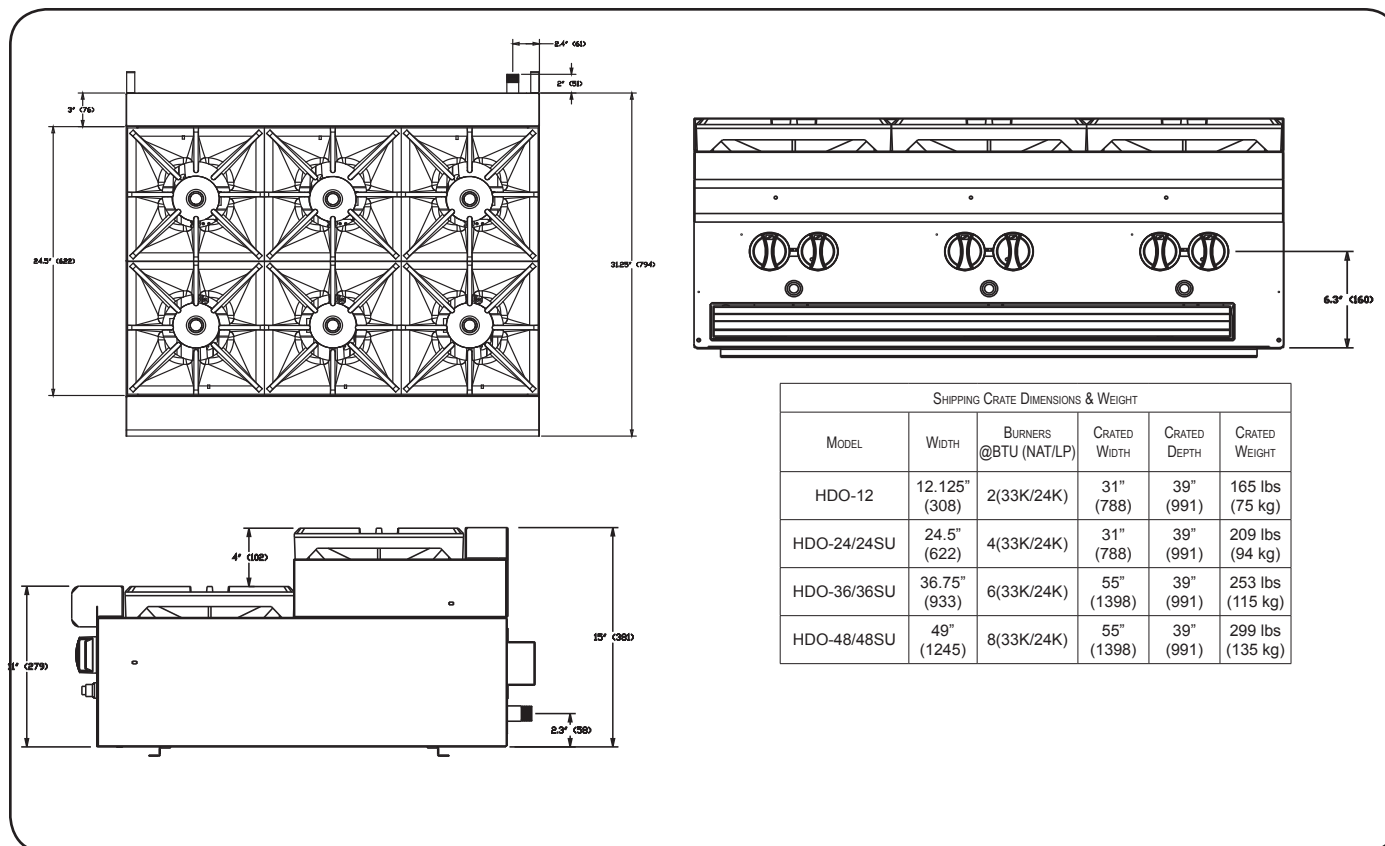
Range Top: Each burner is a 33,000 BTU NAT (24,000 BTU LP) cast iron non-clogging burner (available in step-up). Removable flush top grates. Center-to-center measurements between burners not less than 12", side-to-side or front-to-back. Removable one piece, full width crumb tray provided under burners.

Gas Heat Control System: Each burner is controlled by a gas valve for independent control of flame. One standing pilot services each burner. A 3/4" rear gas connection is standard.

Legs: Stainless steel 4" adjustable legs.



Models: ☐ HDO-12 ☐ HDO-24 ☐ HDO-36 ☐ HDO-48 ☐ HDO-24SU ☐ HDO-36SU ☐ HDO-48SU



SHIPPING CRATE DIMENSIONS & WEIGHT					
MODEL	WIDTH	BURNERS @BTU (NAT/LP)	CRATED WIDTH	CRATED DEPTH	CRATED WEIGHT
HDO-12	12.125" (308)	2(33K/24K)	31" (788)	39" (991)	165 lbs (75 kg)
HDO-24/24SU	24.5" (622)	4(33K/24K)	31" (788)	39" (991)	209 lbs (94 kg)
HDO-36/36SU	36.75" (933)	6(33K/24K)	55" (1398)	39" (991)	253 lbs (115 kg)
HDO-48/48SU	49" (1245)	8(33K/24K)	55" (1398)	39" (991)	299 lbs (135 kg)

UTILITY INFORMATION

GAS: Each unit has a 3/4" rear gas connection with a male NPT connector. Minimum supply pressure is 7" W.C. for natural gas and 11" W.C. for propane. All units require a regulated gas supply. Pressure regulator included. If using a flexible hose gas connection, the I.D. of the hose must not be smaller than the connector on the unit and must comply with ANSI Z21.69, providing an adequate means of restraint to prevent undue strain on the gas connection.

MODEL	GAS (BTU/hr)	
	NATURAL	PROPANE
HDO-12	66,000	48,000
HDO-24/24SU	132,000	96,000
HDO-36/36SU	198,000	144,000
HDO-48/48SU	264,000	192,000

MISCELLANEOUS

- If casters are used with flex hose, a restraining device should be used to eliminate undue strain on the flex hose.
- Minimum clearance from noncombustible construction is zero. Minimum clearance from combustible construction is 10" on sides and 6" on rear.
- Install under vented hood.
- Check local codes for fire and sanitary regulations.

NOTICE: Southbend has a policy of continuous product research and improvement. We reserve the right to change specifications and product design without notice. Such revisions do not entitle the buyer to corresponding changes, improvements, additions or replacements for previously purchased equipment.

OPTIONS AND ACCESSORIES

- ☐ Stainless steel stand
- ☐ Casters for stand
- ☐ High performance WOK ring
- ☐ 2" high insulator base for mounting on refrigerated base
- ☐ Battery spark ignition

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1100 Old Honeycutt Road, Fuquay-Varina, NC 27526
(919) 762-1000 www.southbendnc.com

Submittal Sheet

12/20/2017

ITEM# 72 - TILTING SKILLET BRAISING PAN, GAS (1 EA REQ'D)

Cleveland SGL30TR

DuraPan™ Tilting Skillet, gas, 30-gallon capacity, modular open base, standard with hydraulic hand tilt with quick lowering feature, stainless steel construction, includes spring-assisted cover, gallon markings and electronic spark ignition, food strainer, stainless steel level adjustable feet, CE, NSF, 91,000 BTU

ACCESSORIES

Mfr	Qty	Model	Spec
Cleveland	1		1-year parts & labor warranty, standard
Cleveland	1		Performance start-up included at customer request after equipment is installed (Free Water Quality Check included) (contact Cleveland Sales Representative for details)
Cleveland	1		Natural Gas
Cleveland	1		120v/60/1-ph, 1.8 amp, standard
Cleveland	1	HTS	Standard Manual Hand Tilt, with quick lowering feature (hydraulic)

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCF
1	120	60	1				1.8				

GAS

	SIZE	MBTU	KW
1	3/4"	91.0	

STEAM

	INLET SIZE	RETURN SIZE	LB/HR	PSIG (min)	PSIG (max)
1					



DURAPAN™ SERIES

GAS, OPEN OR MODULAR BASE,
30 & 40 GALLON (115 & 150 LITER)

Project _____
Item _____
Quantity _____
FCSI Section 11400 _____
Approved _____
Date _____

Braising Pans / Tilting Skilleets

Models

- SGL-30-TR • SGM-30-TR
- SGL-40-TR • SGM-40-TR



Open base model shown with optional
Drain Drawer (SLD)

- Adjustable, Electronic Thermostat controls temperature from 100°F to 425°F
- High Efficiency Heating System with even heat distribution
- Electronic Spark Ignition (ESS)
- Fast Heat-Up and Recovery Time-Preheats in 11 minutes, full capacity from cold to boiling in 60 minutes
- Spring Assist Cover with Adjustable Vent and Full Width Handle
- On/Off Switch, Thermostat Knob and Pilots, recessed to avoid breakage
- Four Stainless Steel, Level adjustable feet, rear flanged for bolting
- All Controls are serviceable from the front of the unit
- Two pilot lights; Green = Power on, Amber = Temperature Cycling
- Splash Proof Controls and Water Tight Electrical Connections
- High Limit Safety Device set at 475°F (246°C)
- Anti-Splash Pouring Lip
- Supplied with Cord & Plug for 115-volt controls
- Typical approvals include AGA, CSA, CE and NSF

Short Form Specifications

Shall be CLEVELAND, Tilting Skillet;
Model SG _____ - _____ - TR gas
(TYPE _____) - holding no less than _____
gallons (_____ liters); complete with
Thermostatic Safety and Gas Controls; Gallon
Markings; Stainless Steel Clad 5/8" Cooking
Surface; Hand Tilt; Spring Assist Cover with
adjustable Vent. All Stainless Steel
Construction.

Standard Features

- Leg or Modular Base
- Full 30/40 Gallon (115/150 Liters) Capacity Rating to Bottom of Pouring Lip
- Hydraulic Hand Tilt with quick lowering feature (HTS)
- Stainless Steel Clad 5/8" Cooking Surface Guaranteed against warping
- Stainless Steel Coved Cornered Pans with both Gallon and Liter Markings
- All Stainless Steel Construction for durability and easy cleaning

Options & Accessories

- Sliding Drain Drawer with Splash Screen (SLD) (for SGL models only)
- Power Tilt with Hand Tilt Override (PT1)
- Double or Single Pantry Faucet (SPS14, DPS14), includes Faucet Mounting Bracket
- Double or Single Pantry Skillet Filler with 60" hose (SKF-S or DKF-S)
- Hot & Cold Water Pre-Rinse Spray Head with Hose (PRS-S)
- Gas types other than natural
- Voltage Option:
- VOSK4, 220/240 Volt, 50 Hz, 1 Phase - for export
- Food Strainers for pouring spout (FS)
- Vegetable Steamers (VS)
- Poaching Pans (PP)
- Wall Mounting (WMS)
- In-Wall Carrier (IWCS)
- Pan Carriers (PCS), not available on 30 gallon models with a Tangent Draw-Off Valve
- 2" Tangent Draw-Off Valve (TD2), left side only



DIMENSIONS

MODEL	A	B	C	D	E	G
SGL-30-TR	36" (915mm)	32" (812mm)	9" (229mm)	5" (127mm)	20" (508mm)	32 7/8" (835mm)
SGL-40-TR	48" (1220mm)	44" (1118mm)	12 1/8" (308mm)	8" (203mm)	22" (559mm)	44 7/8" (1140mm)

SPECIFICATIONS

ELECTRICAL SUPPLY (6' CORD & PLUG)		GAS SUPPLY (PIPING 3/4" NPT)		CLEARANCE	
VOLTS:	120	220/240	TYPE: NAT or LP	MIN. TO COMBUSTABLE SURFACES: SIDES: 0, REAR: 6" (153mm) MIN. TO NON COMBUSTABLE SURFACES: SIDES & REAR: 0 NOTE: 4 1/2" (115mm) required on right hand side for faucet	
PHASE:	1	1	WATER COLUMN: 4.5 (NAT), 10.5 (LP)		
AMPS:	1.8	.83	BTU PER CU. FT.: 1000 (NAT), 2500 (LP)		
FREQ:	60 HZ	50 HZ	SUPPLY PRESSURE: 5" W.C. MIN (NAT), 11" W.C. MIN (LP)		
		BTU RATINGS: SGL-30-TR: 91,000 per hour SGL-40-TR: 130,000 per hour			



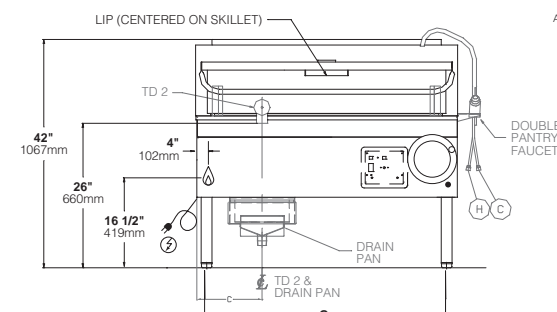
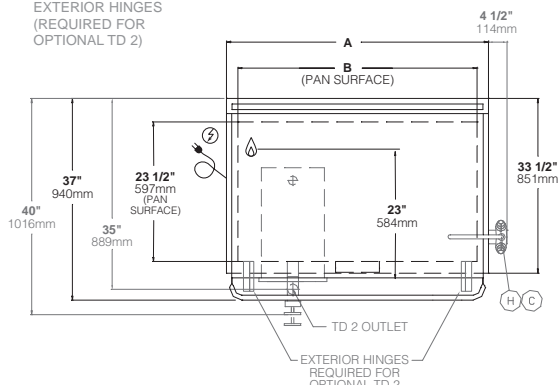
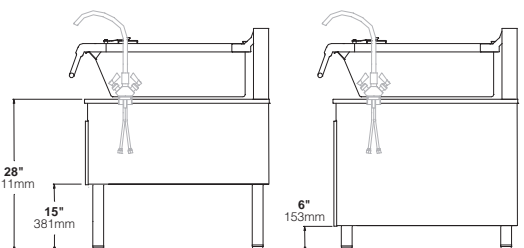
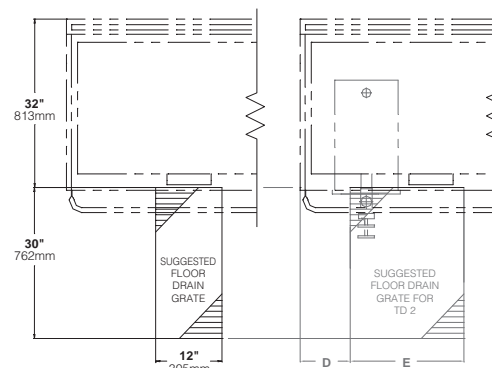
EXTERIOR HINGES
(REQUIRED FOR
OPTIONAL TD 2)

Shipping Weights & Dimensions

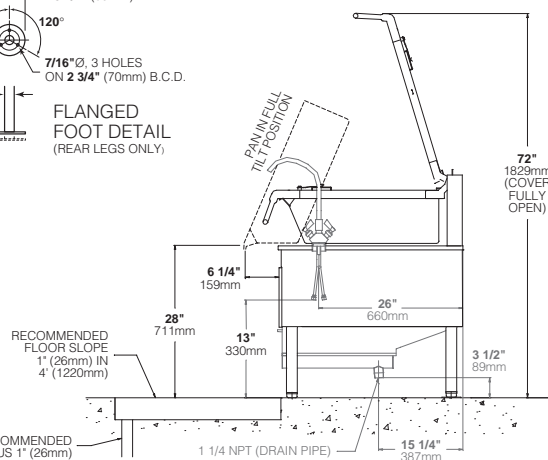
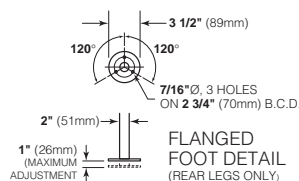
Model -
SGL30TR Weight - 504 lbs
Width - 44"
Depth - 44"
Height - 54"
SGL40TR Weight - 624 lbs
Width - 48"
Depth - 58"
Height - 54"

CAPACITIES

In 4 oz. servings. Other sizes may be calculated.
30 gallons / 115 Liters 960
40 gallons / 150 Liters 1280



NOTE: NON STANDARD ITEMS ARE SHOWN IN GRAY



NOTES:

Cleveland Range reserves right of design improvement or modification, as warranted.
Many regional, state and local codes exist and it is the responsibility of the owner and installer to comply with the codes.
Cleveland Range equipment is built to comply with applicable standards for manufacturers. Included among those approval agencies are U.L., NSF, CGA, CSA, ETL and others.

(NOT TO SCALE)

Braising Pans / Tilting Skillets

18301 St. Clair Street
Cleveland, OH 44110

Tel 1.216.481.4900
Fax 1.216.481.3782
Email steam@clevelandrange.com

www.clevelandrange.com
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08 / 2017

WELBILT
KE004046-93

Submittal Sheet

12/20/2017

ITEM# 73 - EXHAUST HOOD (1 EA REQ'D)

Captive-Aire ND

Wall Type Exhaust Hood: 18 gauge 304 series stainless steel construction in accord with N.F.P.A. 96. Stainless steel baffle type U.L. classified grease extracting filters, with handles. Vapor-proof U.L. listed light fixtures as indicated on drawings. Provide stainless steel wall cabinet (located as shown on plan) for fire suppression system and control package. Fan and light switches to be located on face of hood in an accessible location. Hood to be furnished complete with Starter/contactor package for exhaust fan and make-up air fan (fans furnished by mechanical contractor, coordination of electrical service is required). Provide and install removable stainless steel perimeter trim and/or closure panels from top of hood to ceiling and 18 gauge stainless steel wall panels from floor to bottom of hood. Provide and install any secondary supporting members required to suspend hoods. Supports shall include seismic bracing, if required, in accord with SMACNA guidelines. Furnish unit complete with all standard accessories as normally supplied by the manufacturer.

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1	120	60	1	JB	CLG		10.0				
2	120	60	1	JB	CLG		10.0				

ELECTRICAL 1 REMARKS

LIGHTS

ELECTRICAL 2 REMARKS

FAN CONTROLS



The ND-2 Series is a Type I, Wall Canopy Hood for use over 450°F, 600°F and 700°F cooking surface temperatures. The aerodynamic design includes a mechanical baffle and performance enhancing lip for exceptional capture and containment.

Fully Integrated Package

CaptiveAire sells this hood as a stand-alone appliance to be integrated into a kitchen ventilation application, or provided as part of a FULLY INTEGRATED PACKAGE designed by CaptiveAire and pre-engineered for optimum performance. The package consists of the hood, an integral utility cabinet, factory pre-wired electrical controls, and a listed fire suppression system. Other options include a listed exhaust fan, a listed make-up air unit and listed, factory-built ductwork.



Advantages

- **Exhaust Flow Rates:** Superior exhaust flow rates. A 4' Hood can operate at 150 CFM/ft or 600 total CFM. Available in single or back-to-back configurations.
- **ETL Listed:** ETL Listed for use over 450°F, 600°F and 700°F cooking surface temperatures, which provides flexibility in designing kitchen ventilation systems. ETL Listed to US and Canadian safety standards, ETL Sanitation Listed and built in accordance with NFPA 96.
- **Capture and Containment:** Insulated, double-wall rigid front has aerodynamic design that reduces radiant heat into kitchen, prevents condensation and provides exceptional capture and containment of cooking vapors. This is accomplished with the signature ND-2 "mechanical baffle" on the front of the hood's capture area and the "C-shaped" design of the hood's capture area. Mechanical baffle provides a built-in wiring chase for optimal positioning of electrical controls and outlets on the front face of the hood without penetrating capture area or requiring external chase way.
- **Convenient Design:** Factory pre-wired lighting to illuminate the cooking surface is accessible from the bottom of the hood. Fitted with UL Listed, pre-wired, incandescent light fixtures and tempered glass globes to hold up to a standard 100 watt bulb. Pre-punched hanging angles on each end of hood and additional set provided for hoods longer than 12'.

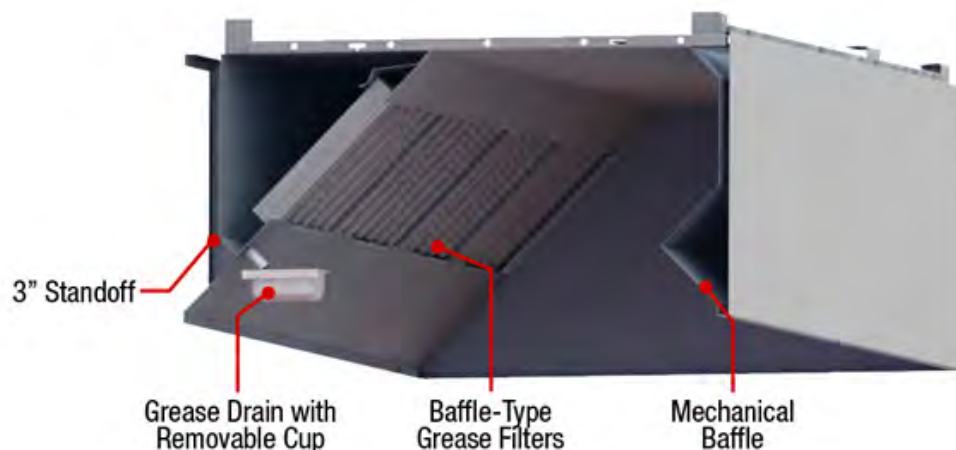
- **Construction:** Polished stainless steel on the interior and exterior of the front enhance aesthetics. Fully welded and polished front corners. Fabricated from Type 430 stainless steel with option of Type 304 available.
- **Channels:** Hood comes standard with structural channels on top and wrapper channels on the bottom.
- **Grease Extraction:** All hoods come standard with stainless steel baffle filters and a deep grease trough which allows for easy cleaning. Captrate Combo® and Captrate Solo® filters are optional. Grease drain system with removable 1/2 pint cup for easy cleaning. Standard filter stops eliminate gaps between filters.
- **Reduced Lead Times and Shipping Costs:** Produced on a high volume assembly line at one of five manufacturing facilities to reduce lead times and shipping costs.
- **Clearance to Combustibles:** Standard built in 3" rear standoff to meet NFPA 96 requirements, when installed in a wall application.
- **Controls:** Hoods can be equipped with modular utility cabinets and end standoffs. Optional listed light and fan control switches flush mounted and pre-wired through electrical chase way.
- **Optional Make-Up Air:** Up to 80% make-up air can be supplied through optional front and/or side plenums (ND-2 Series with PSP or AC-PSP Accessory).
- **Reduced Weight:** Rigid single wall end panels reduce weight.

Performance

AVG. COOKING SURFACE TEMP. (°F)	CONFIGURATION	MIN. EXHAUST CFM / FT.
450°F - Ovens, Steamers, Kettles, Open-Burner Ranges, Griddles, Fryers	Single Wall Hood 2 Wall Hoods Back-to-Back	150 300
600°F - Gas Charbroilers, Electric Charbroilers, Woks	Single Wall Hood 2 Wall Hoods Back-to-Back	200 400
700°F - Mesquite Grills, Charcoal Charbroilers, Wood Burning Appliances	Single Wall Hood 2 Wall Hoods Back-to-Back	250 500

Recommended Duct Sizing: Exhaust - Based on 1500 FPM

Features



Options

Utility Cabinet: Listed for integral side mount and fabricated of same material as hood. Cabinet can house listed fire suppression system and listed, pre-wired electrical controls.

Front Perforated Supply Plenum: Provides low velocity make-up air for the kitchen and is discharged in front of the hood. Perforated diffuser plates allow for even air distribution and supply riser includes a volume damper for easy balancing. Side Perforated Supply Plenums can be added to optimize the air flow if necessary.

Enclosure Panels: Constructed of stainless steel. Sized to extend from hood top to ceiling, enclosing pipe and hanging parts.

End Panels: Should be used to maximize hood performance and eliminate the effects of cross drafts in kitchen. units constructed of stainless steel and sized according to hood width and cooking equipment. Exposed edges hemmed for safety and rigidity.

Roof Top Package: Combination ETL Listed exhaust/supply air unit with factory prewired and mounted motors, trunkline and curb vented on exhaust side.

Separate Exhaust and/or Make-Up Air Fans: ETL Listed single exhaust fans and supply-air fans and curbs available.

Fire Suppression System: UL 300 fire suppression system.

Lighting: Recessed Incandescent, Recessed Fluorescent, Compact Fluorescent, LED, Recessed LED, Halogen

Certifications

The ND-2 Model has been certified by ITS. This certification mark indicates that the product has been tested to and has met the minimum requirements of a widely recognized (consensus) U.S. and Canadian products safety standard, that the manufacturing site has been audited, and that the applicant has agreed to a program of periodic factory follow-up inspections to verify continued performance.

Models ND-2 are ETL Listed under file number 3054804-001 and complies with UL710, ULC710 and ULC-S646 Standards.



Submittal Sheet

12/20/2017

ITEM# 73.1 - FIRE SUPPRESSION SYSTEM (1 EA REQ'D)

Ansul R-102

Wet chemical type fire suppression system. Installation in accord with N.F.P.A. 17A code requirements. Suppression system to be pre-piped at factory and hooked up in field by a local licensed agency. Local agency to perform certifications tests as required by local authorities. Furnish manual strike mechanism in accessible location. Furnish unit complete with all tanks, piping, relays, cable, fusible links, nozzles, etc. as required for a complete system.

Submittal Sheet

12/20/2017

ITEM# 74 - ROLL-IN HEATED CABINET (1 EA REQ'D)

Continental Refrigerator DL2WI

Designer Line Warmer, roll-in, two-section, stainless steel front, aluminum interior & ends, standard depth cabinet, full-height solid doors, exterior digital thermometer

ACCESSORIES

Mfr	Qty	Model	Spec
Continental Refrigerator	1		Standard warranty (for the United States & Canada Only): 3 year parts and labor
Continental Refrigerator	1		115/208-230v/60/1, 14.5 amps, cord & plug supplied by others
Continental Refrigerator	1		Left Door hinged on left & right door hinged on right, standard

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1	115/208-230	60	1				14.5				

DESIGNER LINE ROLL-IN WARMER

Model: **DL2WI**

2-Section Roll-In Warmer with 66¼" Cart Capacity

Standard - Stainless steel front, aluminum end panels and interior
 Suffix SA- Stainless steel exterior, aluminum interior
 Suffix SS - Stainless steel exterior and interior



Options and Accessories

(upcharge and lead times may apply)

Stainless steel case back	Special electrical req. (consult factory)
Chrome or stainless steel shelves	Correctional Facility Options
Rehinging of doors (consult factory)	<ul style="list-style-type: none"> One way security screws
Custom laminates	<ul style="list-style-type: none"> Locking hasp (lock not included)
Half doors	<ul style="list-style-type: none"> Stainless steel mesh cover
Roll-Thru	<ul style="list-style-type: none"> Coverless hinges
Hinged glass doors	

Consult factory for other model configurations, options and accessories.

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 Phone: 215-244-1400
 Fax: 215-244-9579

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www.continentalrefrigerator.com

Project Name:

Model Specified:

Location:

Item No:

Quantity:

AIA #:

SIS #:

Standard Model Features

HEATING SYSTEM

Self-contained, performance-rated "plug" warming system
 90°F - 180°F temperature range
 Humidity relief vent with master on/off control switch
 Unique air flow distribution ducts
 Heating system is accessible on top of cabinet, separate from the food zone

CABINET ARCHITECTURE

Removable stainless steel rack guides
 Removable stainless steel ramps
 Reinforced stainless steel floor
 3" non-CFC polyurethane foam insulation
 Chrome-plated flow line handles
 Cam action, lift off hinges
 Magnetic snap-in door gaskets
 Cylinder lock in door
 Self-closing doors
 66 1/2" high door openings (66 1/4"H rack capacity*)

Standard Finish

Stainless steel front, aluminum end panels and interior

-SA Finish

Stainless steel exterior, aluminum interior

-SS Finish

Stainless steel exterior and interior

MODEL FEATURES

Automatic interior lighting
 External thermostat control
 External digital thermometer

* Racks not supplied

IMPORTANT NOTE: Cabinet upper side panels and heating "plug" system can be easily removed and reinstalled at installation site where space limitations are confining.

APPROVAL:

Model Specifications

DIMENSIONAL DATA

Net Capacity (cu. ft.)	64 (1812 cu l)
Width, Overall (in.)	68 1/2 (1740 mm)
Depth, Overall (incl. handles) (in.)	35 3/8 (899 mm)
Depth [less doors] (in.)	32 (813 mm)
Depth [doors open 90°] (in.)	65 (1651 mm)
Clear Door Width (in.)	27 3/8 (695 mm)
Clear Full Door Height (in.)	66 1/2 (1676 mm)
Height, Overall (in.)	86 (2184 mm)
No. of Door(s)	2
Rack Capacity**	2 ea.

ELECTRICAL DATA

Voltage (int'l)	115/208-230/60/1 (220/50/1)
Total Wattage @ 208-230 Volts	3000
Feed Wires (incl. ground)	4
Total Amps (int'l)	14.5 (13.8)
10 ft. Cord/Plug [attached] (int'l)	No (No)

SHIPPING DATA

Height - Crated (in.)	90 (2286 mm)
Width - Crated (in.)	77 (1956 mm)
Depth - Crated (in.)	42 (1067 mm)
Volume - Crated (cu. ft.)	168 (4757 cu l)
Weight Std - Crated (lbs.)	680 (308 kg)
Weight SS - Crated (lbs.)	720 (327 kg)
Weight Std - Uncrated (lbs.)	540 (245 kg)
Weight SS - Uncrated (lbs.)	575 (261 kg)

** Maximum rack size including wheels - 27"W x 29"D x 66 1/4"H
Figures in parentheses reflect metric equivalents rounded to the nearest whole millimeter.

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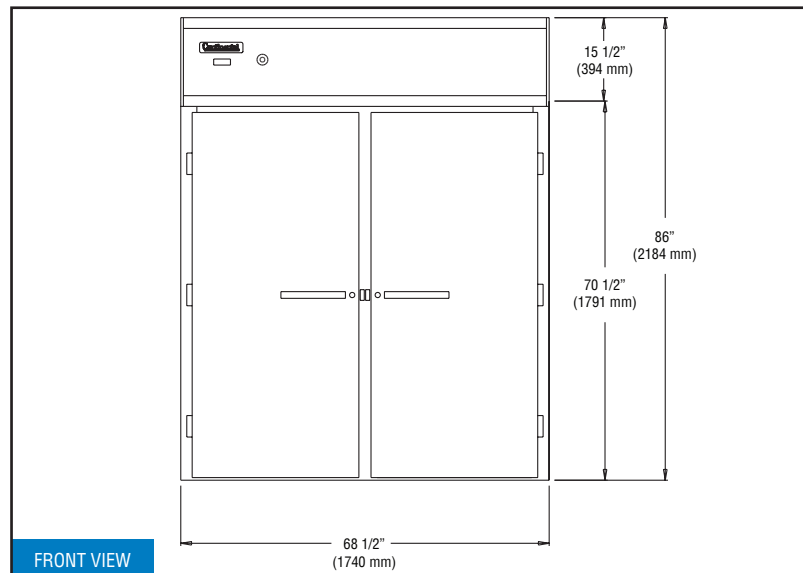
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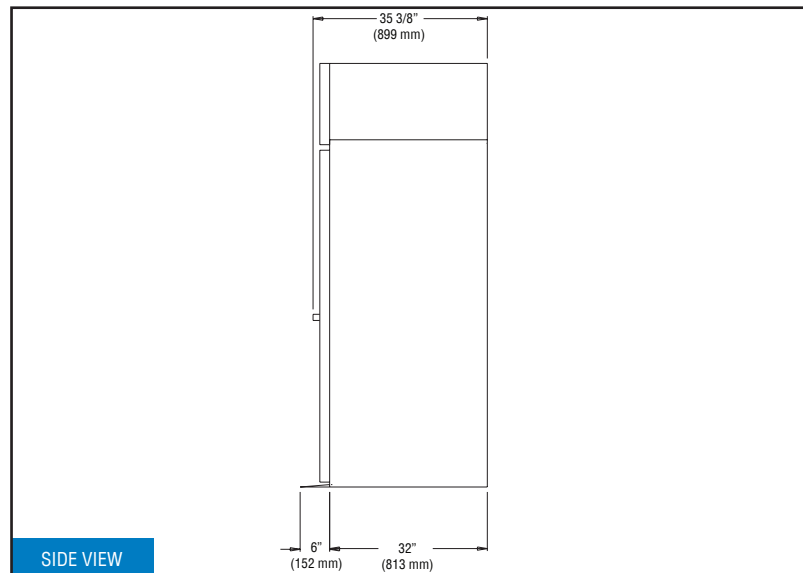
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Model Plan Views



FRONT VIEW



SIDE VIEW

IMPORTANT NOTE: If the cabinet is located directly against a wall and/or under a low ceiling, a minimum clearance of 12\"

HEATING SYSTEM (Range 90°F - 180°F)

Electrically operated heating system is controlled by means of a highly sensitive calibrated thermostat mounted on the cabinet front. Fin strip heating elements are located at the base of the interior. Air circulating blower located in a top mounted, concealed "plug" housing distributes heat throughout product zone, assuring uniform cabinet temperatures. Cabinet top has a built-in humidity relief vent. The entire "plug" system is mounted on a sturdy steel, rail-type base which can be easily removed if refrigerator or freezer conversion is desired. A strict quality assurance team inspects all material and components to certify that each model conforms to the most exacting standards. All models are factory performance tested for a minimum of 16 hours prior to crating.

INSULATION

All cabinet walls, top and bottom have high density, foamed-in-place, non-CFC polyurethane insulation.

CABINET CONSTRUCTION

All materials are of top quality, assembled to conform with strict quality-assurance requirements.

The cabinet front is constructed of heavy-gauge polished stainless steel for durability. All cabinet joints and seams are sealed vapor-tight. Case is of all metal, welded construction and internally supported and braced for a rigid unit construction. Cabinet design eliminated overlapping panels with raw edges. Cabinet body is insulated with non-CFC, foamed-in-place polyurethane foam with an average thickness of 3 inches to ensure increased energy efficiency. Automatic interior lighting is controlled by door openings. Cabinets are equipped with an easily removable, stainless steel ramp and interior rack guides.

DOOR CONSTRUCTION

Solid hinged door shells are constructed of heavy-gauge stainless steel and are internally braced and urethane-foam-insulated for rigidity. Door corners are welded construction and polished. Replaceable snap-in door gaskets are self-adjusting, heavy-duty, magnetic type. Door handles and hinges are chrome-plated and non-corrosive. Doors are provided with built-in cylinder locks which are keyed alike. Hinges are cam action, lift-off type featuring positive safety stop at 120 degrees.

Submittal Sheet

12/20/2017

ITEM# 75 - UNIVERSAL PAN RACK (2 EA REQ'D)

New Age 1306

Rack, mobile, universal, open frame design, square tube construction, (20) universal slides, 3" centers, all-welded aluminum construction, end loading, slides for 12" x 20", 18" x 26" & 13" 18" pans, 3-1/4" wide runners, (4) 5" platform casters, NSF

ACCESSORIES

Mfr	Qty	Model	Spec
New Age	2		Lifetime warranty against rust & corrosion, 5 year construction warranty, standard



JOB:
ITEM:
QTY:



Made in the USA

Wide- Angle Racks

Specifically designed for 18" x 26" and 12" x 20" pans or trays.

"Mix & Match" Pan Size

Extremely versatile, this multipurpose rack is designed to transport 18" x 26" **and** 12" x 20" pans or trays. Extra wide 3 1/4" angles are welded to the heavy duty frame giving you the freedom to mix-and-match pans and trays of both sizes on **one** rack.

"Worry Free" Handling

Specially designed to hold trays by the bottom insuring equal load distribution for easy, "worry free" handling. Heavy duty aluminum tube and angle slides maximize strength and durability.

Easy to Maneuver

Equipped with four 5" heavy duty platform type casters, these all welded aluminum racks are built to be pushed around. Non-marking wheels protect floors and minimize noise.

Guaranteed To Last

Guaranteed to last, each rack carries a **Lifetime Guarantee** against rust and corrosion as well as a **Five-Year Guarantee** against material defects and workmanship.



Model #1305



Phone: 800-255-0104
Fax: 877-877-7687
www.newageindustrial.com
sales@newageindustrial.com

New Age Industrial reserves the right to modify or make changes at any time without notice to materials and specifications.

SPECIFICATIONS

MATERIAL: Hi-tensile, corrosion resistant, rust proof, primary extruded aluminum, Type 6463-T5 alloy.

CONSTRUCTION: All heli-arc welded with all seams welded and sealed (no rivets).

SIDES: Each side had two vertical posts of 1" x 1" x .070 wall tube. Welded to each side are angle runners of 1 1/2" x 3 1/4" x .100 wall aluminum angle, spaced on 3" or 5" centers.

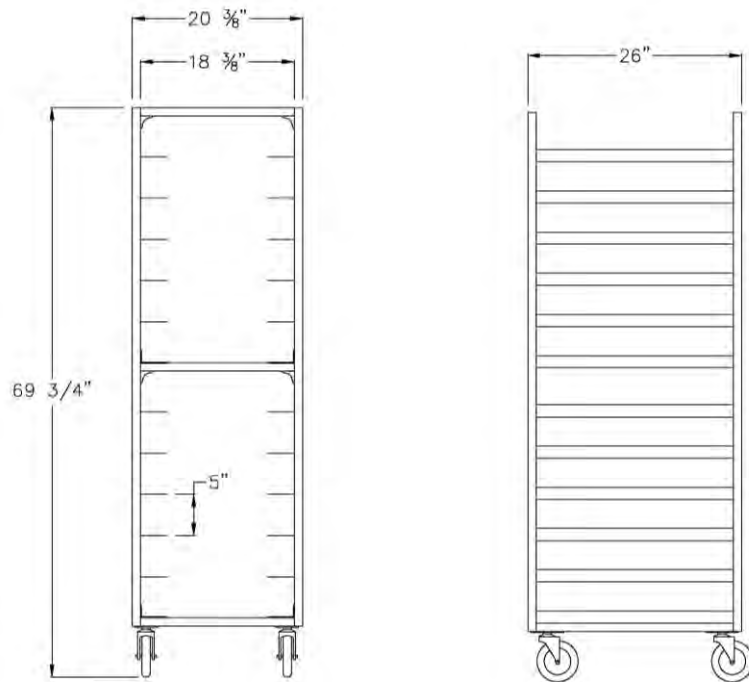
HORIZONTAL SUPPORTS: Each rack has (4) horizontal supports located at the top and center. These supports are 1" x 1" x .070 wall tube.

CORNER GUSSETS: Gussets of 1 1/2" x 1 1/2" x 5/8" thick angle are welded to the inside angles (bottom side) where horizontal cross bracing meets vertical uprights.

Note: Each gusset requires 4 1/2" of weld.

BASE: All welded rectangular frame with caster plates pre-tapped for caster bolts welded to each corner.

CASTERS: Platform type, 5" diameter wheel, full swivel design with sealed ball bearing axle. Wheel material is nonmarking polyurethane.



Model #1305

Model No.	Size-W	Size-H	Size-D	Runner Spacing	Pan Cap.	Wt.
Accepts 18"x26" or 12"x20" Pans-NSF Certified						
1305	20 3/8"	69 3/4"	26"	5"	12	51#
1306	20 3/8"	69 3/4"	26"	3"	20	71#
Accepts 18"x26" or 12"x20" Pans, and Various Oval Trays						
96058	26 1/2"	70"	30"	6"	10	99#
97690	51 3/4"	71 5/8"	30"	6"	20	176#

Options:

CASTER LOCKS (2) — Add "CL" suffix to model #.

CORNER BUMPERS (4) — Add "B" suffix to model #.

PAN STOP — Add -PS" suffix to model #.

PERIMETER BUMPER — Add -PB" suffix to model #.

SOLID BASE — Add -E" suffix to model #.

VERTICAL BUMPER (4) — Suffix -VB" suffix to model #.



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Submittal Sheet

12/20/2017

ITEM# 76 - REACH-IN REFRIGERATOR (1 EA REQ'D)

Continental Refrigerator 2R

Refrigerator, reach-in, two-section, self-contained refrigeration, stainless steel front, aluminum interior & ends, standard depth, full-height solid doors, electronic controller w/ digital display, electric condensate evaporator, 5" casters, 1/3 hp, cETLus, NSF, Made in USA

ACCESSORIES

Mfr	Qty	Model	Spec
Continental Refrigerator	1		Standard warranty (for the United States & Canada Only): 3 year parts and labor; 5 year compressor
Continental Refrigerator	1		115v/60/1-ph, 6.5 amps, cord, NEMA 5-15P, standard
Continental Refrigerator	1		Left Door hinged on left & right door hinged on right, standard
Continental Refrigerator	1		5" Casters, standard

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1									1/3		
2	115	60	1	Cord & Plug		5-15P	6.5				

REACH-IN REFRIGERATOR

Model: 2R

2-Section Reach-In Refrigerator

2R - Stainless steel front, aluminum end panels and interior

2R-SA - Stainless steel exterior, aluminum interior

2R-SS - Stainless steel exterior and interior

Designed to maintain NSF-7 temperatures in 100°F ambient.



Options and Accessories

(upcharge and lead times may apply)

Stainless steel case back	Pan slide assemblies
Additional epoxy-coated steel shelves	Pass-Thru
Chrome or stainless steel shelves	Shallow depth
Heavy-duty pilaster strips	Hinged glass doors
Rehinging of doors (consult factory)	Increased refrigeration systems
Expansion valve system	Special electrical req. (consult factory)
Wine display	Correctional Facility Options
Adjustable legs	• One way security screws
Digital thermometer	• Locking hasp (lock not included)
Remote models	• Stainless steel mesh cover
Custom laminates	• Coverless hinges
Half doors	

Consult factory for other model configurations, options and accessories.

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Project Name:

Model Specified:

Location:

Item No:

Quantity:

AIA #:

SIS #:

Standard Model Features

REFRIGERATION SYSTEM

Environmentally-safe R-134a refrigerant

Self contained, performance-rated refrigeration system

Automatic, electric condensate evaporator

CABINET ARCHITECTURE

3" non-CFC polyurethane foam insulation

Smooth, polished chrome workflow door handles

Cam-action, lift-off hinges

Self-closing doors

Magnetic snap-in door gaskets

Cylinder lock in door

Heavy-duty, epoxy-coated steel shelves

5" casters

MODEL FEATURES

LED interior lighting

External dial thermometer

Energy saving switch for door heaters

APPROVAL:

Model Specifications

DIMENSIONAL DATA

Net Capacity (cu. ft.)	48 (1359 cu l)
Width, Overall (in.)	52 (1321 mm)
Depth, Overall (in.) (incl. handles)	35 3/8 (899 mm)
Depth (in.) (less doors)	32 (813 mm)
Depth (in.) (doors open 90°)	55 1/2 (1410 mm)
Clear Door Width (in.)	19 3/8 (492 mm)
Clear Door Height (in.)	58 5/8 (1489 mm)
Height, Overall (in.) (incl. 5" casters)	82 1/4 (2096 mm)
No. of Doors	2
No. of Shelves	6
Shelf Area (sq. ft.)	40.8 (3.8 sq m)
Tray Slide Capacity (per section)	24

REFRIGERANT DATA

Condensing Unit Size (H.P.)	1/3
Capacity (BTU/Hr)*	2560

ELECTRICAL DATA

Voltage (int'l)	115/60/1 (220/50/1)
Feed Wires (incl. ground)	3
Total Amps (int'l)	6.5 (4.9)
10 ft. Cord/Plug [attached] (int'l)	Yes (No)

SHIPPING DATA

Height - Crated (in.)	85 1/2 (2172 mm)
Width - Crated (in.)	64 (1626 mm)
Depth - Crated (in.)	42 (1067 mm)
Volume - Crated (cu. ft.)	133 (3766 cu l)
Weight Std - Crated (lbs.)	520 (236 kg)
Weight SS - Crated (lbs.)	600 (272 kg)
Weight Std - Uncrated (lbs.)	350 (159 kg)
Weight SS - Uncrated (lbs.)	430 (195 kg)

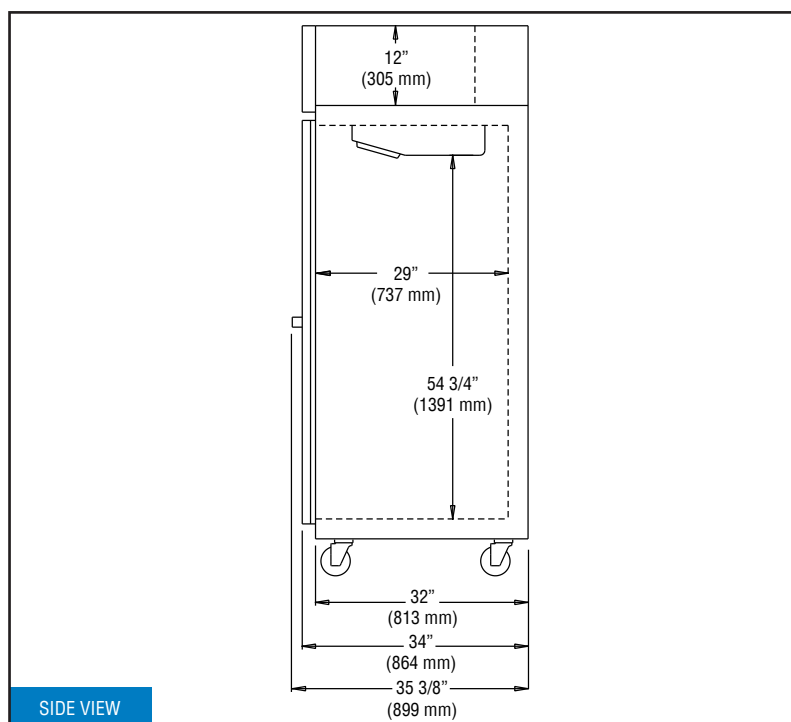
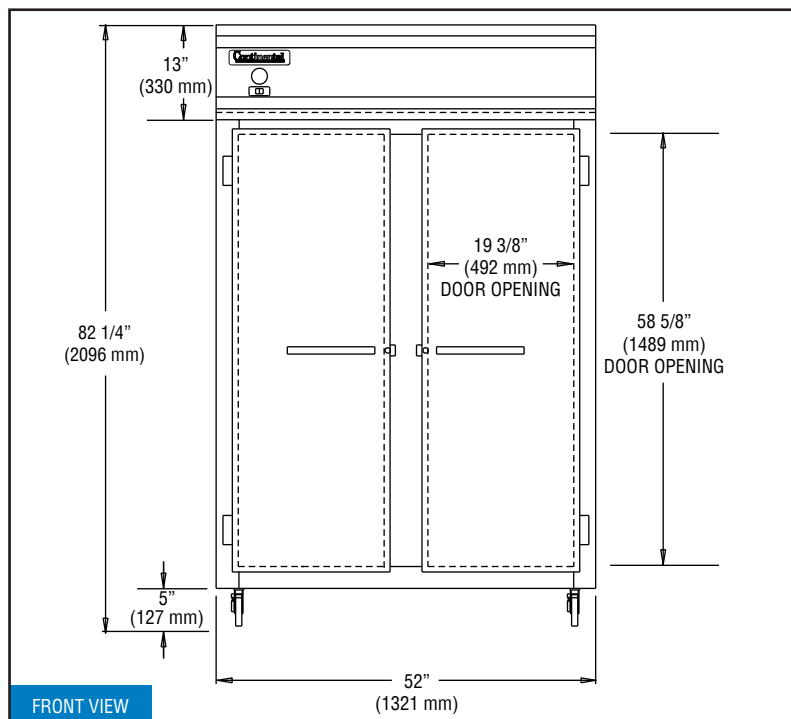
* Rating @ +25°F evaporator, 90°F ambient

Figures in parentheses reflect metric equivalents rounded to the nearest whole unit.



Equipped with one NEMA-5-15P Plug
(varies by country)

Model Plan Views



IMPORTANT NOTE: If the cabinet is located directly against a wall and/or under a low ceiling, a minimum clearance of 12" is required.

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Submittal Sheet

12/20/2017

ITEM# 77 - WORK TABLE, STAINLESS STEEL TOP (1 EA REQ'D)

Eagle Group T3072SE

Spec-Master® Series Work Table, 72"W x 30"D, 14/300 series stainless steel top, rolled edge on front & back, adjustable 18/300 series stainless steel undershelf with marine edge, Uni-Lok® gusset system, (4) stainless steel legs & adjustable bullet feet, NSF

The spec sheet for this item can be viewed on item 15)

ACCESSORIES

Mfr	Qty	Model	Spec
Eagle Group	1	CA4-SB	Table Casters, set of (4), 4" diameter, (2) swivel & (2) swivel/brake, 115 lbs. capacity per caster, zinc with resilient tread, NSF

Submittal Sheet

12/20/2017

ITEM# 78 - REFRIGERATED WORK TOP (1 EA REQ'D)

Continental Refrigerator SW72

Work Top Refrigerator, 72" wide, 20.6 cu ft capacity, three-section, stainless steel flat top, (3) field rehingable doors, stainless steel front and end panels, aluminum interior, electronic controller w/digital display, 5" casters, rear mounted self-contained refrigeration, 1/4 hp, cETLus, NSF, Made in USA

ACCESSORIES

Mfr	Qty	Model	Spec
Continental Refrigerator	1		Standard warranty (for the United States & Canada Only): 3 year parts and labor; 5 year compressor
Continental Refrigerator	1		115v/60/1-ph, 7.6 amps, cord, NEMA 5-15P, standard
Continental Refrigerator	1		Stainless steel finished back
Continental Refrigerator	1		Casters, 5" standard

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1									1/4		
2	115	60	1	Cord & Plug		5-15P	7.6				

WORKTOP REFRIGERATOR

Model: SW72

72" Worktop Refrigerator with Solid Doors

Stainless steel front and top, aluminum end panels, case back and interior.

Designed to maintain NSF-7 temperatures in 100°F ambient.



Options and Accessories

(upcharge and lead times may apply)

Stainless steel exterior and interior	Backsplash - BS models
Stainless back in lieu of aluminum	Expansion valve system
Overshelves (single or double)	Adjustable legs
Additional epoxy-coated steel shelves	Remote models
Stainless steel shelves	Door locks
Automatic electric condensate evaporator	Digital thermometer
Stainless steel roll-out drawers in lieu of doors - D models	Special electrical requirements (consult factory)
Glass doors - GD models	

Consult factory for other model configurations, options and accessories.

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Project Name:

Model Specified:

Location:

Item No:

Quantity:

AIA #:

SIS #:

Standard Model Features

REFRIGERATION SYSTEM

Performance-rated refrigeration system
Environmentally-safe R-134a refrigerant
Automatic, energy saving, non-electric
condensate evaporator
Non-corrosive, plasticized fin evaporator coil
Easily serviceable, back mounted compressor

CABINET ARCHITECTURE

2" non-CFC polyurethane foam insulation
Spring loaded, self closing doors
Magnetic snap-in door gaskets
Heavy-duty, epoxy-coated steel shelves
Completely enclosed, vented and removable case back
5" casters

MODEL FEATURES

Interior hanging thermometer
Field rehingeable doors

APPROVAL:

Model Specifications

DIMENSIONAL DATA

Net Capacity (cu. ft.)	20.6 (583 cu l)
Width, Overall (in.)	72 (1829 mm)
Depth, Overall (in.) (incl. handles & bumpers)	31 7/16 (799 mm)
Depth, Body Only (less doors) (in.)	27 1/2 (699 mm)
Height, Overall (in.) (incl. 5" casters)	35 1/4 (895 mm)
Shelf Area (sq. ft.)	10.2 (.9 sq m)
No. of Shelves	3
No. of Doors	3
Interior Depth (in.)	See Drawing
Interior Height (in.)	26 1/4 (667 mm)
Interior Width (in.)	68 (1727 mm)

REFRIGERANT DATA

Condensing Unit Size (H.P.)	1/4
Capacity (BTU/Hr)*	1940

ELECTRICAL DATA

Voltage (int'l)	115/60/1 (220/50/1)
Fans	4
Total Amps (int'l)	7.6 (4.7)
10 ft. Cord/Plug [attached] (int'l)	Yes (No)

SHIPPING DATA

Weight (lbs.)	318 (144 kg)
Height - Crated (in.)	43 1/4 (1099 mm)
Width - Crated (in.)	80 1/4 (2038 mm)
Depth - Crated (in.)	37 1/4 (946 mm)

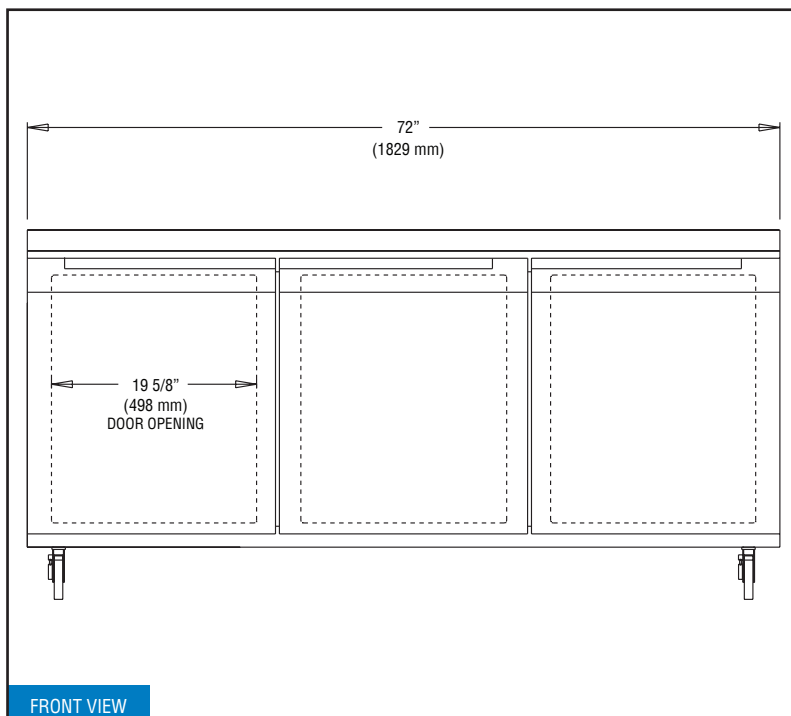
* Rating @ +25°F evaporator, 90°F ambient

Figures in parentheses reflect metric equivalents rounded to the nearest whole unit.

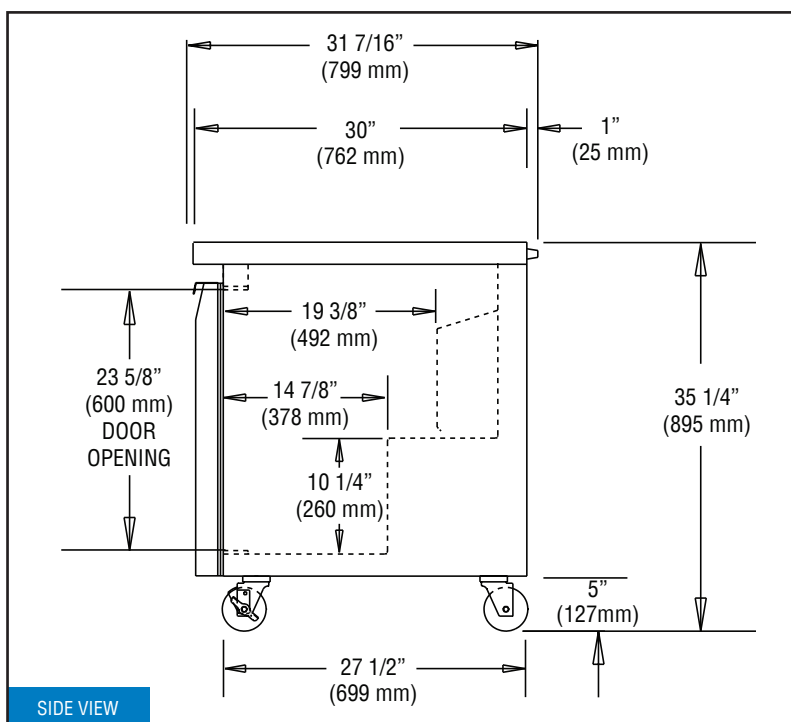


Equipped with one NEMA-5-15P Plug
(varies by country)

Model Plan Views



FRONT VIEW



SIDE VIEW

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Submittal Sheet

12/20/2017

ITEM# 79 - WORK TABLE, STAINLESS STEEL TOP (1 EA REQ'D)

Eagle Group T3096SE

Spec-Master® Series Work Table, 96"W x 30"D, 14/300 series stainless steel top, rolled edge on front & back, adjustable 18/300 series stainless steel undershelf with marine edge, Uni-Lok® gusset system, (6) stainless steel legs & adjustable bullet feet, NSF

The spec sheet for this item can be viewed on item 15)

ACCESSORIES

Mfr	Qty	Model	Spec
Eagle Group	1	E22	Sink, 16" x 20" x 8" bowl, for 30"W tables, complete with faucet & basket drain (specify location)
Eagle Group	1	CA6-SB	Table Casters, set of (6), 4" diameter, (3) swivel & (3) swivel/brake, 115 lbs. capacity per caster, zinc with resilient tread, NSF



Profit from the Eagle Advantage®

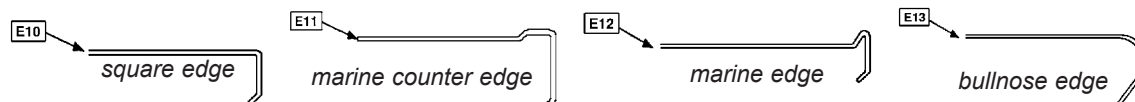
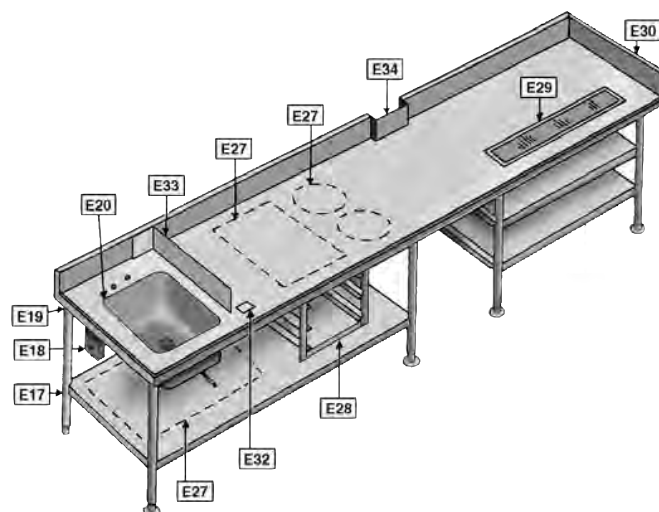
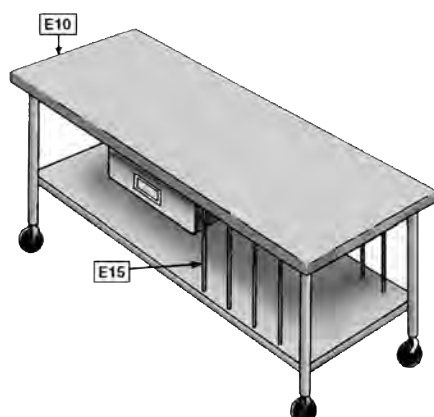
Specification Sheet

Item No.:	_____
Project No.:	_____
S.I.S. No.:	_____

Table Modifications and Accessories

For complete list of E# models and description, see chart below and chart on back page.

Refer to chart below for description of E# models.



model #	description
E10	Square edge table - front and/or rear
E11	Marine counter edge
E12	"V" type marine edge (not available in 16/430)
E13	Bullnose edge
300698	Casters - 4" (102mm)-diameter with brake
300699	Casters - 4" (102mm)-diameter without brake
317635	Casters - 5" (127mm)-diameter with brake
317636	Casters - 5" (127mm)-diameter without brake
300692	Bullet feet - stainless steel
301036	Bullet feet - white metal
300293	Bullet feet - plastic

model #	description
313835	Stainless steel flanged bullet feet
E15	Vertical tray dividers - 4-section assembly, 3" on centers
E17	Special height legs
E18*	Duplex receptacle and mounting plate (under table)
E18.1*	Duplex receptacle in splash (requires at least 6"-high splash)
E18.2*	Pedestal duplex receptacle (top of table or overself)
E19	Stainless steel gussets

NOT PICTURED

model #	description
606329	Scrap chute, 6" (152mm)-diameter
606331	Knife rack (fits rolled rim, poly, and square edge tables)

* For GFI receptacle, add "-GFI" to E number (example: E18.1-GFI).

EAGLE GROUP
 100 Industrial Boulevard, Clayton, DE 19938-8903 USA
 Phone: 302-653-3000 • Fax: 302-653-2065
www.eaglegrp.com

Foodservice Division: Phone 800-441-8440
MHC/Retail Display Divisions: Phone 800-637-5100

For custom configuration or fabrication needs, contact our **SpecFAB® Division**.
 Phone: 302-653-3000 • Fax: 302-653-3091 • e-mail: specfab@eaglegrp.com

Certifications / Approvals



(fabricated to NSF-applicable standards)

AUTOQUOTES



EG10.50 Rev. 04/12

Spec sheets available for viewing, printing or downloading from our online literature library at www.eaglegrp.com

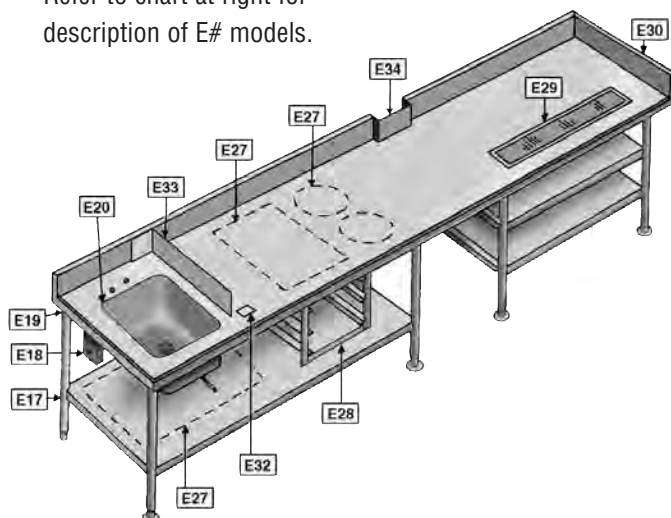
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Profit from the Eagle Advantage®

Table Modifications and Accessories

Refer to chart at right for description of E# models.



model # description

Sinks — complete with faucet and basket drain (Specify location)

E20 - 10" x 14" x 9.5" bowl (254 x 356 x 241mm)

E21 - 14" x 16" x 9.5" bowl (356 x 406 x 241mm)

E22* - 16" x 20" x 8" bowl (406 x 508 x 203mm)

E23* - 16" x 20" x 14" bowl (406 x 508 x 356mm)

E24* - 18" x 20" x 14" bowl (457 x 508 x 356mm)

E24A* - 20" x 20" x 14" (508 x 508 x 356mm)

E25 - 24" x 24" x 14" bowl (610 x 610 x 356mm)
for 36" (914mm)-wide tables

313304 T&S faucet upgrade - deck mount 4" (102mm) centers

300720 Lever drain - 1.5" I.P.S. (38mm)

300721 Lever drain - 2" I.P.S. (51mm)

300722 Lever drain - 2" I.P.S. (51mm) with overflow

341189** Twist handle drain - 1.5" I.P.S. (38mm)

336002** Twist handle drain - 2" I.P.S. (51mm)

341190** Twist handle drain - 2" I.P.S. (51mm) with overflow

E27 Top cutout - square or round (Specify location)

E28 Angle slides for pans, up to six pairs
(Specify location and pan size)

E29 Urn trough, 4.5" wide x 1.25" deep (114 x 32mm) with
1.5" (38mm) drain, complete with louvered grate. (Length
must be maximum of 6" shorter than table. Specify location.)

E30 End splash — per end (Specify end), all heights

E31 1.5" (38mm) rear upturn for undershelf

E32 Can opener hole with under table support (Specify location)

E33 Sink splash — single thickness, 4" tall (102mm)

E34 Column cutout (Send floor plan/sketch)

NOT PICTURED

model # description

E35 16 gauge s/s apron in front of sinks or cutouts

E36 Fully welded - top, undershelf & legs

E36A Welded base only - undershelf & legs

E37 NSF sprayed-on sound deadening up to 12' (3658mm)

- for each additional foot

E38-6*** Cantilever mount up to 6' (1829mm) - add to wall shelf price

E38-12*** Cantilever mount up to 12' (3658mm)

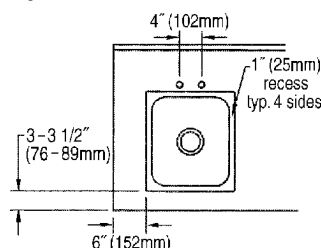
E39 Enclosed backsplash

* These sink bowls will not fit in a table any less than 30" (762mm) wide.

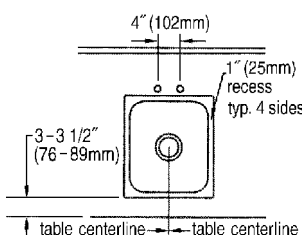
** Optional twist drain brackets available for use with twist handle drains.

*** Applicable to wall mount shelves and pot racks.

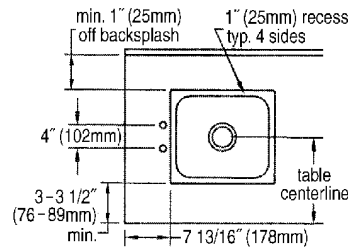
Optional Sinks Built Into Tables – Standard Locations



sink on left/right side of table



sink on center of table



sink with faucet on end of table

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Rev. 04/12

Submittal Sheet

12/20/2017

ITEM# 80 - POT RACK (1 EA REQ'D)

Eagle Group CM84PR

Pot Rack, ceiling mount, 76"W x 20"D x 18"H, triple-bar design, constructed of 3/16" x 2" stainless steel flat bar, includes (21) double-pronged pot hooks & 24" plated chains for mounting



Profit from the Eagle Advantage®

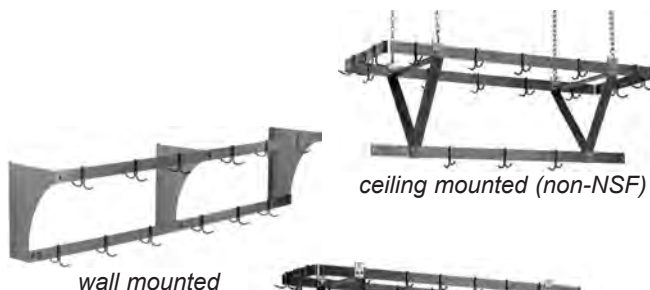
Specification Sheet

Short Form Specifications

Eagle Table Mounted Rack, model _____.
Constructed of $\frac{3}{8}$ " x 2" (aluminum or stainless steel) flat bar, bolted together. Triple bar construction, furnished with one stainless steel double prong sliding pot hook every 12". 1 $\frac{1}{2}$ " O.D. stainless steel tubular supports extend through table and are secured to adjustable undershelf. Available with optional 12" wide 16/304 stainless steel shelf.

Eagle Ceiling Mounted Rack, model _____.
Constructed of $\frac{3}{8}$ " x 2" (aluminum or stainless steel) flat bar, bolted together. Triple bar construction, furnished with one stainless steel double prong sliding pot hook every 12". Provided with plated chain hangers for ceiling suspension.

Eagle Wall Mounted Rack, model _____.
Constructed of $\frac{3}{8}$ " x 2" (aluminum or stainless steel) flat bar bolted together. Furnished with one stainless steel double prong sliding pot hook every 12", and provided with stainless steel mounting brackets.



ceiling mounted (non-NSF)

wall mounted



table mounted

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Item No.: _____
Project No.: _____
S.I.S. No.: _____

Racks

MODELS:

<input type="checkbox"/> CM36*	<input type="checkbox"/> TM36*	<input type="checkbox"/> WM36*
<input type="checkbox"/> CM48*	<input type="checkbox"/> TM48*	<input type="checkbox"/> WM48*
<input type="checkbox"/> CM60*	<input type="checkbox"/> TM60*	<input type="checkbox"/> WM60*
<input type="checkbox"/> CM72*	<input type="checkbox"/> TM72*	<input type="checkbox"/> WM72*
<input type="checkbox"/> CM84*	<input type="checkbox"/> TM84*	<input type="checkbox"/> WM84*
<input type="checkbox"/> CM96*	<input type="checkbox"/> TM96*	<input type="checkbox"/> WM96*
<input type="checkbox"/> CM108*	<input type="checkbox"/> TM108*	<input type="checkbox"/> WM108*
<input type="checkbox"/> CM120*	<input type="checkbox"/> TM120*	<input type="checkbox"/> WM120*
<input type="checkbox"/> CM132*	<input type="checkbox"/> TM132*	<input type="checkbox"/> WM132*
<input type="checkbox"/> CM144*	<input type="checkbox"/> TM144*	<input type="checkbox"/> WM144*

* See charts on back for full model numbers.

Ceiling mounted (non-NSF)

- Racks are triple-bar construction.
- Supported with plated chain hangers supplied.
- Available in stainless steel or aluminum.
- Provided with double-pronged pot hooks.

Wall Mounted

- Racks are double-bar construction.
- Supplied with die-formed stainless steel brackets.
- Available in stainless steel or aluminum.
- Provided with double-pronged pot hooks.

Table Mounted

- Racks are triple-bar construction.
- Front-to-back adjustable crossbracing, plus adjustable undershelf.
- 1 $\frac{1}{2}$ " (41mm) tubular stainless steel supports extend through tabletop and are secured to adjustable undershelf. Units 108" (2743mm) and longer have three supports.
- Provided with double-pronged pot hooks.
- Available in stainless steel or aluminum.

Options / Accessories

- ☐ Additional sliding hooks
- ☐ All-welded construction
- ☐ 12"-wide adjustable shelves (for Table Mounted Racks)

Certifications / Approvals



AUTOQUOTES



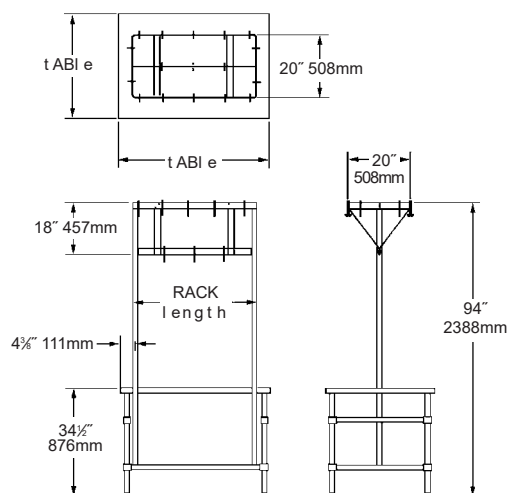
EG10.12 Rev. 06/14



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Item No.: _____
 Project No.: _____
 S.I.S. No.: _____

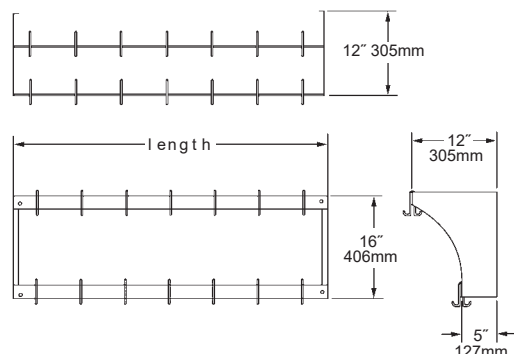
Table Mounted Racks



ALUMINUM			STAINLESS STEEL			rack length		fits table length	
model #	weight lbs.	kg	model #	weight lbs.	kg	in.	mm	in.	mm
TM36APR	38	17.2	TM36PR	50	22.7	28"	711	36"	914
TM48APR	42	19.1	TM48PR	57	25.9	40"	1016	48"	1219
TM60APR	46	20.9	TM60PR	64	29.0	52"	1321	60"	1524
TM72APR	50	22.7	TM72PR	70	31.8	64"	1626	72"	1829
TM84APR	54	24.5	TM84PR	77	34.9	76"	1930	84"	2134
TM96APR	58	26.3	TM96PR	83	37.6	88"	2235	96"	2438
TM108APR*	62	28.1	TM108PR*	89	40.4	100"	2540	108"	2743
TM120APR*	66	29.9	TM120PR*	95	43.1	112"	2845	120"	3048
TM132APR*	71	32.2	TM132PR*	102	46.3	124"	3150	132"	3353
TM144APR*	76	34.5	TM144PR*	109	49.4	136"	3454	144"	3658

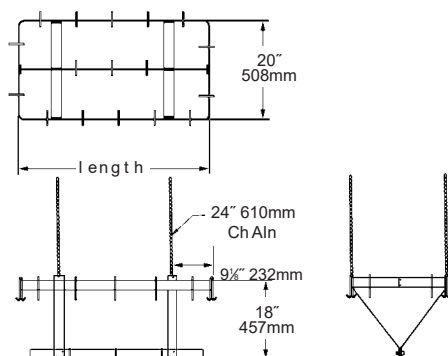
* These racks include center tubular support.

Wall Mounted Racks



ALUMINUM			STAINLESS STEEL			rack length	
model #	weight lbs.	kg	model #	weight lbs.	kg	in.	mm
WM36APR	13	5.8	WM36PR	18	8.2	36"	914
WM48APR	15	6.8	WM48PR	22	10.0	48"	1219
WM60APR	17	7.7	WM60PR	26	11.8	60"	1524
WM72APR	19	8.6	WM72PR	29	13.2	72"	1829
WM84APR	21	9.5	WM84PR	33	15.0	84"	2134
WM96APR	23	10.4	WM96PR	37	16.8	96"	2438
WM108APR	25	11.3	WM108PR	41	18.6	108"	2743
WM120APR	28	12.7	WM120PR	45	20.4	120"	3048
WM132APR	31	14.1	WM132PR	50	22.7	132"	3353
WM144APR	34	15.4	WM144PR	55	24.9	144"	3658

Ceiling Mounted Racks



ALUMINUM			STAINLESS STEEL			rack length	
model #	weight lbs.	kg	model #	weight lbs.	kg	in.	mm
CM36APR	28	12.7	CM36PR	41	18.6	28"	711
CM48APR	32	14.5	CM48PR	48	21.8	40"	1016
CM60APR	36	16.3	CM60PR	54	24.5	52"	1321
CM72APR	40	18.1	CM72PR	60	27.2	64"	1626
CM84APR	44	20.0	CM84PR	67	30.4	76"	1930
CM96APR	48	21.8	CM96PR	74	33.6	88"	2235
CM108APR	53	24.0	CM108PR	81	36.7	100"	2540
CM120APR	58	26.3	CM120PR	87	39.5	112"	2845
CM132APR	63	28.6	CM132PR	94	42.6	124"	3150
CM144APR	68	30.8	CM144PR	101	45.8	136"	3454

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Rev. 06/14

Submittal Sheet

12/20/2017

ITEM# 81 - POT RACK (1 EA REQ'D)

Eagle Group CM108PR

Pot Rack, ceiling mount, 100"W x 20"D x 18"H, triple-bar design, constructed of 3/16" x 2" stainless steel flat bar, includes (27) double-pronged pot hooks & 24" plated chains for mounting

The spec sheet for this item can be viewed on item 80)

Submittal Sheet

12/20/2017

ITEM# 82 - REFRIGERATED WORK TOP (2 EA REQ'D)

Continental Refrigerator SW60

Work Top Refrigerator, 60" wide, 17.0 cu ft capacity, two-section, stainless steel flat top, (2) field rehingable doors, stainless steel front and end panels, aluminum interior, electronic controller w/digital display, 5" casters, rear mounted self-contained refrigeration, 1/4 hp, cETLus, NSF, Made in USA

ACCESSORIES

Mfr	Qty	Model	Spec
Continental Refrigerator	2		Standard warranty (for the United States & Canada Only): 3 year parts and labor; 5 year compressor
Continental Refrigerator	2		115v/60/1-ph, 6.6 amps, cord, NEMA 5-15P, standard
Continental Refrigerator	2		Stainless steel finished back
Continental Refrigerator	2		Casters, 5" standard

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1									1/4		
2	115	60	1	Cord & Plug		5-15P	6.6				

WORKTOP REFRIGERATOR

Model: SW60

60" Worktop Refrigerator with Solid Doors

Stainless steel front and top, aluminum end panels, case back and interior.

Designed to maintain NSF-7 temperatures in 100°F ambient.



Options and Accessories

(upcharge and lead times may apply)

Stainless steel exterior and interior	Backsplash - BS models
Stainless back in lieu of aluminum	Expansion valve system
Overshelves (single or double)	Adjustable legs
Additional epoxy-coated steel shelves	Remote models
Stainless steel shelves	Door locks
Automatic electric condensate evaporator	Digital thermometer
Stainless steel roll-out drawers in lieu of doors - D models	Special electrical requirements (consult factory)
Glass doors - GD models	

Consult factory for other model configurations, options and accessories.

Continental
Refrigerator

Toll-Free: 800-523-7138
Phone: 215-244-1400
Fax: 215-244-9579

539 Dunksferry Road
Bensalem, PA 19020
www.continentalrefrigerator.com

Project Name:

Model Specified:

Location:

Item No:

Quantity:

AIA #:

SIS #:

Standard Model Features

REFRIGERATION SYSTEM

Performance-rated refrigeration system
Environmentally-safe R-134a refrigerant
Automatic, energy saving, non-electric
condensate evaporator
Non-corrosive, plasticized fin evaporator coil
Easily serviceable, back mounted compressor

CABINET ARCHITECTURE

2" non-CFC polyurethane foam insulation
Spring loaded, self closing doors
Magnetic snap-in door gaskets
Heavy-duty, epoxy-coated steel shelves
Completely enclosed, vented and removable case back
5" casters

MODEL FEATURES

Interior hanging thermometer
Field rehingeable doors

APPROVAL:

Model Specifications

DIMENSIONAL DATA

Net Capacity (cu. ft.)	17.0 (481 cu l)
Width, Overall (in.)	60 (1524 mm)
Depth, Overall (in.) (incl. handles & bumpers)	31 7/16 (799 mm)
Depth, Body Only (less doors) (in.)	27 1/2 (699 mm)
Height, Overall (in.) (incl. 5" casters)	35 1/4 (895 mm)
Shelf Area (sq. ft.)	8.1 (.8 sq m)
No. of Shelves	2
No. of Doors	2
Interior Depth (in.)	See Drawing
Interior Height (in.)	26 1/4 (667 mm)
Interior Width (in.)	56 (1422 mm)

REFRIGERANT DATA

Condensing Unit Size (H.P.)	1/4
Capacity (BTU/Hr)*	1940

ELECTRICAL DATA

Voltage (int'l)	115/60/1 (220/50/1)
Fans	3
Total Amps (int'l)	6.6 (4.4)
10 ft. Cord/Plug [attached] (int'l)	Yes (No)

SHIPPING DATA

Weight (lbs.)	284 (129 kg)
Height - Crated (in.)	43 1/4 (1099 mm)
Width - Crated (in.)	68 1/4 (1734 mm)
Depth - Crated (in.)	37 1/4 (946 mm)

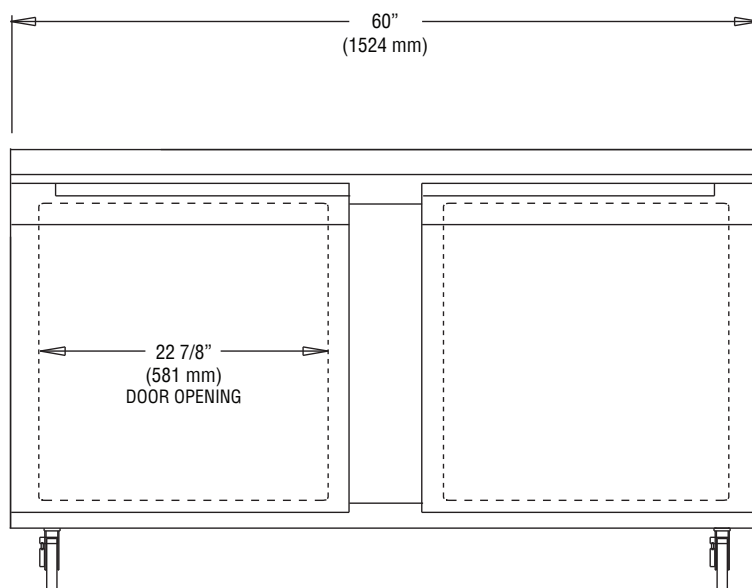
* Rating @ +25°F evaporator, 90°F ambient

Figures in parentheses reflect metric equivalents rounded to the nearest whole unit.

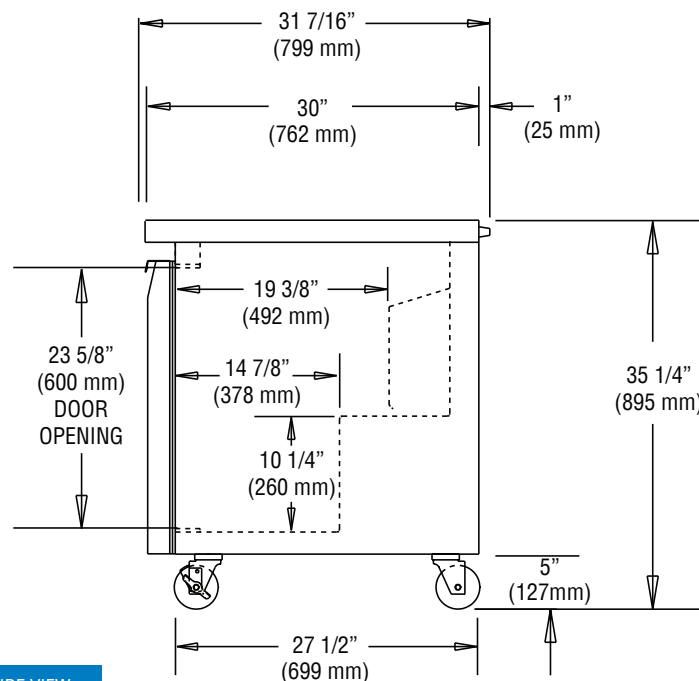


Equipped with one NEMA-5-15P Plug
(varies by country)

Model Plan Views



FRONT VIEW



SIDE VIEW

Continental
Refrigerator

Toll-Free: 800-523-7138
Phone: 215-244-1400
Fax: 215-244-9579

539 Dunksferry Road
Bensalem, PA 19020
www.continentalrefrigerator.com

Due to our continued efforts in developing innovative products, specifications subject to change without notice.



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Submittal Sheet

12/20/2017

ITEM# 83 - FRYER BATTERY, GAS (3 EA REQ'D)

Pitco SG14S-1FD

Solstice™ Prepackaged Fryer System with Solstice™ Solo Filter System, gas, (1) 40-50 lb. oil capacity full tank, millivolt control, stainless steel tank, front & sides, under-fryer drawer filtration, 10" adjustable legs, 110,000 BTU (-F), NSF, CE, CSA Flame, CSA Star, AuGA

ACCESSORIES

Mfr	Qty	Model	Spec
Pitco	3		1 year parts and labor warranty from the date of installation up to a maximum of 15 months from the date of manufacture (with appropriate documentation), standard
Pitco	1		Natural gas
Pitco	3		Millivolt Thermostat, standard
Pitco	3		115v/60/1-ph, 6.1 amps
Pitco	3		Contact factory for cord information
Pitco	3	P6072145	Basket, (2) oblong/twin size, 13-1/2" x 6-1/2" x 5-1/2" deep, long handle, regular mesh (shipped std (n/c) with models "T" SG14, SG14R, SSH55, SE14, SE14X, SE14B, SG14T, 35+, 45+, fryer batteries shipped with (1) per fryer
Pitco	3	B3902301	Casters, 10", rigid, (each) non-locking, for fryers with Solo Filter (excludes Mega Fryers and ROV)
Pitco	3	B8003103	Gas Connector Hose, 3/4" connection, 48" long, with quick disconnect couplings, restraining device & thermal shut-off, for single unit 240,000 BTU

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1									1/3		
2	115	60	1				6.1				

ELECTRICAL 1 REMARKS

1/3 HP for filter pump

ELECTRICAL 2 REMARKS

Fryer/Solo Filter

GAS

	SIZE	MBTU	KW
1	3/4"	110.0	
2		240.0	

STEAM

	INLET SIZE	RETURN SIZE	LB/HR	PSIG (min)	PSIG (max)
1					
2					



SOLOFILTER Solstice Gas (SFSG) Series SFSG14, 14R, 14T, 18 Fryer



SFSG14
w/ standard
Millivolt T-Stat

SFSG14R
w/ optional
SSTC

SFSG14T
w/ optional
Digital Control
& rear casters

SFSG18
w/ optional
I12 computer &
Basket Lifts,
front / rear casters

STANDARD FRYER FEATURES & ACCESSORIES

- Tank - stainless steel construction
- Cabinet - stainless front, door and sides
- Solstice Burner Technology, No blower or ceramics
- Patented Self Cleaning Burner & Down Draft Protection (with upgraded controls, SSTC, Digital, Computer)
- Millivolt Thermostat (T-Stat)
- High Temperature safety limit switch
- Heavy duty 3/16" bottom door hinge
- 1 1/4" (3.2 cm) Full port drain valve for fast draining
- Separate Manual gas shutoffs, for front servicing
- Integrated flue deflector
- 10"(25.4cm) adjustable legs, easier access to clean
- Tube rack, allows crumbs & debris into cool zone
- Removable basket hanger, requires no tools
- Drain Line Clean out rod
- Fryer cleaner sample packet
- Choice of basket options :
 - ☐ 2-Twin Baskets
 - ☐ 1-Full Basket (not available on 14T or Basket Lifts)

STANDARD FILTER FEATURES & ACCESSORIES

- Easy Two Step Filtering
- Extra Large 3" (7.6cm) curved drain spout virtually eliminates splashing and swivels for oil disposal
- 8 gpm filter pump for fast refill times
- Self Aligning filter connection for effortless hookup
- Rear oil return for bottom cleaning
- Filter pan is stainless with rear wheels for easy handling
- Filter pan lid is self storing and out of the way
- Fryer crumb scoop
- Filter shovel scoop
- Filter paper envelope starter pack
- Filter powder sample
- Fryer cleaning brush

Project _____

Item No. _____

Quantity _____

APPLICATION

For Space Saving filtering and high production frying in one single Solo cabinet, specify Pitco SoloFilter Solstice Gas Models SFSG14, 14R, 14T or SFSG18 tube fryers with the patented Solstice Burner Technology. The dependable atmospheric heating system provides fast recovery to cook a variety of food products. The Solstice gas fryer comes in various sizes with optional cooking controllers and a self contained space saving simple two step Solstice filter. Making filtering conveniently fast to keep the oil cleaner for producing better quality products and to maximize oil life & profits.

MODELS AVAILABLE

- ☐ **SFSG14** (40-50 lbs, 14 x14" fry area, 110 Kbtu/hr)
- ☐ **SFSG14R** (40-50 lbs, 14 x14" fry area, 122 Kbtu/hr)
- ☐ **SFSG14T** (20-25 lbs, 7x 14", 50 Kbtu/hr per side for this twin tank fryer, 100 Kbtu/hr total)
- ☐ **SFSG18** (70-90 lbs, 18 x 18" fry area, 140Kbtu/hr)

OPTIONS & ACCESSORIES (AT ADDITIONAL COST)

- ☐ Matchless Ignition with DVI drain valve interlock (included with Solid State T-Stat, Digital Control & Computer only)
- ☐ Solid State T-Stat (SSTC) (w/melt cycle & boil out mode)
- ☐ Digital Controller (2 timers w/melt cycle)
- ☐ Intellifry I-12 Computer (12 elastic timers w/melt cycle & boil out)
- ☐ Backup thermostat (only on Digital and I-12 computer)
- ☐ Basket Lift (must be ordered with Digital Control or Computer) (To meet AGA/CGA/CSA specification, must be ordered with casters & installed with flexible gas hose w/restraining cable)
- ☐ Stainless Steel back (not available with basket lift)
- ☐ 10"(25.4cm) adjustable, rear fixed rigid casters only
- ☐ 10"(25.4cm) adjustable, rear non locking & front locking rigid casters
- ☐ Flexible gas hose with disconnect and restraining cable
- ☐ Tank cover
- ☐ 3-Triple Baskets (not available on 14T or Basket Lifts)
- Splash Guard reversible (L/R) ☐ 6" ☐ 8" ☐ 12" ☐ 18"
- ☐ Work shelves call factory for specifications and availability.
- ☐ Fish Grids (not available on 14T)
- SoloFilter System Options
 - ☐ Filter flush hose
 - ☐ Filter pump heaters
 - ☐ Paperless Filter
 - ☐ Waste Oil Management
 - ☐ Filter Crumb Catch
- ☐ Institutional Prison security package
- ☐ BNB Dump Station, see BNB spec sheet L10-199 for details
- ☐ **SPINFRESH** See Spec Sheet L10-524 for details

SOLOFILTER Solstice Gas (SFSG) Series SFSG14, 14R, 14T, 18 Fryer



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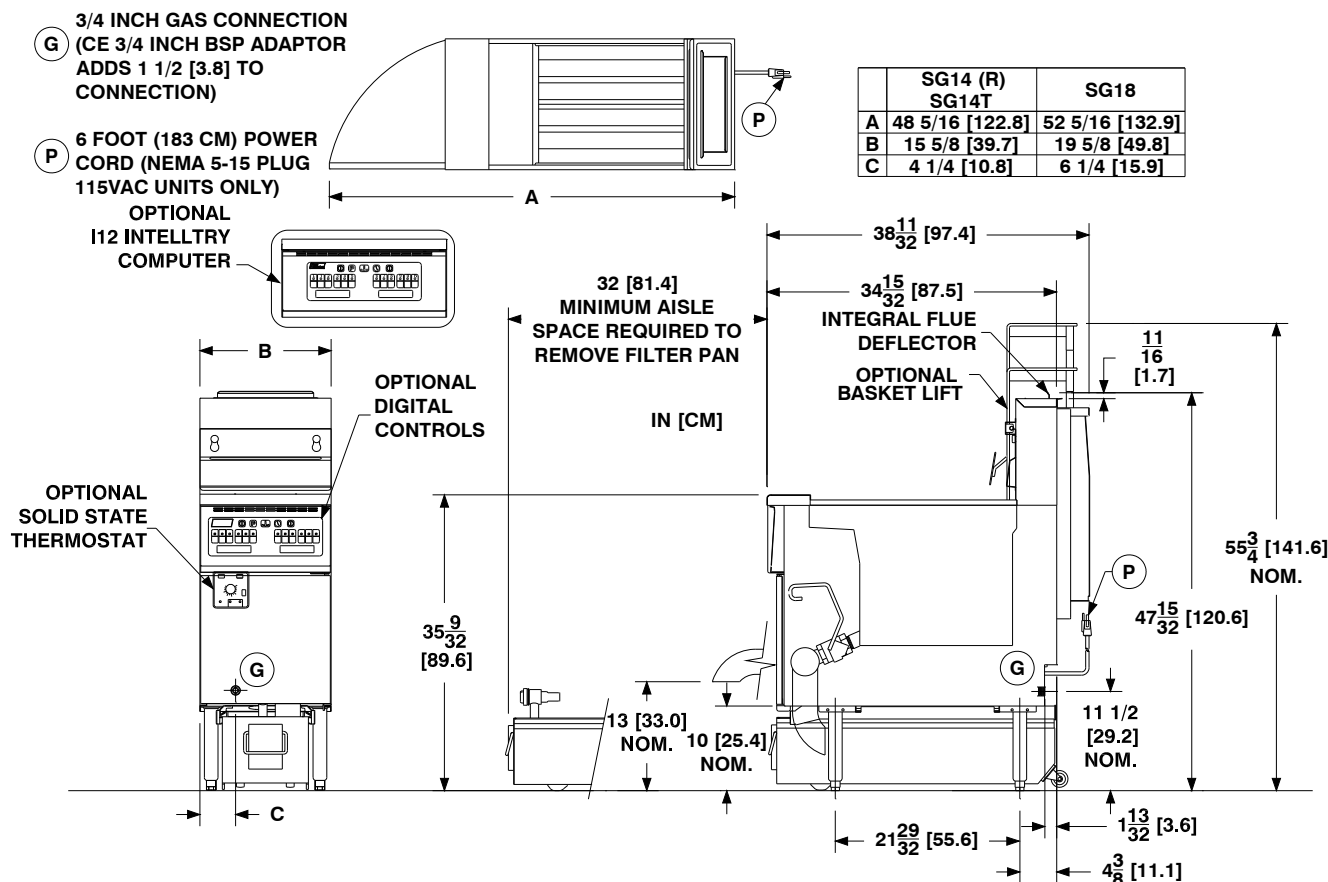
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L10-152 Rev 5 04/12

Printed in the USA

SOLOFILTER Solstice Gas (SFSG) Series SFSG14, 14R, 14T, 18 Fryer

SOLOFILTER Solstice Gas (SFSG) Series SFSG14, 14R, 14T, 18 Fryer



INDIVIDUAL FRYER SPECIFICATIONS

Model	Frying Area	Cook Depth	Oil Capacity
SFSG14 & 14R	14 x 14 in (35.6 x 35.6 cm)	3-1/4 - 5 in (8.3 -12.7 cm)	40 - 50 Lbs (18 - 23 kg)
SFSG14T per side	7 x 14 in (17.7 x 35.6 cm)	3-1/4 - 5 in (8.3 -12.7 cm)	20 - 25 Lbs (9 -11 kg) per side
SFSG18	18 x 18 in (45.7 x 45.7 cm)	3-1/4 - 5 in (8.3 -12.7 cm)	70 - 90 Lbs (34 kg)

FILTER SPECIFICATIONS

For Models	Pan Oil Capacity	Filter Media Paper Envelope	Filter Pump Rated Flow	Filter Pump Motor
SFSG14,14R SFSG14T	66 Lbs (29.9 kg)	10 x 20-1/2 in (25.4 x 52.1 cm)	8 GPM (30.3 LPM) @ 60 Hz 6.7 GPM (25.4 LPM) @ 50 Hz	1/3 HP 50/60 Hz
SFSG18	90 Lbs (41 kg)	14 x 22 in (35.6 x 55.9 cm)		

FRYER SYSTEM SHIPPING INFORMATION (Approximate)

Model	Shipping Weight	Shipping Weight w B/L	Shipping Crate Size H x W x L	Shipping Cube
SFSG14 & 14R	358 Lbs (162 kg)	458 Lbs (208 kg)	59 x 23 x 44 in (149.8 x 58.4 x 111.7 cm)	34.6 ft ³ (1.0m ³)
SFSG14T	380 Lbs (172 kg)	480 Lbs (218 kg)		
SFSG18	376 Lbs (170 kg)	467 Lbs (212 kg)		

INSTALLATION INFORMATION

GAS SYSTEM REQUIREMENTS			ELECTRIC SYSTEM REQUIREMENTS (50/60 hz)			
Gas Type	Store Supply Pressure *	Burner Manifold Pressure	Amps	# of Cord	115V	208 / 220-240V
Natural	7 - 10" w.c.(17.4 mbars/ 1.7 kPa)	4" w.c. (10 mbars / 1 kPa)	Fryer/Filter	1	6.1	6.1
Propane	11 - 13" w.c.(27.4 mbars/ 2.7 kPa)	10" w.c. (25mbars/2.4 kPa)	For heaters add 0.43A to 115V or .24A to 208/230-240V			

* Check plumbing / gas codes for proper gas supply line sizing to sustain burner pressure when all gas appliances are full on.

CLEARANCES (Do Not Curb Mount)

Front min.	Floor min.	Combustible material		Non-Combustible material		Fryer Flue Area
32" (81.4 cm)	6" (15.25 cm)	Sides min.	Rear min.	Sides min.	Rear min.	Do not block / restrict flue gases from flowing into hood or install vent hood drains over the flue.
		6" (15.2cm)	6" (15.2cm)	0"	0"	

SHORT FORM SPECIFICATIONS

Provide Pitco SoloFilter Solstice Gas Model (SFSG xxx) tube fired high production gas floor filter/fryer. Fryer shall be xx-xx lbs oil capacity, xxx Kbtu/hr, xx" by xx" fry area, SS peened tank, stainless front, door, sides. Blower Free atmospheric burner system, with millivolt thermostat (or specify optional upgraded controls: behind the door solid state thermostat w/ melt & boil mode or digital controller or computer controls: with matchless ignition, drain valve interlock and patented self clean burner and down draft protection), separate gas shut off, 3/4" npt rear gas connect, recessed cabinet back, 1-1/4" Full port drain, 3/16" bottom hinge. Drain Line shall be 3" (7.6 cm) diameter with a swivel drain spout for oil disposal. Filter pickup assembly use envelope filter paper. 8 GPM, 60 hz (25.4 LPM 50 hz) filter pump. Filter piping to be self aligning, filter lid integral to cabinet, filter pan to have rear casters for portability, two step filter process. Provide options and accessories as follows:



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We reserve the right to change specifications without notice and without incurring any obligation for equipment previously or subsequently sold.

Submittal Sheet

12/20/2017

ITEM# 84 - FRYER DUMP STATION (1 EA REQ'D)

Pitco BNB-SG14

Solstice™ Bread & Batter Cabinet, with BNB dump station, fryer match design, approximately 15-5/8" wide, includes 4-5/8" recessed pan and screen, standard finish, stainless steel front, sides & door, for prepackage system SG 14 gas fryers, NSF

ACCESSORIES

Mfr	Qty	Model	Spec
Pitco	1		1 year parts and labor warranty from the date of installation up to a maximum of 15 months from the date of manufacture (with appropriate documentation), standard
Pitco	1	PFW-1	Food Warmer, built-in, 750watt, CSA, NSF, UL
Pitco	1		120v/60/1-ph, 6.3 amps, 750 watts, NEMA 5-15P
Pitco	1	B3901504	Casters, 9" adjustable swivel (set of 4) non-lock rear & lock front casters, ALL Solstice BNB's

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1	120	60	1	Cord & Plug		5-15P	6.3	0.75			



Project _____

Item No. _____

Quantity _____

Model SG/SE Solstice Bread & Batter Cabinet-Dump Station



SGBNB18 with optional
food warmer, top shelf and casters

To be used with the Solstice Fryer line. Unit can be installed on either side or between fryer(s). Design to match existing or accompanying fryers. Pan area allows for holding and draining of finished product. Drain screen easily lifts out for cleaning. Bottom Shelf provides ample storage for breadings, batter, food utensils, etc. **Bottom Shelf is not provided when a filter pump or flush hose is located inside the dump station.*

Cabinet: polished stainless steel front, sides, door and splash back. Aluminized steel back. Tank: stainless steel. Heavy Duty 3/16" (.48 cm) door hinge. Welded pan with an extra smooth peened finish ensures easy cleaning.

ACCESSORIES/OPTIONS (AT ADDITIONAL COST)

- ☐ Extra High Basket Hangers
- ☐ Cover and (or) Flush Top Work Surface
- ☐ Flat Top Work Surface (no splash back)
(not available with Food warmer/Heat Lamp)
- ☐ Foodwarmer/Heat Lamp
 - ☐ Single Food Warmer / Heat Lamp
 - ☐ Dual Food Warmer / Heat Lamp – SG/SE-BNB18 only.
- ☐ Polished Stainless Steel Back
- ☐ 9" (22.9 cm) adjustable, non-locking rear & front lock casters
- ☐ Scooped Pan Liner in lieu of drain screen (for scooping of French Fries, etc.) (not available with Flat Top)
- ☐ Work Shelf Top
- ☐ Center shelf inside cabinet

STANDARD FEATURES & ACCESSORIES

- Recess Pan 4-5/8" (11.75 cm)
- Removable drain screen
- Removable basket hanger, requires no tools
- 9" (22.9 cm) adjustable legs, easier access to clean
- Bottom Shelf

TYPICAL APPLICATIONS

High Volume restaurants or multi-store restaurant chains Providing a draining and holding area for finished products. Provide additional work area when used with optional flat or flush work surface.

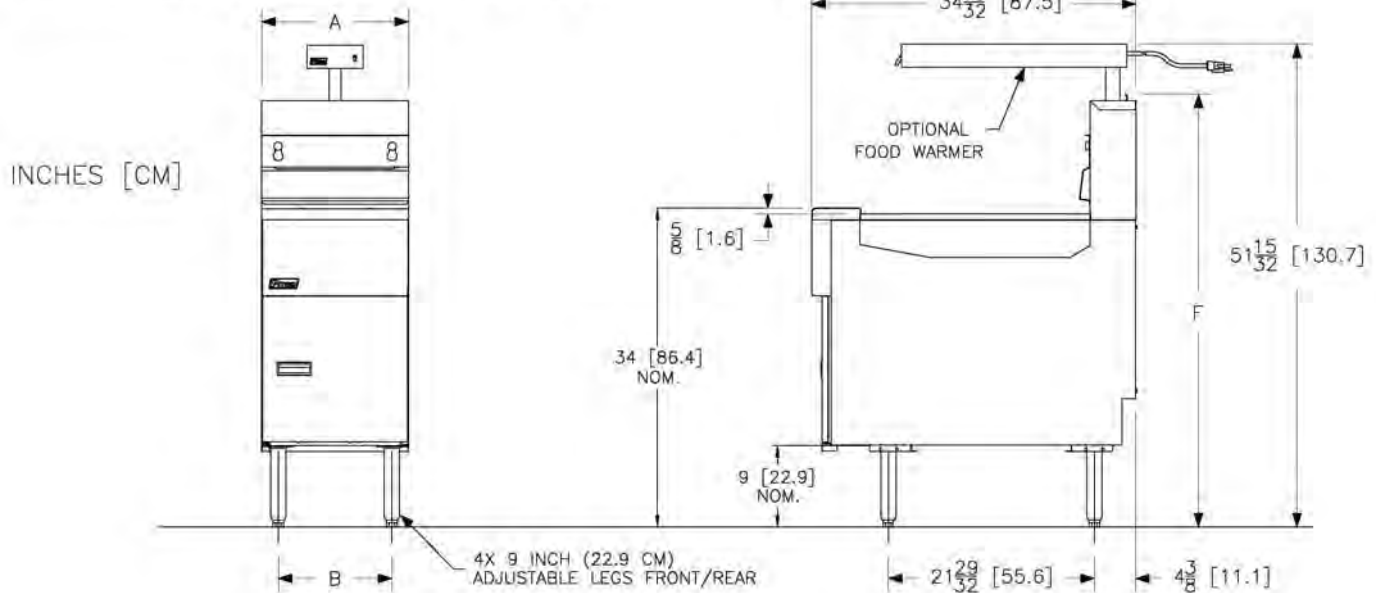
Model SG/SE Solstice Bread & Batter Cabinet-Dump Station



Model SG/SE Solstice Bread & Batter Cabinet-Dump Station

TABLE											
MODEL	DIM A			DIM B			DIM C				
BNB-SG14	15	5/8	39.7	12	1/16	30.7	14	1/2	36.8		
BNB-SG18	19	5/8	49.8	16	1/16	40.8	18	1/2	47.0		
BNB-SE14	15	5/8	39.7	12	1/16	30.7	14	1/2	36.8		
BNB-SE18	19	5/8	49.8	16	1/16	40.8	18	1/2	47.0		

TABLE											
MODEL	DIM D			DIM E			DIM F				
BNB-SG14	23	5/16	59.2	48	5/16	122.8	46	1/8	117.2		
BNB-SG18	23	5/16	59.2	52	5/16	132.9	46	1/8	117.2		
BNB-SE14	21	27/32	55.5	48	5/16	122.8	39	3/4	101.0		
BNB-SE18	24	27/32	63.1	52	5/16	132.9	39	3/4	101.0		



ORDERING INFORMATION

Specify model number of fryers desired and placement of dump station.

BNB-SG/SE model number indicates dump station for use with gas/electric cooking systems only.

SHORT FORM SPECIFICATION

Provide Pitco Model BNB-SG/SE Bread & Batter Cabinet - Dump Station. Unit shall be a one piece cabinet to match the dimensions of existing or new SG/SE Gas/Electric equipment. Bread & Batter Cabinet - Dump Station shall be supplied with a removable drain screen, 4-5/8 in (11.5 cm) recessed pan and basket hanger.

ELECTRICAL

Per each Food warmer	115V 60HZ	220-230-240V 50HZ
	6.3 amps	3.1 amps

TYPICAL APPLICATION

Provide a draining and holding area for finished products. Provide additional work area when used with optional flat or flush work surface.

SHIPPING INFORMATION (Approximate)

Model	Shipping Weight	Shipping H x W x L	Shipping Cube
BNB-SG/SE14	150.0 lb (68.0 kg)	59 x 23 x 44 in (149.8 x 58.4 x 111.8 cm)	34.6 ft ³ (0.5 m ³)
BNB-SG/SE18	175.0 lb (79.4 kg)		



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Model PFW-1 & PFW-2 Food Warmers



Project _____

Item No. _____

Quantity _____

Model PFW-1 & PFW-2 Food Warmers

STANDARD SPECIFICATIONS

CONSTRUCTION

- Rugged, easy to clean stainless steel and aluminum housing.
- Specifically designed reflector directs heat away from element to provide better coverage of food.
- Fiberglass insulated hood minimizes heat loss.
- PFW-1 (Built-in) features high energy ceramic radiant heating element with 750watts of power. Post mounted food warmer is mounted to the bread-and batter cabinet. Swing away design allows for the unit to be moved out of the way or swing away if hit.
- PFW-2 (Free Standing) features a long life metal sheath element rod with 500 watts of power. Stand alone design allows the unit to be placed on the side shelf of a model 14 or larger Pitco Frialator.

CONTROLS

- Up front ON/OFF switch for easy activation.

OPERATIONS

- ON/OFF switch controls power to the heating element.

MODELS

- Built-in model (PFW-1) 750 watt
- Free standing model (PFW-2) 500 watt

AVAILABLE OPTIONS & ACCESSORIES

- ☐ None necessary

APPROVALS

- CSA Certified (AGA, CGA)
- NSF Listed
- MEA Approved
- UL Listed

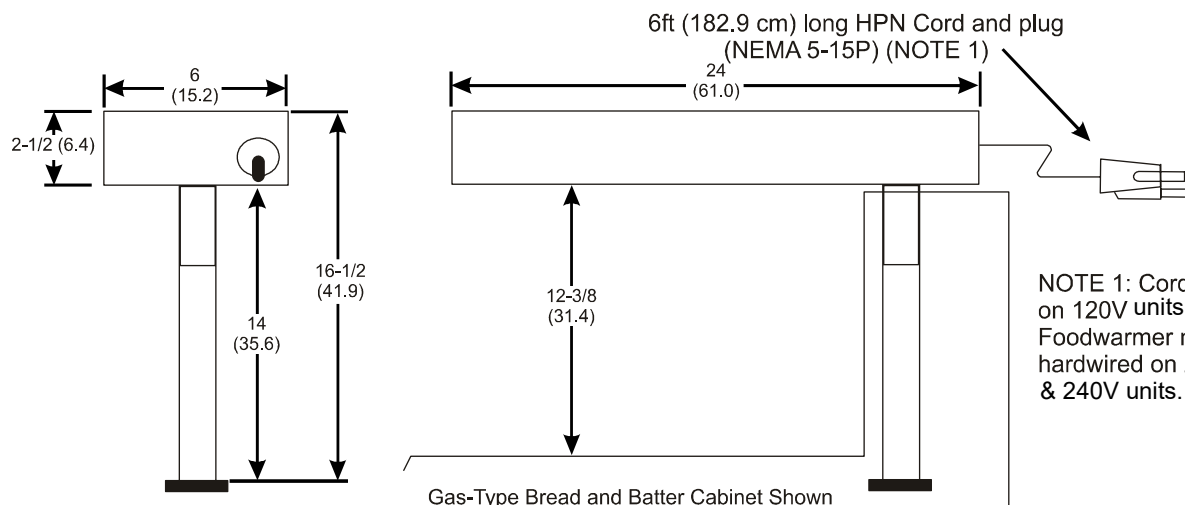


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Model PFW-1 & PFW-2 Food Warmers

Model PFW-1 (Built-In)

750 WATT

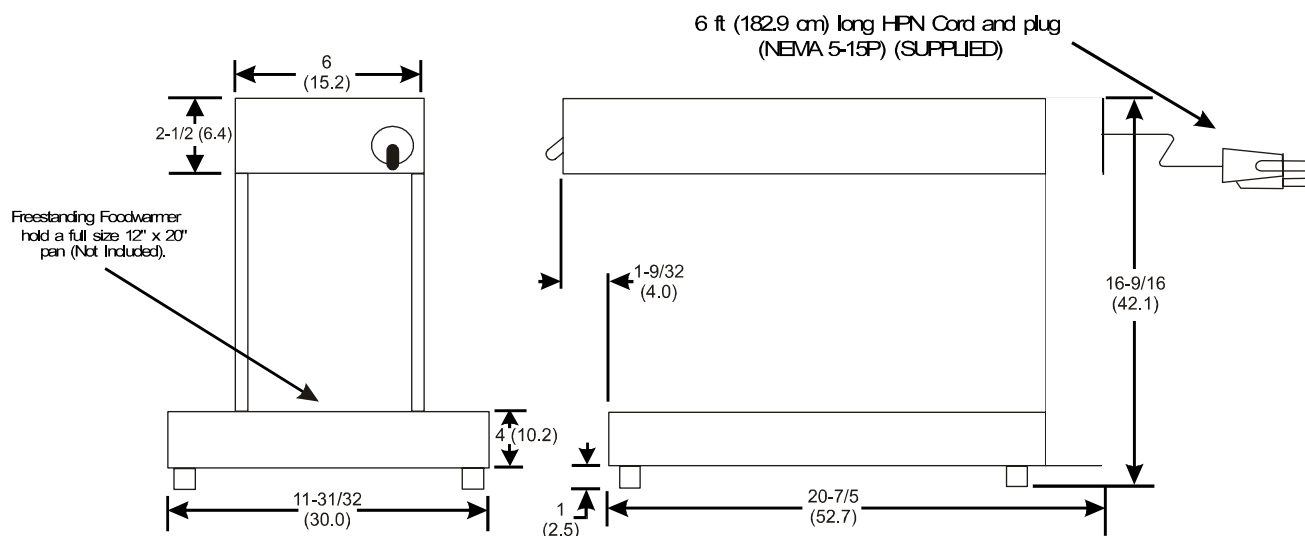


NOTE 1: Cord supplied on 120V units only. Foodwarmer must be hardwired on 208V & 240V units.

INCHES
CENTIMETERS

Model PFW-2 (Free Standing)

500 WATT



ELECTRICAL			SHIPPING INFORMATION	
Model	VOLTAGE / PHASE / HZ		16 Pounds (7.3 KG) / 3.83 cubic feet (0.11) cubic meters)	
	120 / 1 / 60	240 / 1 / 50		
	AMPS / EA	AMPS / EA		
PFW-1 (750 watt)	6.3	3.6 / 3.1	PERFORMANCE CHARACTERISTICS Specify designed infrared reflecting system maintains food at peak temperature without overcooking.	
PFW-2 (500 watt)	4.2	N/A		
SHORT FORM SPECIFICATION				
Provide Pitco Model PFW-1 or PFW-2 Pitco-Matic Food Warmer. Food warmer will be built-in or free standing. Heating element hood shall be insulated with fiberglass to minimize heat loss. Heat deflector design shall focus radiated heat to provide equalized heat to prevent overheating. Provide accessories as follows:				
TYPICAL APPLICATION				
Provide a heat source for holding fried foods at a “just cooked” temperature.				



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L10-034 Rev 8 (08/12) Specifications subject to change without notice.

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Submittal Sheet

12/20/2017

ITEM# 85 - EXHAUST HOOD (4 EA REQ'D)

Captive-Aire ND

Wall Type Exhaust Hood: 18 gauge 304 series stainless steel construction in accord with N.F.P.A. 96. Stainless steel baffle type U.L. classified grease extracting filters, with handles. Vapor-proof U.L. listed light fixtures as indicated on drawings. Provide stainless steel wall cabinet (located as shown on plan) for fire suppression system and control package. Fan and light switches to be located on face of hood in an accessible location. Hood to be furnished complete with Starter/contactor package for exhaust fan and make-up air fan (fans furnished by mechanical contractor, coordination of electrical service is required). Provide and install removable stainless steel perimeter trim and/or closure panels from top of hood to ceiling and 18 gauge stainless steel wall panels from floor to bottom of hood. Provide and install any secondary supporting members required to suspend hoods. Supports shall include seismic bracing, if required, in accord with SMACNA guidelines. Furnish unit complete with all standard accessories as normally supplied by the manufacturer.

The spec sheet for this item can be viewed on item 73)

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1	120	60	1	JB	CLG		10.0				
2	120	60	1	JB	CLG		10.0				

ELECTRICAL 1 REMARKS

LIGHTS

ELECTRICAL 2 REMARKS

FAN CONTROLS

Submittal Sheet

12/20/2017

ITEM# 85.1 - FIRE SUPPRESSION SYSTEM (1 REQ'D)

Custom R-102

Submittal Sheet

12/20/2017

ITEM# 86 - FLOOR TROUGH (1 EA REQ'D)

IMC Teddy FWR-84-SG

FWR Floor Water Receptacle, 84"W x 7-1/2"D, 4" deep receptacle, (1) 4" OD tailpiece, stainless steel beehive strainer, 16/304 stainless steel construction, brushed satin finish, (SG) subway grating, NSF, Made in USA

ACCESSORIES

Mfr	Qty	Model	Spec
IMC Teddy	1		SEC-AS Anti-Splash Grating, add 15%

WATER

	HOT SIZE	HOT AFF	HOT GPH	COLD SIZE	COLD AFF	FILTERED SIZE	FILTERED AFF	CONDENSER INLET SIZE	CONDENSER OUTLET SIZE
1									
2									

WASTE

	INDIRECT SIZE	DIRECT SIZE
1		4"
2		4"



FWR

Floor Water Receptacle

Project Name: _____

Consultant: _____

Item #: _____

Model #: _____

Quantity: _____



Specifications

FWR Model Floor Water Receptacles are 16-gauge type 304 stainless steel one-piece construction. Horizontal corners are coved and the trough is integrally pitched toward a waste outlet with a stainless steel beehive strainer and a 4" OD tailpiece.

Recessed flange and 1" deep ledge for IMC grating are integral with the unit. Unit is 7 1/2" wide and 4" deep.

Joints are TIG welded and leak-proof. Exposed surfaces finished brush satin.

Product Guide

Use for Commercial and Institutional Buildings or large food prep facilities.

Unit is generally used underneath Ice Machines or in front of walk-ins or large water discharge areas, in tight spaces.

Flexible design such as custom depths make this a versatile drain trough.

Recessed flange supports floor tile and provides a grout pocket.

Setting frame for waterproof membrane and/or integral seepage flange with "weep" holes can be added for wet floor areas.

Extension arms and intersections available for multiple equipment layout.

Options

- ☐ 12 or 14-gauge stainless steel
- ☐ Use with most IMC trough grating
- ☐ Custom designs, sizes and waste location. Shallow 2" deep available
- ☐ Optional waste locations
- ☐ Seepage flange and "weep" holes
- ☐ Standard and stock sizes fit most applications
- ☐ Anti-Splash Design
- ☐ See Price Book for more options



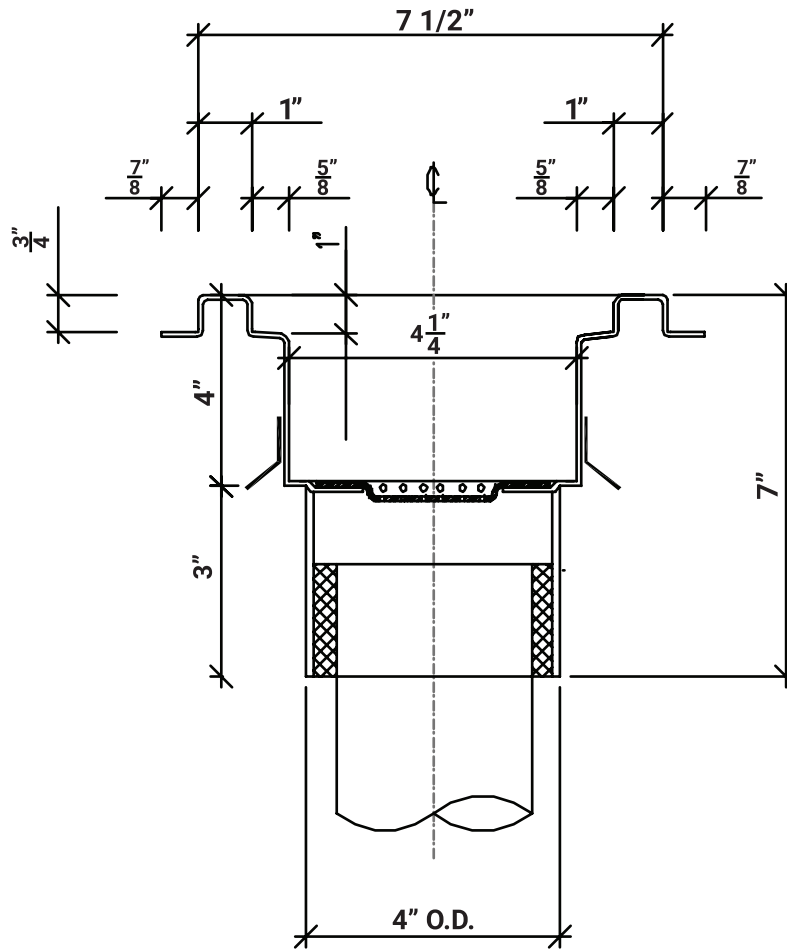
FWR-40 0716



IMC/TEDDY
DECADES OF FINE CRAFTSMANSHIP

FWR

Floor Water Receptacle



FLOOR WATER RECEPTACLES, STANDARD DESIGN - 4" DEEP

Model	Size (W x L)
<input type="checkbox"/> FWR-24	$7 \frac{1}{2}" \times 24"$
<input type="checkbox"/> FWR-36	$7 \frac{1}{2}" \times 36"$
<input type="checkbox"/> FWR-42	$7 \frac{1}{2}" \times 42"$
<input type="checkbox"/> FWR-48	$7 \frac{1}{2}" \times 48"$
<input type="checkbox"/> FWR-54	$7 \frac{1}{2}" \times 54"$
<input type="checkbox"/> FWR-60	$7 \frac{1}{2}" \times 60"$
<input type="checkbox"/> FWR-72	$7 \frac{1}{2}" \times 72"$
<input type="checkbox"/> FWR-84	$7 \frac{1}{2}" \times 84"$
<input type="checkbox"/> FWR-96	$7 \frac{1}{2}" \times 96"$
<input type="checkbox"/> FWR-108	$7 \frac{1}{2}" \times 108"$
<input type="checkbox"/> FWR-120	$7 \frac{1}{2}" \times 120"$

☐ Custom Size: FWR-_____

Note - Standard troughs up to 96" have one (1) waste at center. Over 96", troughs have two (2) wastes equidistant.

Specifications subject to change without notice.

FWR-40 0716

Submittal Sheet

12/20/2017

ITEM# 87 - HD RANGE, 36", 6 OPEN BURNERS (1 EA REQ'D)

Southbend P36A-BBB

Platinum Heavy Duty Range, gas, 36", (6) 35,000 BTU open burners, manual controls, (1) convection oven, includes (3) racks, stainless steel front, sides, exterior bottom & 6" adjustable legs, 255,000 BTU, CSA, NSF

ACCESSORIES

Mfr	Qty	Model	Spec
Southbend	1		Domestic Shipping, inside of North America (Contact factory for price)
Southbend	1		Standard (3) years limited parts and labor warranty (reference warranty document for details)
Southbend	1		NOTE: 5" flue riser, standard
Southbend	1		Natural Gas
Southbend	1		Natural Gas pressure regulator required for stand alone unit (1" npt male rear gas supply connection standard)
Southbend	1		115v/60/1-ph, 5.9 amps, cord & plug

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1	115	60	1	Cord & Plug			5.9				

GAS

	SIZE	MBTU	KW
1	1"	255.0	

STEAM

	INLET SIZE	RETURN SIZE	LB/HR	PSIG (min)	PSIG (max)
1					



36" SECTIONAL RANGE

Six 35,000 BTU Open-Top Burners

Platinum

Standard Features

- 36" wide sectional range with six open-top burners available with a standard-oven base, convection-oven base, cabinet base, or as a modular unit (for mounting on countertop, refrigerated or freezer base).
- Six 35,000 BTU NAT (35,000BTU LP) patented clog-free burners
- Removable, welded steel top grates
- 9-1/4" deep front rail
- Removable drip tray
- Stainless steel front, sides, rear and exterior bottom
- Fully insulated lining and burner box
- 1-1/4" front gas manifold and 1" rear gas connection
- 5" high stainless steel flue riser
- Free battery-design assistance
- Standard (3) years limited parts and labor warranty (reference <http://www.southbendnc.com/service.html> for limited warranty details)

Standard Features of Oven-Base Models

- 45,000 BTU NAT (45,000 BTU LP) oven with standing pilot
- Heavy duty, stainless steel door handle
- Porcelain enamel interior
- Oven racks (2 for standard oven, 3 for convection oven)
- "Insta-On" thermostat ranging from 175°F to 550°F
- Standard-oven interior is large enough (26" by 26-1/2") for sheet pans to fit either way
- Convection-oven models have 1/2 hp, two-speed blower

Standard Features of Cabinet-Base Models

- Stainless steel cabinet with removable doors that open from the center

Standard Features of Step-Up Models

- Rear burners are 4" higher than front burners

- ☐ P36N-BBB (Modular Mount)
- ☐ P36N-BBB-SU (Modular Mount with Step-Up Rear Burners)
- ☐ P36C-BBB (Cabinet Base)
- ☐ P36C-BBB-SU (Cabinet Base with Step-Up Rear Burners)
- ☐ P36D-BBB (Standard-Oven Base)
- ☐ P36D-BBB-SU (Standard-Oven Base with Step-Up Rear Burners)
- ☐ P36A-BBB (Convection-Oven Base)
- ☐ P36A-BBB-SU (Convection-Oven Base with Step-Up Rear Burners)



Model P36A-BBB shown with optional
36" flue riser and casters

STANDARD CONSTRUCTION SPECIFICATIONS

Exterior Finish: Front and sides constructed of #3 polished 430 and 304 stainless steel.

Range: 36"-wide front-manifold sectional range with six 35,000 BTU NAT (35,000 BTU LP) clog-free, open-top burners with removable, welded steel top grates.

Front Rail: 9-1/4" deep front rail.

Flue Riser: 5" high stainless steel flue riser

Battery: Unit can be in any position in a battery. If the unit is at the end of the battery, the end side will be solid (rather than have a coverplate over the end of the front manifold).

Legs: 6" stainless steel adjustable legs standard.

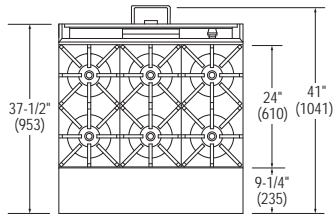
Model 36D: 45,000 BTU NAT (45,000 BTU LP) oven with standing pilot and thermostat range of 175°F to 550°F (79°C to 288°C). Porcelain enamel interior, measuring 14" high x 26" wide x 26.5" deep. Two racks with five-position side rails.

Model 36A: 45,000 BTU NAT (45,000 BTU LP) convection oven with standing pilot and thermostat range of 175°F to 550°F (79°C to 288°C). Porcelain enamel interior, measuring 14" high x 26" wide x 24" deep. Three racks with five-position side rails. Two-speed, 1/2 hp blower motor.

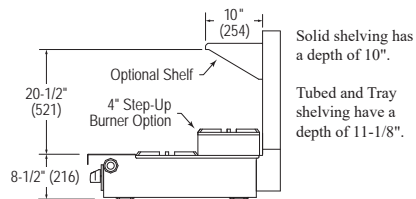
Model 36C: Stainless steel cabinet base with two removable doors that open from the center.



Models: ☐ P36N-BBB ☐ P36N-BBB-SU ☐ P36C-BBB ☐ P36C-BBB-SU ☐ P36D-BBB ☐ P36D-BBB-SU ☐ P36A-BBB ☐ P36A-BBB-SU



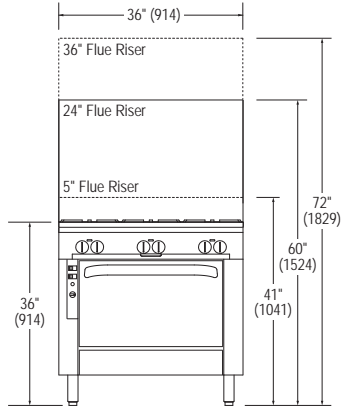
TOP VIEW



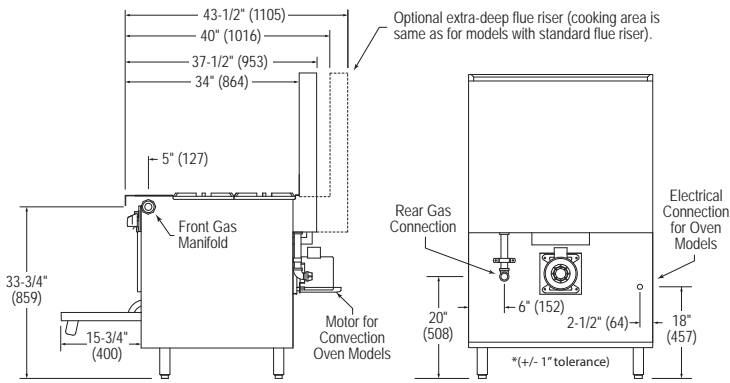
SIDE VIEW of MODULAR MODEL

SHIPPING CRATE DIMENSIONS & WEIGHT					
MODEL	WIDTH	HEIGHT	DEPTH	VOLUME	WEIGHT
P36N-BBB P36N-BBB-SU	45.5" (1156)	23" (584)	55" (1397)	33.3 cu ft (0.94 cu m)	390 lbs (176.9 kg)
P36C-BBB P36C-BBB-SU	45.5" (1156)	45" (1143)	55" (1397)	65.2 cu ft (1.85 cu m)	600 lbs (272.2 kg)
P36D-BBB P36D-BBB-SU	45.5" (1156)	45" (1143)	55" (1397)	65.2 cu ft (1.85 cu m)	706 lbs (320.2 kg)
P36A-BBB P36A-BBB-SU	45.5" (1156)	45" (1143)	55" (1397)	65.2 cu ft (1.85 cu m)	759 lbs (344.3 kg)

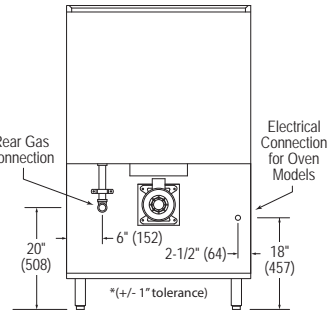
Dimensions shown in inches and (millimeters)



FRONT VIEW



SIDE VIEW



REAR VIEW

UTILITY INFORMATION

GAS: Each unit has a 1-1/4" front manifold that couples to the adjacent sectional unit(s), and a 1" rear gas connection with a male NPT connector. Minimum gas supply pressure is 7" W.C. for natural gas and 11" W.C. for propane. All sectional units

require a regulated gas supply (a pressure regulator must be ordered separately). If using a flexible-hose gas connection, the inside diameter of the hose must not be smaller than the connector on the unit and must comply with ANSI Z21.69, providing an adequate means of restraint to prevent undue strain on the gas connection.

ELECTRICITY: All oven models with optional electronic ignition require 50Hz or 60Hz single-phase power. 120V models have a 7-foot power cord with ground plug (5.9A for "A" models). 208/240V models have a terminal block for connection to a single-phase 208/240V source (2.7A for "A" models).

MODEL	GAS (BTU/HOUR)		ELECTRICITY (AMPS)	
	NATURAL	PROPANE	120V	208/240V
P36N-BBB P36N-BBB-SU	210,000	210,000	-	-
P36C-BBB P36C-BBB-SU	210,000	210,000	-	-
P36D-BBB P36D-BBB-SU	255,000	255,000	0*	0*
P36A-BBB P36A-BBB-SU	255,000	255,000	5.9*	2.7*

*Standing Oven Pilot Models

MISCELLANEOUS

- If casters are used with a flexible-hose gas connection, a restraining device should be used to prevent undue strain on the hose.
- Minimum clearance from noncombustible construction is zero (except there must be 2" clearance behind the blower motor of convection-oven models). Minimum clearance from combustible construction is 10" (254 mm) on sides and 6" (152 mm) on rear.
- Installation under a vented hood is recommended.
- Check local codes for fire and sanitary regulations.

NOTICE:

Southbend has a policy of continuous product research and improvement. We reserve the right to change specifications and product design without notice. Such revisions do not entitle the buyer to corresponding changes, improvements, additions or replacements for previously purchased equipment.

OPTIONS and ACCESSORIES

- | | | |
|---|--|---|
| <ul style="list-style-type: none"> <input type="checkbox"/> External pressure regulator <input type="checkbox"/> Front rail options: <ul style="list-style-type: none"> <input type="checkbox"/> Cutouts in front rail for sauce pans <input type="checkbox"/> 7-1/4" deep front rail (to match old style sectional) <input type="checkbox"/> Square belly bar mounted on 7-1/4" deep front rail <input type="checkbox"/> Casters (front two casters lock) | <ul style="list-style-type: none"> <input type="checkbox"/> Cable restraint kit (to restrict movement when on casters) <input type="checkbox"/> 24" or 36" high flue riser <input type="checkbox"/> Shelves on flue riser (one on 24" flue riser, one or two on 36" flue riser, 10" deep) <input type="checkbox"/> Tray or tubular shelving (12" deep) <input type="checkbox"/> Open-frame base with casters for battery <input type="checkbox"/> Extra-deep rear-extending flue riser | <ul style="list-style-type: none"> <input type="checkbox"/> Stainless steel oven interior <input type="checkbox"/> Salamander or cheesemelter mounted on 36" high flue riser <input type="checkbox"/> Removable shelf inside cabinet <input type="checkbox"/> Electronic pilot ignition - Piezo <input type="checkbox"/> Removable, cast iron grate tops <input type="checkbox"/> Electronic oven pilot ignition (no charge) <input type="checkbox"/> Battery spark ignition for open tops |
|---|--|---|

**INTENDED FOR COMMERCIAL USE ONLY.
NOT FOR HOUSEHOLD USE.**



1100 Old Honeycutt Road, Fuquay-Varina, NC 27526
(919) 762-1000 www.southbendnc.com

Submittal Sheet

12/20/2017

ITEM# 88 - EQUIPMENT STAND, REFRIGERATED BASE (1 EA REQ'D)

Continental Refrigerator DL84G

Refrigerator Griddle Stand, two-section, (4) drawers - four drawers accommodates (2) 12" x 20" x 6", dial thermometer, stainless steel top with drip guard marine edge, stainless steel exterior and interior, 4" casters, self-contained refrigeration, 1/3 hp, 10' cord, cETLus, NSF, Made in USA

ACCESSORIES

Mfr	Qty	Model	Spec
Continental Refrigerator	1		Standard warranty (for the United States & Canada Only): 3 year parts and labor; 5 year compressor
Continental Refrigerator	1		115v/60/1-ph, 7.5 amps, cord, NEMA 5-15P, standard
Continental Refrigerator	1		Condensing unit on the right, standard
Continental Refrigerator	1		4" Casters, standard

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1									1/3		
2	115	60	1	Cord & Plug		5-15P	7.5				

GRIDDLE STAND REFRIGERATOR

Model: **DL84G**

84" Griddle Stand Refrigerator

Stainless steel exterior and interior.

Designed to maintain NSF-7 temperatures in 100°F ambient.



Options and Accessories

(upcharge and lead times may apply)

Flat top in lieu of marine edge	Adjustable legs
16-gauge stainless steel top (flat or marine)	Digital thermometer
Condensing unit left or right	Cylinder locks
Automatic, electric condensate evaporator	Stainless steel pans
Stainless steel top extensions (flat or marine)	Special electrical requirements (consult factory)
Integral heat shield	

Consult factory for other model configurations, options and accessories.

Continental
Refrigerator

Toll-Free: 800-523-7138
Phone: 215-244-1400
Fax: 215-244-9579

539 Dunksferry Road
Bensalem, PA 19020
www.continentalrefrigerator.com

Project Name:

Model Specified:

Location:

Item No:

Quantity:

AIA #:

SIS #:

Standard Model Features

REFRIGERATION SYSTEM

- Performance-rated refrigeration system
- Environmentally-safe R-134a refrigerant
- Side-mounted, automatic, energy saving non-electric condensate evaporator
- Non-corrosive, plasticized fin evaporator coil
- Easily serviceable, front slide-out condensing unit

CABINET ARCHITECTURE

- High density, non-CFC polyurethane foamed-in-place insulation
- Easy glide, fully extendable drawers designed to hold 6" deep pans side-by-side
- One-piece, snap-in magnetic drawer gaskets
- Heavy-duty drawer track with built-in drawer safety clips
- Drawers designed to hold 250 lb. capacity
- 4" casters on support plates
- Stainless steel case back
- Reinforced stainless steel work top with drip guard marine edge

MODEL FEATURES

- Capillary dial thermometer
- Front breathing

APPROVAL:

Model Specifications

DIMENSIONAL DATA

Net Capacity (cu. ft.)	20.0 (566 cu l)
Width, Overall (in.)	84 (2134 mm)
Depth, Overall (in.) (incl. handles)	34 3/4 (883 mm)
Height, Overall (in.) (incl. 4" casters)	26 3/8 (670 mm)
No. of Drawers	4

REFRIGERANT DATA

Condensing Unit Size (H.P.)	1/3
Capacity (BTU/Hr)*	2560

ELECTRICAL DATA

Voltage (int'l)	115/60/1 (220/50/1)
Fans	3
Feed Wires (incl. ground)	3
Total Amps (int'l)	7.5 (3.6)
10 ft. Cord/Plug [attached] (int'l)	Yes (No)

SHIPPING DATA

Weight (lbs.)	605 (274 kg)
Height - Crated (in.)	44 (1118 mm)
Width - Crated (in.)	109 (2769 mm)
Depth - Crated (in.)	39 (991 mm)

TOP WEIGHT CAPACITY

Max. Top Weight Capacity (lbs.)	1400 (635 kg)
---------------------------------	---------------

* Rating @ +25°F evaporator, 90°F ambient

Figures in parentheses reflect metric equivalents rounded to the nearest whole unit.



Equipped with one NEMA-5-15P Plug
(varies by country)

Continental
Refrigerator

Toll-Free: 800-523-7138
Phone: 215-244-1400
Fax: 215-244-9579

539 Dunkserry Road
Bensalem, PA 19020
www.continentalrefrigerator.com

Due to our continued efforts in developing innovative products, specifications subject to change without notice.



Intertek

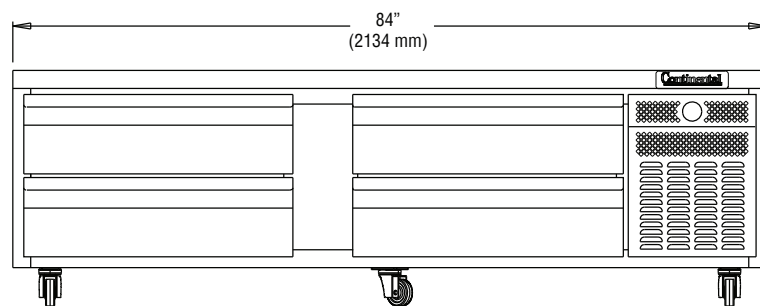
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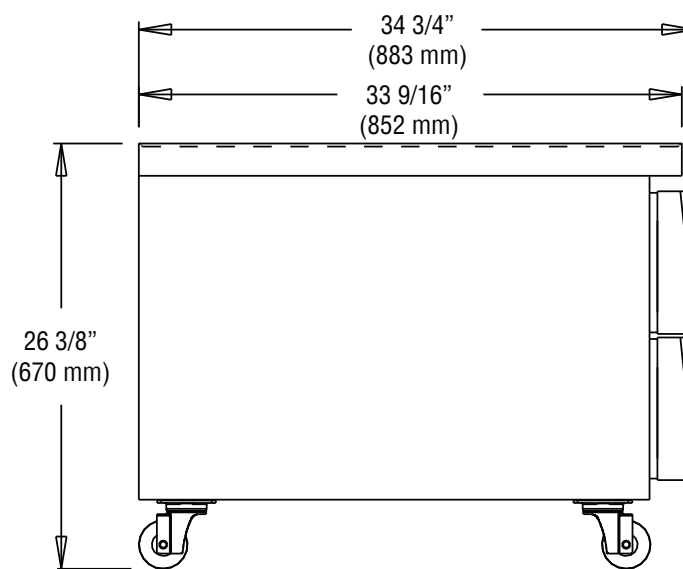


MADE IN THE U.S.A.

Model Plan Views

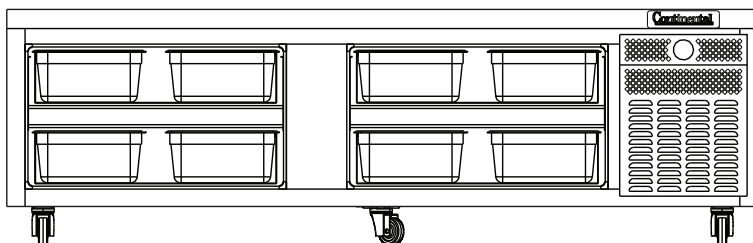


FRONT VIEW



SIDE VIEW

Shown with (8) 12 x 20 x 6 pans (not furnished)



DRAWER PAN CONFIGURATION

Submittal Sheet

12/20/2017

ITEM# 89 - GAS COUNTERTOP GRIDDLE (1 EA REQ'D)

Southbend HDG-48

Griddle, countertop, gas, 48" W x 24" D cooking surface, 1" thick polished steel plate, thermostatic controls, battery spark ignition, stainless steel front, sides & 4" adjustable legs, 120,000 BTU, CSA, NSF

The spec sheet for this item can be viewed on item 69)

ACCESSORIES

Mfr	Qty	Model	Spec
Southbend	1		Domestic Shipping, inside of North America (Contact factory for price)
Southbend	1		Standard one year limited warranty
Southbend	1		Natural Gas
Southbend	1		400° thermostat control, standard

GAS

	SIZE	MBTU	KW
1	3/4"	120.0	

STEAM

	INLET SIZE	RETURN SIZE	LB/HR	PSIG (min)	PSIG (max)
1					

Submittal Sheet

12/20/2017

ITEM# 90 - CHARBROILER, GAS, COUNTERTOP (1 EA REQ'D)

Southbend HDC-36

Charbroiler, gas, countertop, 36", cast iron radiants, stainless steel burners, two-position, two sided cooking grid, removable crumb tray, stainless steel front, sides & 4" adjustable legs, 120,000 BTU, CSA, NSF

The spec sheet for this item can be viewed on item 70)

ACCESSORIES

Mfr	Qty	Model	Spec
Southbend	1		Domestic Shipping, inside of North America (Contact factory for price)
Southbend	1		Standard one year limited warranty
Southbend	1		Natural Gas
Southbend	1		Battery spark ignition

GAS

	SIZE	MBTU	KW
1	3/4"	120.0	

STEAM

	INLET SIZE	RETURN SIZE	LB/HR	PSIG (min)	PSIG (max)
1					

Submittal Sheet

12/20/2017

ITEM# 91 - COMBI OVEN, GAS (2 EA REQ'D)

RATIONAL B619206.27E202

(CMP 61NG – 120V) CombiMaster® Plus, Combi Oven/Steamer, natural gas, (6) 12" x 20" full size hotel or (6) 13" x 18" half size sheet pan capacity, mode selector control, 100 cooking programs, automatic cleaning, LED display, 5-speed programmable fan, core temperature probe, hand shower with automatic retracting system, interface USB, hinging rack 2-5/8", 120v/60/1-ph, 8'cord, NEMA 5-15P, 49,000 BTU, cCSAus, NSF/ANSI 4, IPX5, ENERGY STAR®

ACCESSORIES

Mfr	Qty	Model	Spec
RATIONAL	2		NOTE: All discounts subject to approval by manufacturer
RATIONAL	2		2 years parts and labor warranty
RATIONAL	2	CAP	Chef Assistance Program, a RATIONAL certified Chef conducts 4 hours/location specialized application training with personnel, no charge
RATIONAL	2	8720.1560US	Installation Kit, for gas SCC WE/CMP 101G (120/60/1ph); gas SCC WE/CMP 62G (208-240/60/1ph); gas SCC WE/CMP 61G (120/60/1ph) THIS ITEM IS NON-DISCOUNTABLE, USA ONLY (NET)
RATIONAL	2		Note: The Combination of two RATIONAL appliances simply mounted on top of each other opens up new possibilities, even when space in the kitchen is limited. The following descriptions are laid out in this order: First: Closed or Open; Second: Stationary or Mobile; Third: Top unit - Gas or Electric; Fourth: stacked on Gas or Electric. The bottom RATIONAL (fourth item) is the one that dictates which type of Stacking Kit must be used.
RATIONAL	2	60.71.929	Combi-Duo Closed Stacking Kit, Stationary, 6" feet, for gas SCC 61 or CMP 61 stacked on gas SCC 61, SCC 101, CMP 61, or CMP 101 (gas unit stacked on a gas 101 unit is not recommended)
RATIONAL	2	9999.9959	RCI Rational Certified Installation, new certified installation cost for a Combi-Duo stacked unit is \$200 for the first two units for double-stack (Pricing based on a 50 mile radius, Additional charges may apply, See attached installation flyer for details) THIS ITEM IS NON-DISCOUNTABLE. USA ONLY (NET)
RATIONAL	2		Door hinged on right std.

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1	120	60	1	Cord & Plug		5-15P					

GAS

	SIZE	MBTU	KW
1	3/4"	49.0	

STEAM

	INLET SIZE	RETURN SIZE	LB/HR	PSIG (min)	PSIG (max)
1					

WATER

	HOT SIZE	HOT AFF	HOT GPH	COLD SIZE	COLD AFF	FILTERED SIZE	FILTERED AFF	CONDENSER INLET SIZE	CONDENSER OUTLET SIZE
1				3/4"					
2				3/4"		3/4"			

WASTE

	INDIRECT SIZE	DIRECT SIZE
1	2"	
2		

PLUMBING 1 REMARKS

Common Water Connection

PLUMBING 2 REMARKS

Optional Split Connection

Project:	Quantity:	Item No:	FCSI Section:	Approval:	Date:
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Specification

Sat May 13 14:08:37 CEST 2017

CombiMaster® Plus XS 61 G (6 x 12 x 20 inch/6 x 13 x 18 inch)



Capacity

- Six (6) Half-size sheet pans (13"x18") or Six (6) Steam table pans (12"x20"x2.5") GN1/1
- Removable, swivelling hinging rack
- Vertical distance between rails 2 5/8" (68 mm)

Standard Features

- Gas heated table device for cooking of meat, poultry, fish, side dishes, vegetables, egg dishes, desserts, bakery products and for automatic rethermalization
- Combi-steamer according to DIN 18866, DIN 10535 for selective use of steam and hot air, separately, sequentially, or combined
- 2-Year parts and labor warranty
- 5-Year steam generator warranty
- No-charge 4-hour RATIONAL certified chef assistance program
- Probe for core temperature measurement
- ClimaPlus® – humidity measurement, 5 stage setting and regulation
- Combi-steamer mode °F/(°C): steam: 85 to 265/(30 to 130), hot air: 85 to 575/(30 to 300), combination: 85 to 575/(30 to 300)

- Individual programming of at least 100 cooking programs with up to 6 steps transferable via USB
- High-performance fresh steam generator, pressureless
- 5 programmable fan speeds
- Integral, maintenance-free grease extraction system with no additional grease filter
- Single water connection as shipped, can be split connection for treated and untreated water
- Turbo fan cool down function
- Dynamic air mixing
- Automatic adaptation to the installation location (elevation)
- Unit door with rear-ventilated double-glass panel and hinged inner panel
- Height adjustable feet +/- 3/8" (10 mm)
- 304 (DIN 1.4301) stainless steel material inside and out
- Seamless interior and with rounded corners
- Temperature units can be set in °F/(°C)
- Digital temperature display
- Digital timer, 0-24 hours with permanent setting
- USB Interface
- Demand-related energy supply

Operation

- Mode selector for cooking modes, separate controls for temperature, core temperature and time settings
- LED illuminated display, visible from a distance
- Clear control panel

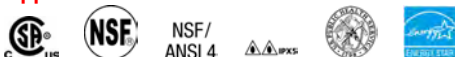
Safety features

- Detergent and rinse tabs (solid detergents) for optimum working safety
- VDE approved for unsupervised operation
- HACCP data output and software update via integral USB port
- Safety temperature limiter for steam generator and hot-air heating
- Maximum rack height 5 1/4 ft./1.60 m when original stand is used
- Integral fan impeller brake
- Door handle with right/left and slam function
- Splash an hose-proof to IPX5

Cleaning & care

- 3 automatic cleaning programs
- Service Diagnostic system (SDS) with automatic service notices displayed
- Menu-guided user descaling program
- Hand shower with automatic retracting system

Approval/Labels



Project:	Quantity:	Item No:	FCSI Section:	Approval:	Date:
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Specification

Sat May 13 14:08:37 CEST 2017

CombiMaster® Plus XS 61 G (6 x 12 x 20 inch/6 x 13 x 18 inch)

Combi-Steamer mode



Steam between 85-265 °F (30-130 °C)



Hot-air from 85-575 °F (30-300 °C)



Combination of steam and hot-air 85-575 °F (30-300° C)

ClimaPlus



Climate management - humidity measurement, 5-stage setting and regulation

Technical Specification

Dimensions	Width	Depth	Height
Exterior	33 3/8" (847 mm)	30 1/2" (776 mm)	30 3/4" (782 mm)
Incl. Vent/Handle	-	33" (838 mm)	32 3/4" (832 mm)
Shipping	37 3/8" (950 mm)	36 1/4" (920 mm)	39 3/8" (1,000 mm)

Weight	
Max Per Shelf	33 lbs
Max Load Size	66 lbs
Net	266 lbs
Shipping	299 lbs

Size	Electric. 60 hz	Breaker	Cable connection	Running Amps
61	120V 1 PH	15 A	5-15P	3.33 amps
61	208V 1 PH	15 A	6-15P	1.92 amps
61	240V 1 PH	15 A	6-15P	1.67 amps

Gas units are supplied with 8 ft. 14-3 AWG cord and plug. 120V 1Ph L1, N, G or 208/240V 1 Ph L1, L2, G (208V is field retrofittable to 240V). Dedicated 2 pole circuit breaker required. Due to GFCI having a 4-6mA tolerance, 208/240V is recommended. Do not use fuses. Special voltages available upon request.

Thermal load and airflow requirements

Latent	595 W
Sensible	714 W
Unit free standing	13314 ft ³ /h
One side against a wall	8405 ft ³ /h
Noise values	70 dBA

Rated thermal load

	Natural gas	Liquid gas LPG
Total:	49,000 BTU	48,200 BTU
Steam:	45,500 BTU	44,500 BTU
Hot air:	49,000 BTU	48,200 BTU

Connected load electric: 0.4 kW

Water Requirements

Connection	3/4"
Supply	Minimum 1/2" ID Drinking Quality Cold
Pressure	21-87 psi (1.5-6 bar)
Average Water Consumption	0.8 gal/h
Min/Max Flow Rate	3 gpm/5.27 gpm
Water Drain	2" OD (50 mm) hub

Connect only to 2" (XS type 6 2/3 = 1 5/8") high-temperature resistant pipe. Water discharge temperature can be field adjusted to meet section 701.7 of the Inter-national Plumbing Code. Contact RATIONAL for back flow recommendation.

Water Quality

Sodium ion exchangers are not recommended; H+ Ion exchange systems are recommended. Water that does not meet the following minimum standards will require the proper conditioning.

Contaminant	Water Requirements	If > than recommended
Sand/Particles	< 15 µm	Particle filter
Chlorine (Cl ₂)	< 0.12 gr/gal (0.2 ppm)	Active carbon filter
Chloride (Cl ⁻)	< 4.68 gr/gal (80 ppm)	RO or deionization

Clearance Requirements

To facilitate servicing, we recommend leaving a 18"-20" (450-500 mm) gap on the left-hand side of the unit. If there is not 18"-20" (450-500 mm) left side clearance available, provisions for moving the unit or appliance to the left for service access must be made. These include, but are not limited to, having quick connections (water, gas, etc.) and lengthened electrical connections with flexible cords. If there are no external heat sources acting on the unit, there should be a minimum gap of 2" (50 mm) to the left, right, and back of unit. If a high temperature heat source is on the left side of the unit, the left-hand gap must be a minimum of 14" (350 mm). This gap may be reduced to 2" (50 mm) by using a heat shield (see options). Recommended clearance from unobstructed rear exhaust pipes and any surface collecting grease or flammable material; 16" (400 mm) gas, 10" (254 mm) electric. It is recommended to have a hood overhang of 6" (150 mm) to 18" (450 mm) at the front of the unit and 6" (150 mm) on the side if installed at the end of the cooking line. Please refer to the Installation Manual for further technical data and for instructions on installation and setup. Installations must comply with all local electrical, plumbing, and ventilation codes.

RATIONAL USA Inc.

1701 Golf Road, Suite C-120, Commerce
Rolling Meadows, IL 60008
Toll Free: 888-320-7274, Fax.: 847-755-9583

Visit us on the internet: www.rationalusa.com

We reserve the right to make technical improvements

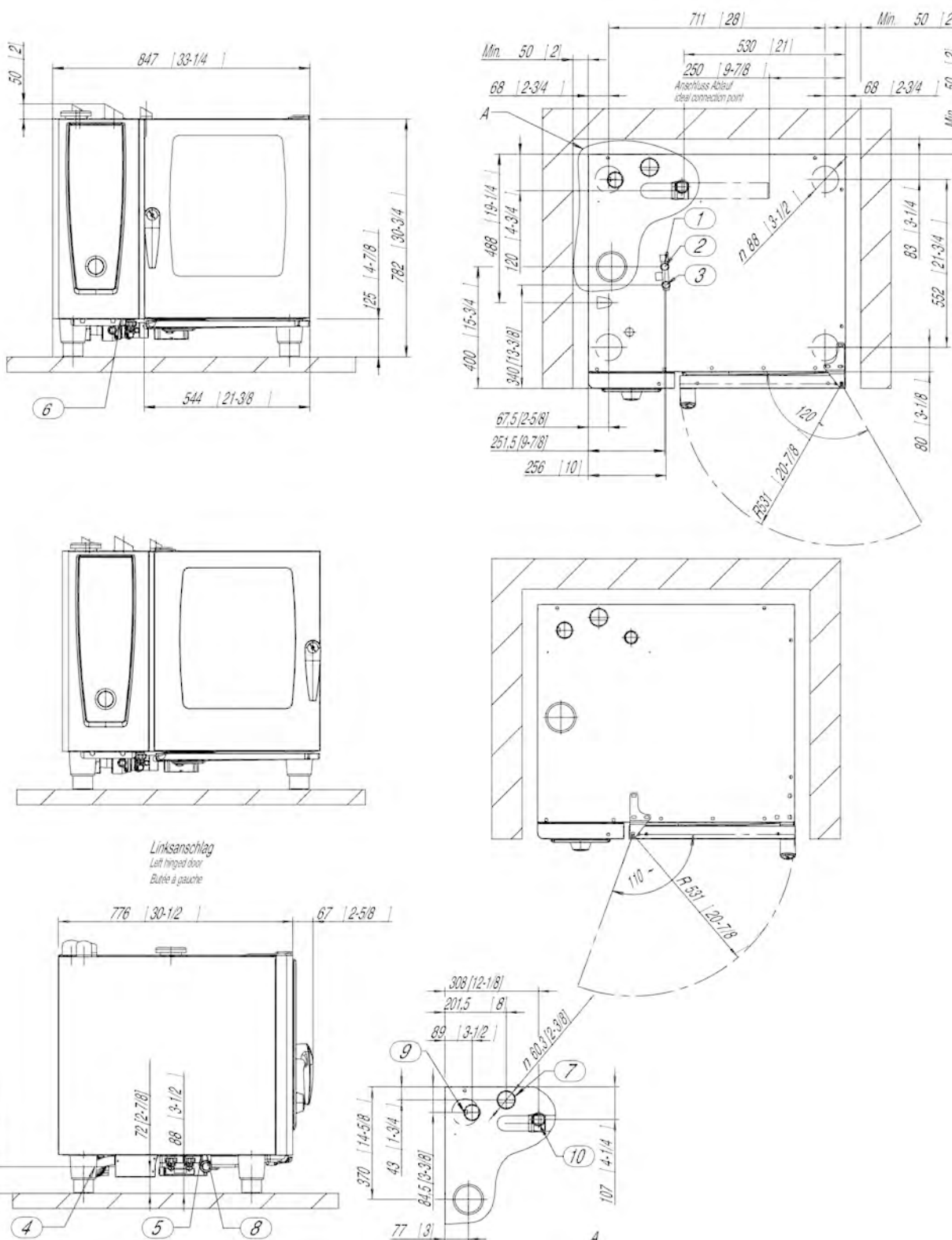
Project:	Quantity:	Item No:	FCSI Section:	Approval:	Date:
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Specification

Sat May 13 14:08:37 CEST 2017

CombiMaster® Plus XS 61 G (6 x 12 x 20 inch/6 x 13 x 18 inch)



1. Common water supply (cold water) "Single" water connection as shipped 2. Water supply cold water / condensate "Split" water connection 3. Water supply cold / Treated "Split" water connection 4. Water drain 5. Electrical connection wire entrance 6. Chassis Ground connection 7. Steam Vent pipe DN 2 3/8" / 60 mm 8. Gas connection 3/4 NPT 9. Steam burner exhaust pipe 10. Hot-air burner exhaust pipe minimum distance 2" / 50 mm Left side clearance 20" recommended for servicing of unit without the ability to move unit while connected. Measurements in mm (inch)

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Project:	Quantity:	Item No:	FCSI Section:	Approval:	Date:
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Specification

Sat May 13 14:08:37 CEST 2017

CombiMaster® Plus XS 61 G (6 x 12 x 20 inch/6 x 13 x 18 inch)

GAS OPTIONS

- ☐ Natural Gas
- ☐ Liquid Gas (LP)

ELECTRICAL CONNECTION ON GAS UNITS (all 60Hz) Special voltages available upon request

Voltage / breaker / running amps /

- ☐ 120V 1 Ph / 15 / 3.33 / comes with 5-15P cord and plug
- ☐ 208V 1 Ph / 15 / 1.92 / comes with 6-15P cord and plug -field retrofittable to 240 V / 15 / 1.67

ACCESSORIES

- ☐ Installation Kits – include quick disconnect gas, water and drainage connection
 - ☐ Gas 208/60/1 PH 8720.1560US
- ☐ RATIONAL Cleaner Tabs without phosphorous – guarantee maximum cleaning power 56.00.210A
- ☐ RATIONAL Rinse Tabs 56.00.211
- ☐ Electric descaler pump 60.40.497
- ☐ Descaler, 4x 1 gallon case 6006.0110US
- ☐ Certified installation by RATIONAL SERVICE-PARTNERS See document
- ☐ Preventative Maintenance Kits – door gaskets, air filters, interior light gasket, and light bulbs 87.00.520US
- ☐ Available stands – standard (stationary) and mobile (open or closed) See accessories brochure
- ☐ Mobile catering stand – especially for heavy mobile catering usage 60.30.890
- ☐ Catering kit for mobile catering stand – support frame and feet 60.73.111
- ☐ Mobile oven racks and Finishing® plate racks – easier operation of full loads See accessories brochure
- ☐ Run-in rail for mobile oven and plate racks 60.61.226
- ☐ Transport trolley for mobile oven and plate racks – standard and height adjustable See accessories brochure
- ☐ Stackable Combi-Duo kit, options: mobile or feet See accessories brochure
- ☐ Heat shield – for installation next to heat source (e.g. range, grill) 60.70.390
- ☐ Condensation breaker – to divert steam from the unit into existing hood system 60.72.591
- ☐ RATIONAL USB data-memory stick – for transferring cooking programs and HACCP data 42.00.162
- ☐ VarioSmoker – for a large variety of smoked products 60.73.010
- ☐ For ideal grilling, baking, roasting, frying, rotisserie, steaming, Finishing®, and much more See accessories brochure

FACTORY INSTALLED OPTIONS (special order)

- ☐ Left-hinged door natural gas
- ☐ Left-hinged door liquid gas (LP)
- ☐ Ethernet card and port – for easy connection of LAN cable
- ☐ Door safety lock – handle is turned left then right before the door can be opened
- ☐ Sous-Vide core temperature probe (externally attached)
- ☐ Externally attached standard core temperature probe
- ☐ Lockable control panel cover
- ☐ Control panel protection
- ☐ Mobile oven rack package (mobile oven rack + run-in rail)
- ☐ Unit with special hinging racks for bakeries and supermarkets
- ☐ Integrated fat drain (only in conjunction with UG II or US IV stands)
- ☐ Security and prison version

RATIONAL USA Inc.

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 Toll Free: 888-320-7274, Fax.: 847-755-9583

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We reserve the right to make technical improvements



Installation Kit

Article no. 8720.1560US

The RATIONAL Installation Kit ensures that the installer has all the essential connection materials on hand at the time of install. Not all parts are used in every installation.

Gas SelfCookingCenter® 5 Senses/CombiMaster® Plus 61G (120v/60/1ph) or (208v/60/1ph)
 Gas SelfCookingCenter® 5 Senses/CombiMaster® Plus 101G (120v/60/1ph) or (208v/60/1ph)
 Gas SelfCookingCenter® 5 Senses/CombiMaster® Plus 62G (208-240v/60/1ph)

The Installation Kit for the above models includes:

1	ea	Gas Connector Hose, 3/4" NPT connection, 48" long, stainless steel braid with Plastic coat exterior, brass push to connect quick disconnect coupling, for castered equipment with cable strain relief
1	ea	90 degree black iron elbows, 3/4" NPT
2	ea	90 degree black iron street elbows, 1" NPT
1	ea	18" long × 3/4" NPT black iron pipe
1	ea	10" long × 3/4" NPT black iron pipe
1	ea	8" long × 3/4" NPT black iron pipe
1	ea	Close nipple 3/4" NPT black iron pipe
2	ea	45 degree black iron elbows, 3/4" NPT
2	ea	2" Minnies
1	ea	3/4" minnies
2	ea	3/4" Water Connector Hose, 5/8" ID, 3/4" female hose thread both ends, 60" long rubber coated, NSF approved
1	ea	Male union 3/4" × 3/4" MHT
2	ea	90 deg Fresh water elbow
8	feet	2" copper pipe (two 4' pieces)
2	ea	2" copper pipe 90 degree elbow
1	ea	2" copper pipe T fitting
2	ea	2" copper pipe 45 degree elbow
1	ea	2" copper pipe 90 degree elbow female to male
1	ea	2" copper pipe 90 degree long sweep
1	ea	2" copper pipe coupling
1	ea	Receptacle NEMA 6-15R 15A-250V
1	ea	NEMA 6-15R cover plate single junction box

Please note that installation kits are non-discountable.

Submittal Sheet

12/20/2017

ITEM# 92 - VERTICAL ROTISSERIE (1 EA REQ'D)

Wood Stone WS-GVR-10

Whatcom Vertical Rotisserie, Gas, (10) spit locations, (3) gas burners which includes showy radiant flame post and (2) adjustable infrared burners, constant drip water bath, glass door, stainless steel cabinet & legs, casters, standard items include: (3) Chicken Bell Choirs for (9) Chickens, (5) 3-prong Rib Hooks and (5) Protein/Veg. Skewer with Keeper Clips, 115,000 BTUs

ACCESSORIES

Mfr	Qty	Model	Spec
Wood Stone	1		Natural gas
Wood Stone	1		120v/60/1-ph, 1.3 amps, (15 amp cord w/3-prong plug supplied unattached)
Wood Stone	1	000318STDSSCAST2	Optional closed GVR stand with casters, double door

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1	120	60	1	Cord & Plug			1.3				

GAS

	SIZE	MBTU	KW
1	3/4"	115	

STEAM

	INLET SIZE	RETURN SIZE	LB/HR	PSIG (min)	PSIG (max)
1					

WATER

	HOT SIZE	HOT AFF	HOT GPH	COLD SIZE	COLD AFF	FILTERED SIZE	FILTERED AFF	CONDENSER INLET SIZE	CONDENSER OUTLET SIZE
1				1/4"					

WASTE

	INDIRECT SIZE	DIRECT SIZE
1		

Wood Stone



WS-GVR-10 model shown.

FEATURES

- Unique Vertical Roasting
- No Cross-Contamination
- Cooks up to 25 lbs. per Spit
- Countertop Model Available
- Custom Accessories
- Beautiful Live Flame
- Optional Rear Door Available



Optional Rear Door (rear view) shown.



Optional Closed Cabinet & Rear Door (rear view) shown.

WHATCOM GAS VERTICAL ROTISSERIE



Job Name	
Model	WS-GVR-10
Item#	

The unique design of the Whatcom Gas Vertical Rotisserie (GVR) allows different foods to be cooked at the same time, in the same rotisserie, without exchanging flavors (cross-contamination). The GVR has 10 spit locations (stations), allowing a large variety of products to be cooked simultaneously.

The rotisserie comes standard with a tempered glass front door, allowing the cooking process to be fully visible to chefs and customers alike. Although the front-loading model is standard, the GVR is available with an optional rear access glass door so that it can be loaded from either side. A water bath and drain facilitate simple and safe cleaning by connecting to a water line and drain line provided with a grease trap.

The cabinet of the GVR is constructed of polished stainless steel. The standard unit is on legs equipped with heavy-duty, non-marking locking casters to easily roll into an existing cook line under a Listed Type 1 exhaust hood. The GVR is also available in a countertop configuration.

The GVR is powered by three gas burners: two infrared (IR) burners (in the front corners of the cabinet and the primary heat source), and a post of live flame, located in the center of the unit. The IR burners operate on an adjustable cycle timer (10 minute cycles) or can be turned off completely so that the rotisserie is heated by the center flame post alone. The drum of the rotisserie turns at a speed of 1.5 revolutions per minute. Each spit connection (or station) rotates approximately 6.5 times during one revolution of the drum. A jog feature allows for safe loading and unloading.

The unit comes standard with an accessory package including Chicken Bells, Skewers with Keeper Clips and Three-Pronged Rib Hooks. Maximum capacity for chickens is 15 birds.

The unit arrives completely assembled, ETL Listed, ready to install and is made in the USA. Information about additional tools and accessories can be found online at: woodstone-corp.com.



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tf. 800.988.8103
f. 360.650.1166

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REVISED: SPRING 2017

An ongoing program of product improvement may require us to change specifications without notice.



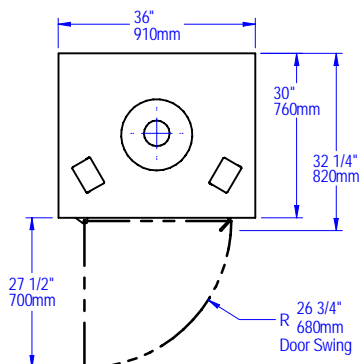


WHATCOM

GAS VERTICAL ROTISSERIE • WS-GVR-10

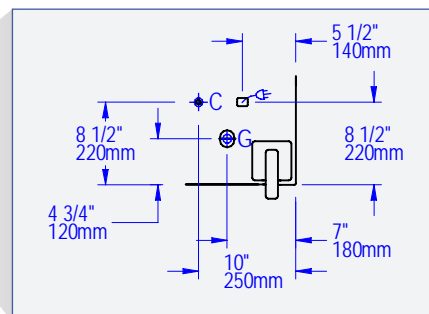
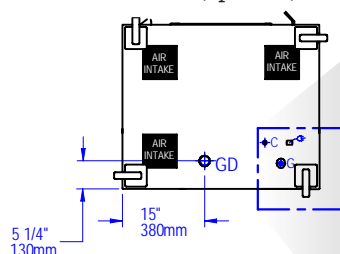
Note: This unit is on casters; utility hookups should be made in such a way as to allow mobility of the rotisserie for service and maintenance purposes. We recommend "quick disconnects" and flexible connections.

PLAN VIEW

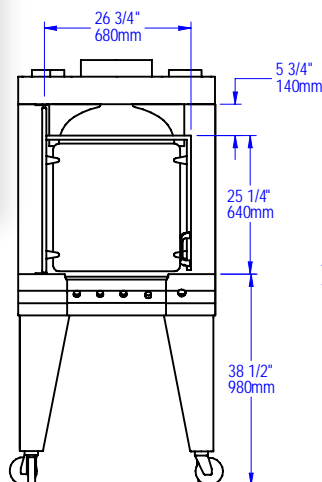


BOTTOM VIEW

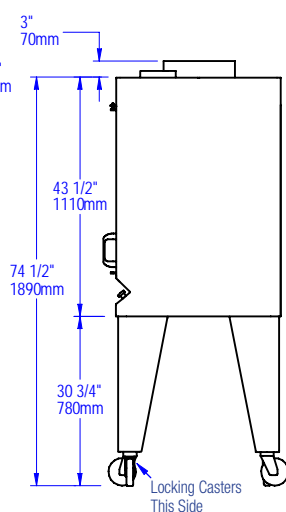
w/bottom utility connections
on (optional) rear door models



FRONT VIEW

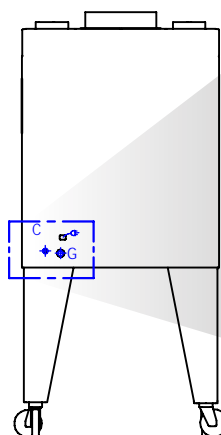


SIDE VIEW



REAR VIEW

w/standard rear utility connections



C	Water Supply 1/4" NPT
G	Gas Inlet 3/4" NPT
GD	Grease Drain
	Cord with NEMA 5-15 Plug
AIR INTAKE	

UTILITIES SPECIFICATIONS

GAS

3/4 inch gas inlet (FNPT)
115,000 BTU/hr - Natural Gas (NG)
OR
115,000 BTU/hr - Propane (LP)

WATER

Provide incoming water supply
equipped with a 1/4" NPT fitting.

ELECTRICAL

120 VAC, 1.3 A, 50/60 Hz
NEMA 5-15 plug. Unit plugs into a
standard 120 VAC, 15 A outlet.

DRAIN

Provide connection to floor sink
(grease trap) equipped with a 1 1/2"
slip-fit NPT fitting.

VENTING INFORMATION

The WS-GVR-10 must be vented using a Listed Type 1
exhaust hood, or one constructed in accordance with
NFPA 96 and all relevant local and national codes. The
rotisserie must be vented in accordance with all relevant
local and national codes, and in a manner acceptable to
the authority having jurisdiction.

Ship Weight: 750 lbs / 340 kg



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REVISED: SPRING 2017

An ongoing program of product
improvement may require us to change
specifications without notice.

Wood Stone

Submittal Sheet

12/20/2017

ITEM# 93 - REACH-IN UNDERCOUNTER REFRIGERATOR (1 EA REQ'D)

Continental Refrigerator SW48-U

Undercounter Refrigerator, 48" wide, 13.4 cu ft capacity, two-section, (2) field rehingeable doors, stainless steel front, top and end panels, aluminum interior, 1 3/8" diameter plate casters, front breathing, electronic controller w/ digital display, rear-mounted self-contained refrigeration, 1/5 hp, cETLus, Made in USA

ACCESSORIES

Mfr	Qty	Model	Spec
Continental Refrigerator	1		Standard warranty (for the United States & Canada Only): 3 year parts and labor; 5 year compressor
Continental Refrigerator	1		115v/60/1-ph, 7.3 amps, cord, NEMA 5-15P, standard

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1									1/5		
2	115	60	1	Cord & Plug		5-15P	7.3				

UNDERCOUNTER REFRIGERATOR

Model: **SW48-U**

48" Undercounter Refrigerator with Solid Doors

Stainless steel front, top and end panels, aluminum back and interior.

Designed to maintain NSF-7 temperatures in 100°F ambient.



Options and Accessories

(upcharge and lead times may apply)

Stainless steel interior	Automatic electric condensate evaporator
Stainless steel back	Expansion valve system
Stainless steel shelves	Door locks
Additional epoxy-coated steel shelves	Special electrical requirements (consult factory)
Drawers in lieu of doors	

Consult factory for other model configurations, options and accessories.

Project Name:

Model Specified:

Location:

Item No:

Quantity:

AIA #:

SIS #:

Standard Model Features

REFRIGERATION SYSTEM

Performance-rated refrigeration system

Environmentally-safe R-134a refrigerant

Automatic, energy-saving, non-electric
condensate evaporator

Non-corrosive, plasticized fin evaporator coil

Easily serviceable back mounted compressor

CABINET ARCHITECTURE

2" non-CFC polyurethane foam insulation

Spring loaded, self closing doors

Magnetic snap-in door gaskets

Heavy-duty, epoxy-coated steel shelf

Completely enclosed, vented and removable case back

1 3/8" diameter plate casters (factory installed)

MODEL FEATURES

Electronic controller w/ digital display

2" high, bottom mounted front breather air divider

Field rehingeable doors

Continental
Refrigerator

Toll-Free: 800-523-7138
Phone: 215-244-1400
Fax: 215-244-9579

539 Dunksferry Road
Bensalem, PA 19020
www.continentalrefrigerator.com

APPROVAL:

Model Specifications

DIMENSIONAL DATA

Net Capacity (cu. ft.)	13.4 (379 cu l)
Width, Overall (in.)	48 (1219 mm)
Depth, Overall (in.) (incl. handles & bumpers)	31 9/16 (802 mm)
Height, Overall (in.) (incl. 1 3/8" plate casters)	31 13/16 (808 mm)
Shelf Area (sq. ft.)	6.8 (.6 sq m)
No. of Shelves	2
No. of Doors	2
Interior Depth (in.)	See Drawing
Interior Height (in.)	26 1/4 (667 mm)
Interior Width (in.)	44 (1118 mm)

REFRIGERANT DATA

Condensing Unit Size (H.P.)	1/5
Capacity (BTU/Hr)*	1620

ELECTRICAL DATA

Voltage (int'l)	115/60/1 (220/50/1)
Fans	3
Total Amps (int'l)	7.3 (3.6)
10 ft. Cord/Plug [attached] (int'l)	Yes (No)

SHIPPING DATA

Weight (lbs.)	248 (112 kg)
Height - Crated (in.)	43 1/4 (1099 mm)
Width - Crated (in.)	55 (1397 mm)
Depth - Crated (in.)	37 1/4 (946 mm)

* Rating @ +25°F evaporator, 90°F ambient

Figures in parentheses reflect metric equivalents rounded to the nearest whole unit.



Equipped with one NEMA-5-15P Plug
(varies by country)

Continental
Refrigerator

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Phone: 215-244-1400
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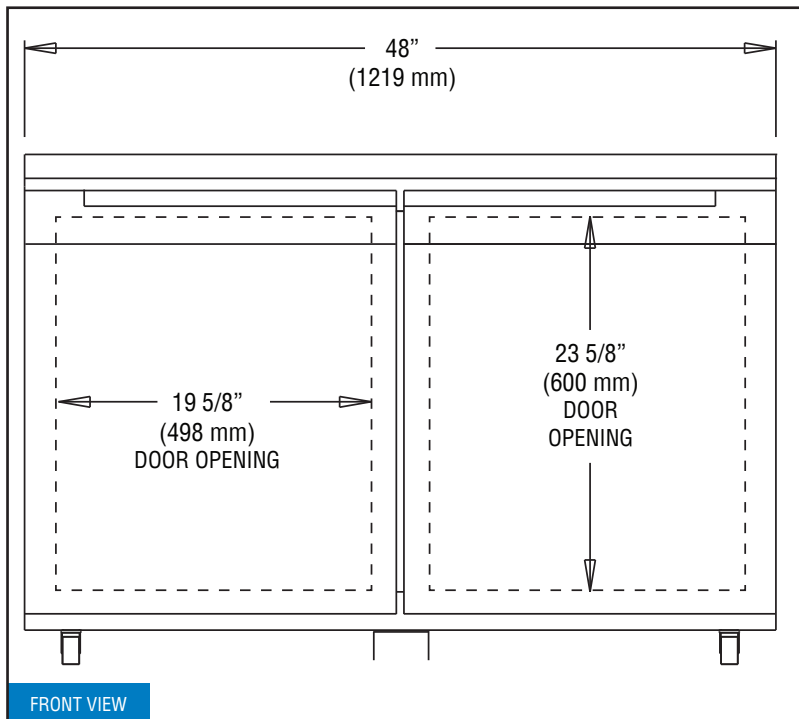
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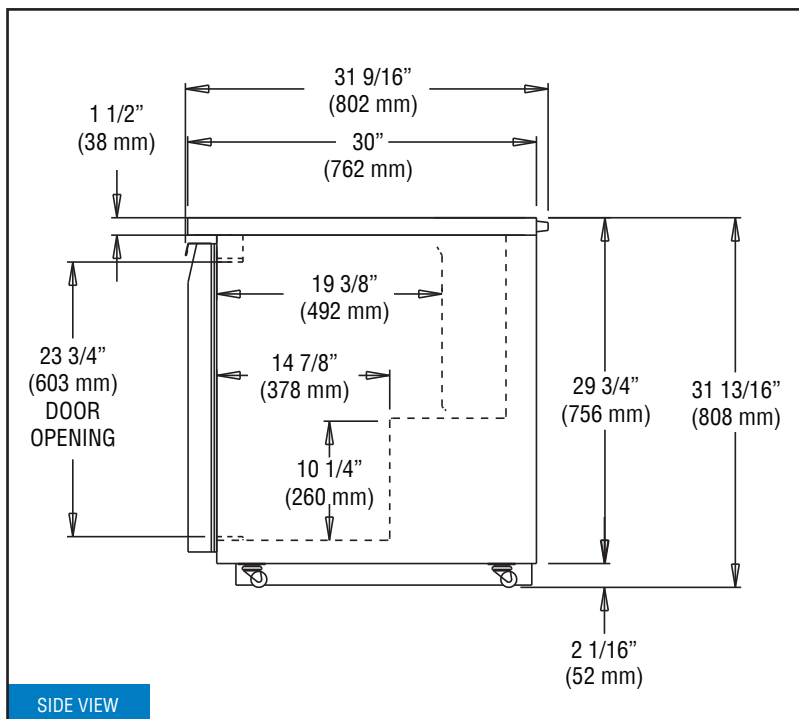
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Model Plan Views



FRONT VIEW



SIDE VIEW

NOTE: For proper operation, the area under and in front of the cabinet **must** not be obstructed in any way.

Submittal Sheet

12/20/2017

ITEM# 94 - SANDWICH / SALAD PREPARATION REFRIGERATOR (1 EA REQ'D)

Continental Refrigerator DL48-12

Designer Line Sandwich Unit, 48" wide, two-section, (12) 1/6 size x 4" deep pans with 12" cutting board, (2) field rehingable doors, stainless steel top, front, sides & interior, electronic controller w/digital display, 6" adjustable legs, rear mounted self-contained refrigeration, 1/5 hp, cETLus, NSF, Made in USA

ACCESSORIES

Mfr	Qty	Model	Spec
Continental Refrigerator	1		Standard warranty (for the United States & Canada Only): 3 year parts and labor; 5 year compressor
Continental Refrigerator	1		115v/60/1-ph, 7.3 amps, cord, NEMA 5-15P, standard
Continental Refrigerator	1		(00HFL) Stainless steel flat cover - with hinges
Continental Refrigerator	1		10" cutting board, rear mounted (NOTE: Must use stainless steel flat cover)
Continental Refrigerator	1		NOTE: Overshelves not available with rear mounted cutting board option
Continental Refrigerator	1	50177-4	Castors, swivel, with brakes (5" diameter rubber tires) set of 4 (6" height)

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1									1/5		
2	115	60	1	Cord & Plug		5-15P	7.3				

DESIGNER LINE SANDWICH UNIT

Model: **DL48-12**

48" Standard Top Sandwich Unit Refrigerator with Solid Doors - 12 Pans

Stainless steel exterior and interior.

**Certified under NSF-7 to maintain temperatures in 86°F ambient
and designed to maintain NSF-7 temperatures in 100°F ambient.**



Options and Accessories

(upcharge and lead times may apply)

Stainless steel finished back in lieu of aluminum	Rear-mounted cutting board
Overshelves (single or double)	Flat insulated night cover
Stainless steel shelves	Remote models
Drawers in lieu of doors	Door locks
Additional epoxy-coated steel shelves	Crumb catcher
Automatic, electric condensate evaporator	Top extensions
Modified pan openings	Digital thermometer
Front breathing	Casters
Expansion valve system	

Consult factory for other model configurations, options and accessories.

Continental
Refrigerator

Toll-Free: 800-523-7138
Phone: 215-244-1400
Fax: 215-244-9579

539 Dunksferry Road
Bensalem, PA 19020
www.continentalrefrigerator.com

Project Name:

Model Specified:

Location:

Item No:

Quantity:

AIA #:

SIS #:

Standard Model Features

REFRIGERATION SYSTEM

- Performance-rated refrigeration system
- Environmentally-safe R-134a refrigerant
- Unique air flow distribution allows pan product to maintain 33° - 41°F
- Automatic, energy saving, non-electric condensate evaporator
- Non-corrosive, plasticized fin evaporator coil
- Easily serviceable, back mounted compressor

CABINET ARCHITECTURE

- 2" non-CFC polyurethane foam insulation
- Spring loaded, self closing doors
- Magnetic snap-in door gaskets
- Heavy-duty, epoxy-coated steel shelves
- 12" deep, full length nylon cutting board
- Insulated lid
- Adjustable 6" stainless steel legs
- Completely enclosed, vented and removable case back

MODEL FEATURES

- (12) 1/6 size non-recessed pans, 4" deep
- Interior hanging thermometer
- Field rehingeable doors

APPROVAL:

Model Specifications

DIMENSIONAL DATA

Net Capacity (cu. ft.)	13.4 (379 cu l)
1/6 Size Pans (4" deep)	12
Width, Overall (in.)	48 (1219 mm)
Depth, Overall (in.) (incl. handles & bumpers)	31 7/16 (799 mm)
Depth, Body Only (in.) (less doors)	27 1/2 (699 mm)
Depth, Cutting Board (in.)	12 (305 mm)
Height, Overall (in.) (incl. 6" legs)	43 1/4 (1099 mm)
Shelf Area (sq. ft.)	6.8 (.6 sq m)
No. of Shelves	2
No. of Doors	2
Interior Depth (in.)	19 3/8 (492 mm)
Interior Height (in.)	26 1/4 (667 mm)
Interior Width (in.)	44 (1118 mm)

REFRIGERANT DATA

Condensing Unit Size (H.P.)	1/5
Capacity (BTU/Hr)*	1620

ELECTRICAL DATA

Voltage (int'l)	115/60/1 (220/50/1)
Fans	3
Total Amps (int'l)	7.3 (3.6)
10 ft. Cord/Plug [attached] (int'l)	Yes (No)

SHIPPING DATA

Weight (lbs.)	270 (122 kg)
Height - Crated (in.)	43 1/4 (1099 mm)
Width - Crated (in.)	64 (1626 mm)
Depth - Crated (in.)	46 (1168 mm)

* Rating @ +25°F evaporator, 90°F ambient

Figures in parentheses reflect metric equivalents rounded to the nearest whole unit.



Equipped with one NEMA-5-15P Plug
(varies by country)

Continental
Refrigerator

Toll-Free: 800-523-7138
Phone: 215-244-1400
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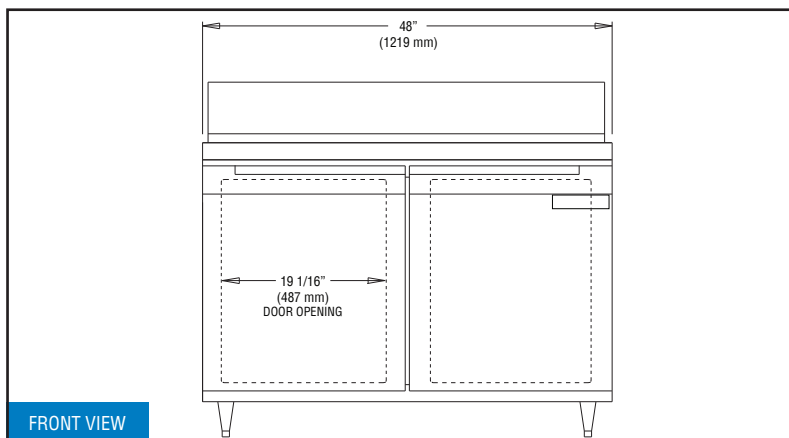


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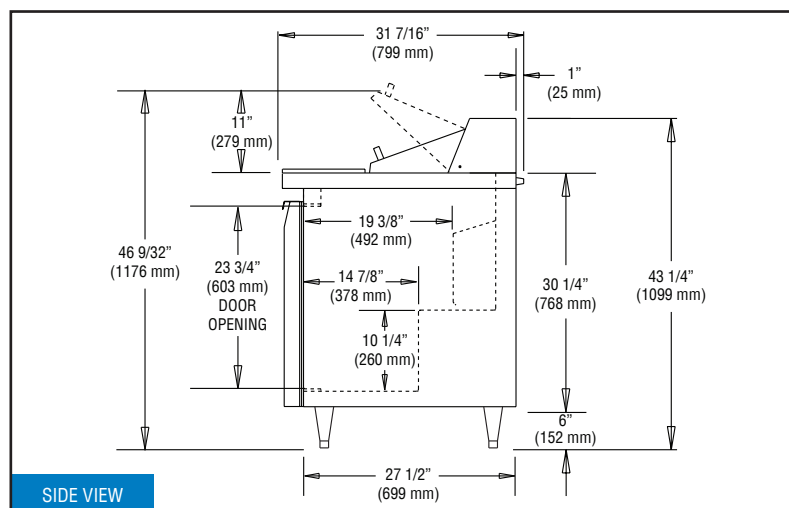
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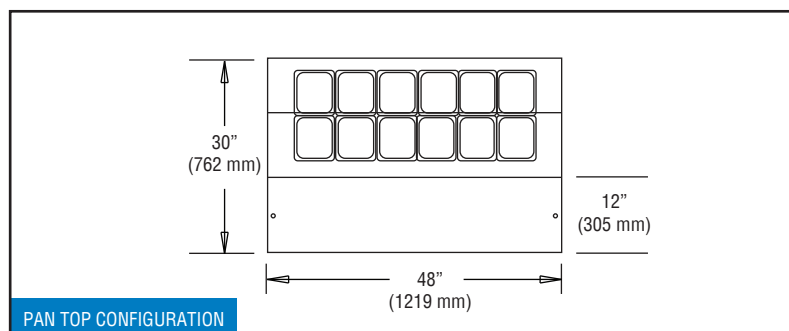
Model Plan Views



FRONT VIEW



SIDE VIEW



PAN TOP CONFIGURATION

REFRIGERATION SYSTEM

Self-contained refrigeration system is rear mounted, concealed behind a removable louvered cover. A "performancerated", air-cooled, hermetically sealed, capillary type refrigeration system is installed in model. Plasticized finned coil and air circulating fans are contained within an easily accessible rear mounted housing. Unique airflow design allows the cabinet to be enclosed on both sides or mounted flush against a wall. Refrigeration system, fully charged with R-134a refrigerant, is designed to maintain 38°-41°F while operating with an unrestricted air supply in an ambient temperature of 100°F. All condensate water is directed to a non-electric condensate vaporizer located in the compressor compartment, no plumbing is required. A strict quality assurance team inspects all materials and components to certify the model conforms to the most exacting standards. Model is performance tested for a minimum of 16 hours prior to crating.

INSULATION

All cabinet walls, top and bottom have high density, foamed-in-place, non-CFC polyurethane insulation.

CABINET CONSTRUCTION

Materials are top quality, assembled under rigid supervision conforming to strict quality assurance requirements. Case is welded metal construction, internally supported and braced for rigid unit construction. Exterior, interior and worktop are heavy gauge polished stainless steel. Design eliminates overlapping panels with raw edges. Interior corners are rounded with 1/4" radius. Joints and seams are vapor-tight sealed. Easily removable anti-sweat door heaters, concealed by non-metallic, non-conductive, high impact thermal breaker strips, eliminates condensation build-up on case front.

DOOR CONSTRUCTION

Door shells are constructed of heavy-gauge stainless steel and are internally braced and urethane-foam-insulated for rigidity. Door corners are of welded construction and polished. Replaceable snap-in door gaskets are self adjusting, heavy-duty, magnetic type. Door handles and hinges are chrome-plated and non-corrosive. Hinges are spring loaded, heavy duty and self-closing.

Submittal Sheet

12/20/2017

ITEM# 95 - HEATED CABINET, UNDERCOUNTER (1 EA REQ'D)

Cres Cor H-339-X-128C

Cabinet, Mobile Heated, under counter, insulated field reversible door, removable wire pan supports, hold (8) 12" x 20" pans slides on 2-3/4" centers, anti-microbial & magnetic latch, analog thermometer, twist-lock, non-corrosive Hi-Tensile aluminum, (4) heavy duty 3" swivel casters (2) braked, cCSAus, CSA

ACCESSORIES

Mfr	Qty	Model	Spec
Cres Cor	1		Standard Warranty: 1 yr labor, 2 yrs parts warranty
Cres Cor	1		120v/60/1-ph, 900 w, 7.5 amp, standard
Cres Cor	1		Right-hand door swing, standard

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1	120	60	1				7.5	.9			



JOB: _____

ITEM NO: _____

INSULATED UNDERCOUNTER HOT CABINET MODEL H-339-X-128C (FOR 12" X 20" PANS)

FEATURES AND BENEFITS:

- Fully insulated undercounter hot cabinet keeps prepared foods at serving temperatures. Ideal for transport.
- Powerful, yet efficient, 900 Watt heating system maintains the right temperature to properly hold products. Heats up to 200°F (93°C).
- Internal frame in body and door maintains structural rigidity.
- Body constructed of non-corrosive, Hi-Tensile aluminum for strength and ease of mobility. One piece extended base protects cabinet body.
- Safety-conscious anti-microbial latch protects against spreading germs.
- Insulated field reversible door for flexibility. Standard with right hand hinging; left hand hinging available upon request.
- Magnetic latch for "easy open"; twist-lock catch secures door during transport. Latch and hinges mounted inboard.
- Removable wire pan supports for easy cleaning hold 12" x 20" pans on 2-3/4" centers.
- Pan stops on inside of door and back allow for proper air flow.
- Heavy duty 3" swivel casters, two with brakes. Provides mobility when fully loaded.



H-339-X-128C



ACCESSORIES and OPTIONS

(Available at extra cost):

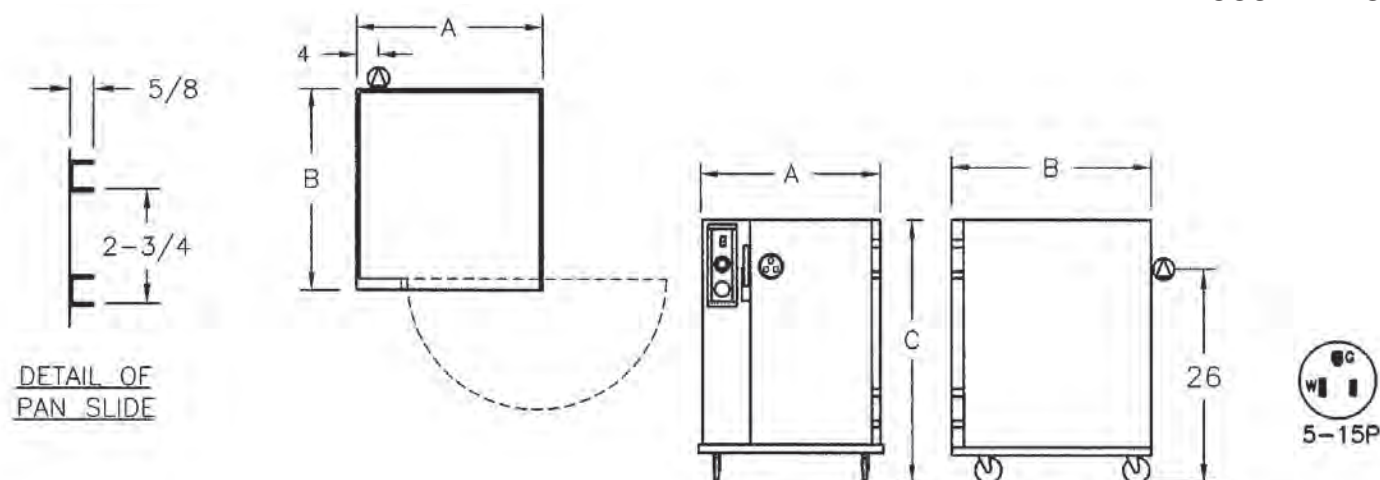
- ☐ Key Lock Handle
- ☐ Pan Support Interior for 13" x 18" Trays
- ☐ Corner Bumpers
- ☐ Perimeter Bumper
- ☐ Digital Thermometer
- ☐ Door Window
- ☐ 240 Volt Service

See page B-20 for accessory details.



5925 Heisley Road • Mentor, OH 44060-1833
Phone: 877/CRESCOR • Fax: 440/350-7267
www.crescor.com

Page B-13.1A
Nov., 2013

H-339-X-128C

CRES COR MODEL NO.	PAN			DIM "A"	DIM "B"	DIM "C"	INSIDE DIMENSIONS				WEIGHT ACT.
	CAP	SIZE		WIDTH	DEPTH	HEIGHT	WIDTH	DEPTH	HEIGHT		
H-339-X-128C	8	12 x 20	IN	22-5/8	27-1/4	32	13-3/16	21-1/4	24-7/8	LBS	112
		305 x 510	MM	575	695	813	335	540	632	KG	51

CABINET:

- Body: .063 aluminum.
- Reinforcement: Internal framework of channels, 1 x 3/4 x .125.
- Insulation: Fiberglass, thermal conductivity (K factor) is .23 at 75°F. 1-1/2" in walls; 1" in door, top and bottom.
- Pan stop channels: Mounted to inside rear of cabinet and door.

BASE:

- One piece construction, .125 aluminum.
- Casters: 3" dia., swivel, modulus tires, 1-1/4 wide, load cap. 240 lbs. each, temp. range -45°/+180°F. Bearings are sealed and permanently lubricated. Front casters equipped with brakes.

DOOR:

- Field reversible.
- Formed .063 aluminum.
- Latch: Chrome plated zinc with composite handle, magnetic type; mounted inboard.
- Hinges: Heavy duty chrome plated zinc; mounted inboard.
- Gasket: Perimeter type, silicone.
- Transport latch.
- Vent: Adjustable.

PAN SLIDES:

- Flat wire racks, .104 x 5/8 nickel chrome plated steel, spaced on 2-3/4" centers.

ELECTRICAL COMPARTMENT:

- Control panel: Formed .063 aluminum; black front.
- Thermostat: Solid state, room ambient to 200°F (93°C).
- Switch: Lighted ON-OFF rocker type.
- Power cord: Permanent, 6 ft., 14/3 ga. with molded straight plug.
- Heaters (3): 300 Watts each.
- Thermometer.

POWER REQUIREMENTS:

- 900 Watts, 120 Volts, 60 Hz., single phase, 7.5 Amps., 15 Amp. service.

SHORT FORM SPECIFICATIONS

Cres Cor Insulated Under Counter Hot Cabinet Model H-339-X-128C. Inner, outer and top liners of .063 aluminum, reinforced with channel frame. Field reversible, formed .063 aluminum door. Fiberglass insulation in walls 1-1/2"; door, top and bottom 1". Welded and finished .125 aluminum base. (3) 300 Watt inner wall heaters, 120 Volts. Removable pan supports for (8) 12" x 20" pans on 2-3/4" centers. 3" swivel modulus casters, permanently lubricated. Load capacity 240 lbs. each. 2-Year parts / 1-Year Labor warranty. Provide the following accessories: _____ . CSA-US, CSA-C, CSA to NSF4 listed.



5925 Heisley Road • Mentor, OH 44060-1833
Phone: 877/CRESCOR • Fax: 440/350-7267
www.crescor.com

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In line with its policy to continually improve its products, CRES COR reserves the right to change materials and specifications without notice.

Litho in U.S.A.

Submittal Sheet

12/20/2017

ITEM# 96 - DOUBLE OVERSHELF (1 REQ'D)

Eagle Group CUSTOM

Submittal Sheet

12/20/2017

ITEM# 97 - OMS SCREEN - WALL MOUNT (1 REQ'D)

Provided by Operations CONTACT OPERATIONS

Submittal Sheet

12/20/2017

ITEM# 110 - DISPOSABLE CUP DISPENSER (5 EA REQ'D)

Dispense-Rite ADJ-2

Cup Dispenser, in-counter, adjustable, two spring (F & P), accommodates cups 8 oz. to 44 oz. with rim diameter range 3" - 4-5/8", ring bezel 6-7/8", 22" long, stainless steel construction, for paper, plastic and foam cups in vertical, horizontal or angled mounting, NSF

ACCESSORIES

Mfr	Qty	Model	Spec
Dispense-Rite	5		1 year limited warranty, standard

Submittal Sheet

12/20/2017

ITEM# 111 - REFRIGERATED SELF-SERVICE UNDER COUNTER HEIGHT CASE (3 EA REQ'D)

Structural Concepts CO63R-UC

Oasis® Self-Service Refrigerated Under Counter Height Case, 71-1/4"W, 32-3/4"H, Breeze-E (Type II) with EnergyWise self-contained refrigeration system, Blue Fin coated coil, top light, one piece formed ABS plastic tub, black interior, (2) square full end panels, casters with levelers, front panel extends over end panels to blend with adjacent counters (supplied by others), counter surface (supplied by others) extends over top of unit, cETLus, ETL-Sanitation

ACCESSORIES

Mfr	Qty	Model	Spec
Structural Concepts	3		NOTE: If GFCI is required, a GFCI breaker MUST be used in lieu of a GFCI receptacle
Structural Concepts	3		1 yr. parts & labor warranty, 5 yr. compressor warranty, standard
Structural Concepts	3		Breeze-E (Type II) with EnergyWise refrigeration - NSF Type II compliant, standard
Structural Concepts	3		110-120v/60/1ph, 15.02 amps, standard
Structural Concepts	3		6 ft straight blade power cord with NEMA 5-20P, standard
Structural Concepts	3		NOTE: Compressor air rear intake, front discharge at toe kick, unit MUST remain 4" from wall & front & rear panels cannot be blocked (Not applicable with remote refrigeration option)
Structural Concepts	3		Interior: Stainless steel, in lieu of standard black
Structural Concepts	3		Exterior: Stainless steel
Structural Concepts	3		Exterior back panel: Solid back panel - stainless steel
Structural Concepts	3		Left end panel: Square full with mirrored interior, standard
Structural Concepts	3		Right end panel: Square full with mirrored interior, standard
Structural Concepts	3		Night curtain, retractable, non-locking (not available with security cover)

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1	110-120	60	1	Cord & Plug			15.02				
2						5-20P					

Oasis®

Product Specifications

Refrigerated Self-Service Counter Case

- ☐ CO33R
- ☐ CO43R
- ☐ CO53R
- ☐ CO63R

Lengths include end panels

36-1/4"L x 32-3/8"D x 33-3/4"H

47-1/4"L x 32-3/8"D x 33-3/4"H

59-1/4"L x 32-3/8"D x 33-3/4"H

71-1/4"L x 32-3/8"D x 33-3/4"H



STD = FREESTANDING (-FS) / 33-3/4"H



OPT = COUNTER HEIGHT (-CH) / 33-3/4"H



OPT = UNDERCOUNTER HEIGHT (-UC) / 32-3/4"H

Conforms to NSF STD 7
TYPE II

STANDARD FEATURES

- NOTE: ADD SUFFIX TO MODEL # LISTED ABOVE BASED ON MODEL CONFIGURATION CHOSEN BELOW
- Breeze~E (Type-II) w/ EnergyWise s/c refrigeration
- Blue Fin coated coil
- Casters (non-locking) w/ levelers
- Compressor air rear intake, front discharge at toe kick. Front and rear panels cannot be blocked. Must remain 4" from wall
- Condensate pan (self-contained refrig. only)
- Flat front panel
- Integrated average product temperature of 40°F or less
- LED 3500K top light(s)
- One piece formed ABS plastic tub
- One year parts & labor; 5 year compressor warranty
- Removable deck pans provide complete access to evaporator coil & refrigeration connections
- Toe kick, black

Features	Standard	Options
MODEL CONFIGURATION	<input type="checkbox"/> Freestanding (-FS) Counter ht. 33-3/4"H; freestanding unit w/2 end panels. Top & front panels positioned between end panels	<input type="checkbox"/> Counter height (-CH) Counter ht. 33-3/4"H; Top & front panels extended over end panels to blend w/adj. counters (supplied by others) <input type="checkbox"/> Undercounter height (-UC) Undercounter ht. 32-3/4"H; front panel extends over end panels to blend w/adj. counters (supplied by others). Counter surface (supplied by others) extends over top of unit
EXTERIOR COLOR	<input type="checkbox"/> Laminated (non-premium) Confirm pattern/grain direction	<input type="checkbox"/> Laminated (premium) Confirm pattern/grain direction <input type="checkbox"/> Stainless steel exterior
INTERIOR COLOR	<input type="checkbox"/> Black interior	<input type="checkbox"/> Stainless steel interior
END PANEL LEFT	<input type="checkbox"/> Square full end panel w/mirror	<input type="checkbox"/> Curved end panel w/mirror (-FS model only) <input type="checkbox"/> No end panel w/ synchronized defrost
END PANEL RIGHT	<input type="checkbox"/> Square full end panel w/mirror	<input type="checkbox"/> Curved end panel w/mirror (-FS model only) <input type="checkbox"/> No end panel w/ synchronized defrost
EXTERIOR BACK PANEL	<input type="checkbox"/> Solid back panel, black	<input type="checkbox"/> Solid back panel, stainless steel
ELECTRICAL CONNECT	<input type="checkbox"/> 6' straight blade power cord (self-cont.)	<input type="checkbox"/> 6' locking power cord (self-cont.) <input type="checkbox"/> Electrical leads (remote)
REFRIGERATION	<input type="checkbox"/> Breeze~E (Type-II) w/ EnergyWise s/c refrigeration	<input type="checkbox"/> Note: Remote doesn't incl Conds unit. Floor drain reqd. <input type="checkbox"/> Remote w/thermostat, solenoid & TXV
MISCELLANEOUS		<input type="checkbox"/> Second year parts & labor warranty (excludes compressor)
ACCESSORIES		<input type="checkbox"/> 2"H Full depth display riser(s) for lower display <input type="checkbox"/> Clean Sweep® coil cleaner (n/a w/remote) <input type="checkbox"/> Night curtain, retractable, non-locking <input type="checkbox"/> Solid security cover, removable, locking

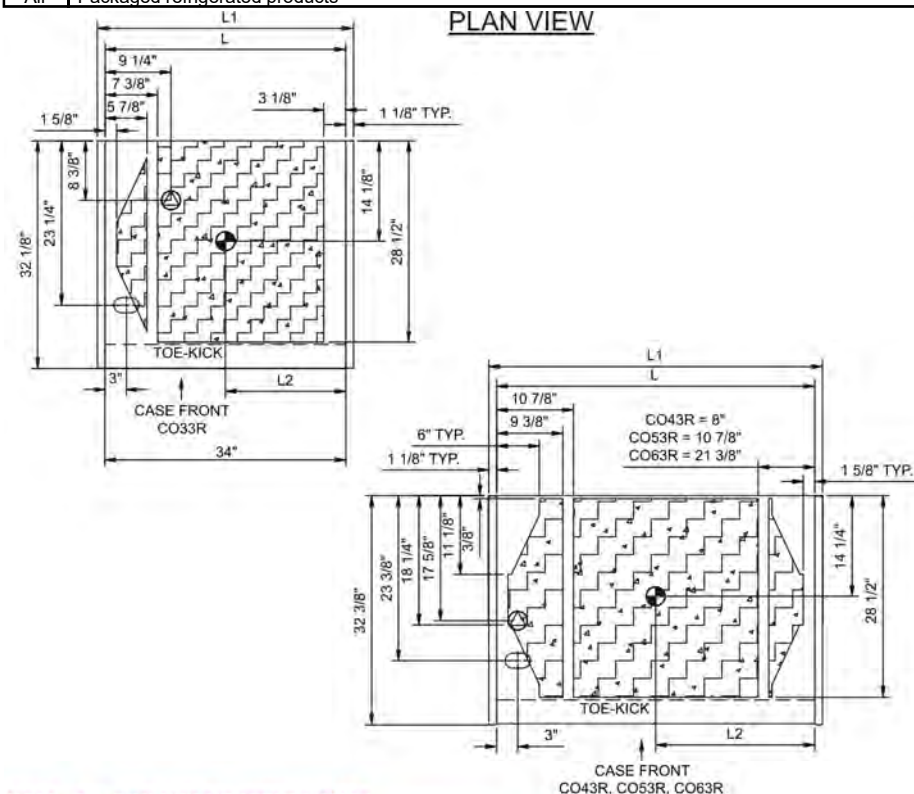
Option Notes: 1 - See tech spec for remote load reqmts

Oasis®

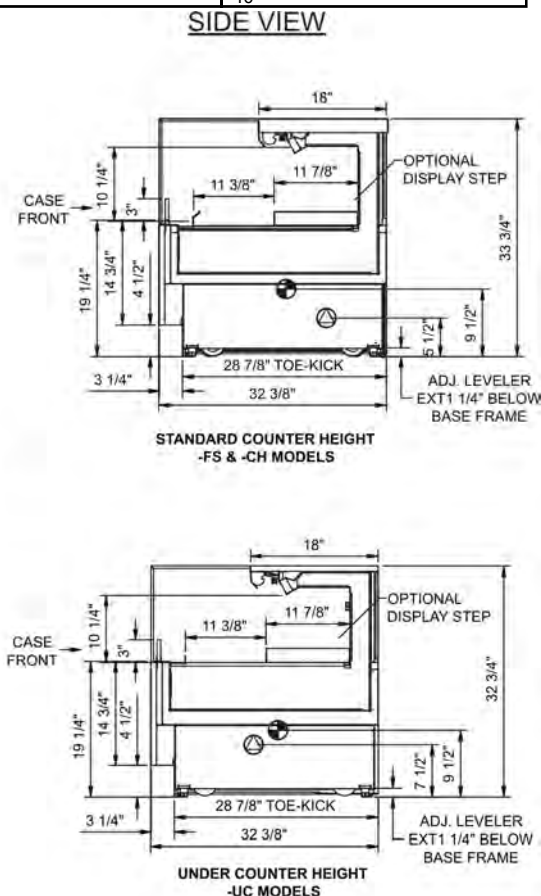
Product Specifications

Intended Environment: Type II - Designed to operate in ambient conditions of 80°F and 60% relative humidity unless noted otherwise in system information below.

Zone	Intended Product To Be Displayed	Warmest Avg Prod Temp ° F
All	Packaged refrigerated products	40



NOTE: ALL DIMENSIONS APPROXIMATE



Model Technical Specifications															
Model	L"	L1"	L2"	System Circuit Volts			Phs	Freq	Amps ***	Watts	Wires	NEMA Plug	SST	BTUH	Est Wt
CO33R	N/A	36.25	17.00	Remote(Type I)	Circuit #1	110-120	1	60	1.12	36	2+G	Leads Multiple	20.00	1650	600
				Remote(Type II)	Circuit #1	110-120	1	60	1.12	42	2+G	Leads Multiple	20.00	1975	
				Self-Contained	Circuit #1	110-120	1	60	10.98	1,114	2+G	5-15P or L5-15P	N/A	N/A	
CO43R	N/A	47.25	22.50	Remote(Type I)	Circuit #1	110-120	1	60	1.14	40	2+G	Leads Multiple	20.00	1875	700
				Remote(Type II)	Circuit #1	110-120	1	60	1.14	40	2+G	Leads Multiple	20.00	2225	
				Self-Contained	Circuit #1	110-120	1	60	11.70	1,241	2+G	5-15P or L5-15P	N/A	N/A	
CO53R	N/A	59.25	28.50	Remote(Type I)	Circuit #1	110-120	1	60	1.22	52	2+G	Leads Multiple	20.00	2375	900
				Remote(Type II)	Circuit #1	110-120	1	60	1.22	52	2+G	Leads Multiple	20.00	2800	
				Self-Contained	Circuit #1	110-120	1	60	14.58	1,446	2+G	5-20P or L5-20P	N/A	N/A	
CO63R	N/A	71.25	34.50	Remote(Type I)	Circuit #1	110-120	1	60	1.56	75	2+G	Leads Multiple	20.00	2925	1,000
				Remote(Type II)	Circuit #1	110-120	1	60	1.56	75	2+G	Leads Multiple	20.00	3450	
				Self-Contained	Circuit #1	110-120	1	60	15.02	1,485	2+G	5-20P or L5-20P	N/A	N/A	

*** Does not include electric defrost on freezer models.

Regulatory Approvals:

All Models	<p>Accordance with AHRI Std 1200</p> <p>ETL Listed to UL 471</p> <p>ETL Listed to CAN/CSA 22.2 No. 1200</p> <p>ETL Sanitation to NSF 7</p>
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Important Notes:

- 1) ELECTRICAL NOTE: If GFCI is required, a GFCI breaker MUST be used in lieu of a GFCI receptacle
- 2) 33" Minimum entry door clearance required (w/out shipping skid)
- 3) Performance issues (product temperatures, water on floor, etc.) caused by adverse conditions are not covered by warranty.
- 4) Keep unit at least 15' from exterior doors, overhead HVAC vents, or any air curtain disruption.
- 5) Do not expose unit to direct sunlight or any heat source (ovens, fryers, etc.).

Submittal Sheet

12/20/2017

ITEM# 112 - HEATED SHELF FOOD WARMER (2 EA REQ'D)

Hatco GRSBF-48-I

Glo-Ray® Built In Heated Shelf with Flush Top, 49-1/2" x 21" surface area, hardcoat aluminum top, control thermostat, illuminated on/off switch & mounting bracket, NSF, cUL, UL, UL EPH Classified, ANSI/NSF 4, CSA

ACCESSORIES

Mfr	Qty	Model	Spec
Hatco	1		NOTE: Sale of this product must comply with Hatco's Minimum Resale Price Policy; consult order acknowledgement for details
Hatco	1		NOTE: Includes 24/7 parts & service assistance, call 800-558-0607
Hatco	2		1-Yr Warranty on Blanket Heating Elements against burnout, standard
Hatco	2		120v/60/1-ph, 1000W, 8.3 amps, NEMA 5-15P
Hatco	2		NOTE: Recommended for use in metallic countertop, verify that the material is suitable for temperatures up to 200 degree F
Hatco	2		Thermostat control with lighted rocker switch (Available at time of purchase only), standard

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1	120	60	1	Cord & Plug		5-15P	8.3	1.0			



Project _____
 Item # _____
 Quantity _____

Glo-Ray® Built-In Rectangular Heated Shelves with Flush Top

Models: GRSBF-24-F, -I, -S, -O; -30-F, -I, -S, -O;
 -36-F, -I, -S, -O; -42-F, -I, -S, -O; -48-F, -I, -S, -O;
 -60-F, -I, -S, -O; -72-F, -I, -S, -O

Let Hatco add heat to your serving surface with the Glo-Ray® Rectangular Built-In Heated Shelf with Flush Top. This flush top foodwarmer has a hardcoated aluminum surface and blanket-type element for uniform heat to extend your food holding time. Fiberglass insulation keeps heat at the holding surface while a built-in adjustable thermostat controls surface temperature.

Standard features

- Uniform heat distribution with hardcoated aluminum surface and blanket-type element
- 36" (914 mm) flexible conduit channels power lines from the shelf to a control box
- GRSBF models are available in widths from 25.5" to 73.5" (648-1867 mm) and depths of 17", 21", 25.5" or 31.5" (432, 533, 648 or 800 mm).
- Standard controller includes control thermostat, an illuminated power switch and mounting brackets
- Thermostatically-controlled heated base
- The Built-in Heated Shelf has a .75" (19 mm) flanged edge that allows the unit to fit into a countertop opening
- Recommended for use in metallic counters. For other surfaces, verify that the material is suitable for temperature up to 200°F (93°C)♦

* Models with flush mount recessed electronic control box are not CE approved.

** Non-standard colors are non-returnable.

♦ Hatco is not responsible for counter damage caused by heat from the warmer.



Options (available at time of purchase only)

Designer Colors for Flush Mount Control Bezel Box - Stainless Steel is standard color**

☐ Warm Red ☐ Black ☐ Gray Granite ☐ White Granite
☐ Navy Blue ☐ Hunter Green ☐ Antique Copper

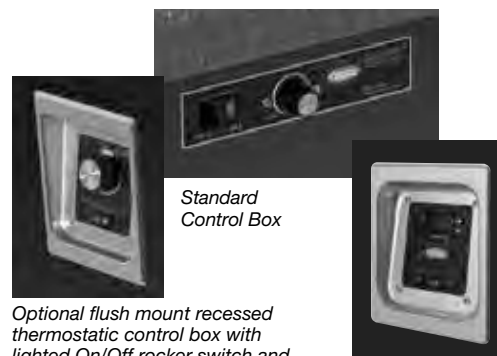
☐ Stainless Steel Top Surface

☐ Flush Mount Electronic Control Box with Lighted Power Switch with cord and plug

☐ Flush Mount Thermostatic Control Box with Lighted Power Switch with cord and plug

Conduit in lieu of standard 3' (914 mm) (Flush Mount ITC Control Box only)

☐ 6' (1829 mm) conduit ☐ 10' (3048 mm) conduit



Standard
Control Box

Optional flush mount recessed
thermostatic control box with
lighted On/Off rocker switch and
angled recessed controls

Optional flush
mount recessed
electronic control
box with lighted
On/Off rocker
switch and angled
recessed controls

Note for Built-in Heated Shelves with overhead Strip Heaters:

For any size GRSBF, the next larger size GRA or GR2A Strip Heater will fit over the top. For example, a GRSBF-30 will require a GRA-36 or GR2A-36. The GRA will have a tight fit to the frame of the base. The GR2A will have approximately a 4" (102 mm) space.



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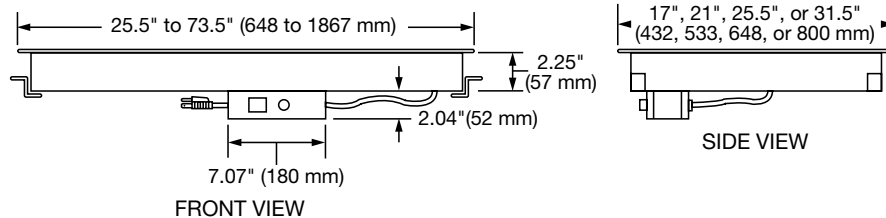
(800) 558-0607 | (414) 671-6350 | www.hatcocorp.com | equipsales@hatcocorp.com | intl@hatcocorp.com



Glo-Ray® Flush Top Built-In Heated Shelves

Models: GRSBF-24-F, -I, -S, -O; -30-F, -I, -S, -O; -36-F, -I, -S, -O; -42-F, -I, -S, -O;
-48-F, -I, -S, -O; -60-F, -I, -S, -O; -72-F, -I, -S, -O

GRSBF Models Shown with Standard Control Box



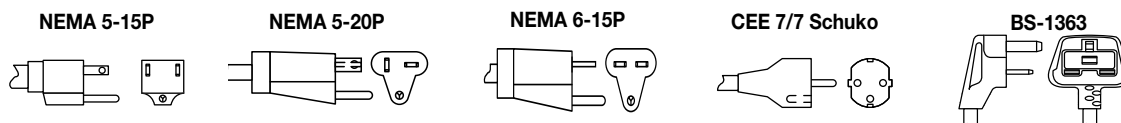
GRSBF Built-In Countertop Cut-Out Dimensions

Model	Minimum Width	Maximum Width	Minimum Depth	Maximum Depth
GRSBF-24-F	24.5" (622 mm)	24.75" (629 mm)	16" (406 mm)	16.25" (413 mm)
GRSBF-24-I	24.5" (622 mm)	24.75" (629 mm)	20" (508 mm)	20.25" (514 mm)
GRSBF-24-S	24.5" (622 mm)	24.75" (629 mm)	24.5" (622 mm)	24.75" (629 mm)
GRSBF-24-O	24.5" (622 mm)	24.75" (629 mm)	30.5" (775 mm)	30.75" (781 mm)
GRSBF-30-F	30.5" (775 mm)	30.75" (781 mm)	16" (406 mm)	16.25" (413 mm)
GRSBF-30-I	30.5" (775 mm)	30.75" (781 mm)	20" (508 mm)	20.25" (514 mm)
GRSBF-30-S	30.5" (775 mm)	30.75" (781 mm)	24.5" (622 mm)	24.75" (629 mm)
GRSBF-30-O	30.5" (775 mm)	30.75" (781 mm)	30.5" (775 mm)	30.75" (781 mm)
GRSBF-36-F	36.5" (927 mm)	36.75" (933 mm)	16" (406 mm)	16.25" (413 mm)
GRSBF-36-I	36.5" (927 mm)	36.75" (933 mm)	20" (508 mm)	20.25" (514 mm)
GRSBF-36-S	36.5" (927 mm)	36.75" (933 mm)	24.5" (622 mm)	24.75" (629 mm)
GRSBF-36-O	36.5" (927 mm)	36.75" (933 mm)	30.5" (775 mm)	30.75" (781 mm)
GRSBF-42-F	42.5" (1080 mm)	42.75" (1086 mm)	16" (406 mm)	16.25" (413 mm)
GRSBF-42-I	42.5" (1080 mm)	42.75" (1086 mm)	20" (508 mm)	20.25" (514 mm)
GRSBF-42-S	42.5" (1080 mm)	42.75" (1086 mm)	24.5" (622 mm)	24.75" (629 mm)
GRSBF-42-O	42.5" (1080 mm)	42.75" (1086 mm)	30.5" (775 mm)	30.75" (781 mm)
GRSBF-48-F	48.5" (1232 mm)	48.75" (1238 mm)	16" (406 mm)	16.25" (413 mm)
GRSBF-48-I	48.5" (1232 mm)	48.75" (1238 mm)	20" (508 mm)	20.25" (514 mm)
GRSBF-48-S	48.5" (1232 mm)	48.75" (1238 mm)	24.5" (622 mm)	24.75" (629 mm)
GRSBF-48-O	48.5" (1232 mm)	48.75" (1238 mm)	30.5" (775 mm)	30.75" (781 mm)
GRSBF-60-F	60.5" (1537 mm)	60.75" (1543 mm)	16" (406 mm)	16.25" (413 mm)
GRSBF-60-I	60.5" (1537 mm)	60.75" (1543 mm)	20" (508 mm)	20.25" (514 mm)
GRSBF-60-S	60.5" (1537 mm)	60.75" (1543 mm)	24.5" (622 mm)	24.75" (629 mm)
GRSBF-60-O	60.5" (1537 mm)	60.75" (1543 mm)	30.5" (775 mm)	30.75" (781 mm)
GRSBF-72-F	72.5" (1842 mm)	72.75" (1848 mm)	16" (406 mm)	16.25" (413 mm)
GRSBF-72-I	72.5" (1842 mm)	72.75" (1848 mm)	20" (508 mm)	20.25" (514 mm)
GRSBF-72-S	72.5" (1842 mm)	72.75" (1848 mm)	24.5" (622 mm)	24.75" (629 mm)
GRSBF-72-O	72.5" (1842 mm)	72.75" (1848 mm)	30.5" (775 mm)	30.75" (781 mm)

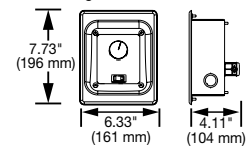
CORD LOCATION

Cord Location: Cord is attached to Control Box.

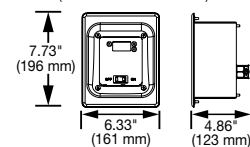
PLUG CONFIGURATIONS



Optional GRSB-FLUSH-TSTAT Flush Mount Thermostatic Control Box with Lighted Rocker Switch



Optional GRSB-FLUSH-ITC Flush Mount Electronic Control Box with Lighted Rocker Switch (not available with CE mark)



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Glo-Ray® Flush Top Built-In Heated Shelves

Models: GRSBF-24-F, -I, -S, -O; -30-F, -I, -S, -O; -36-F, -I, -S, -O; -42-F, -I, -S, -O;
-48-F, -I, -S, -O; -60-F, -I, -S, -O; -72-F, -I, -S, -O

SPECIFICATIONS

Built-In Rectangular Heated Shelves with Flush Top

The shaded areas contain electrical information for International models

Model	Dimensions (W x D x H)	Usable Shelf (W x D)	Volts	Phase	Watts	Amps	Plug	Ship Weight*
GRSBF-24-F	25.5" x 17" x 2.25" (648 x 432 x 57 mm)	25.5" x 17" (648 x 432 mm)	120	Single	420	3.5	NEMA 5-15P	28 lbs. (13 kg)
			220		384	1.7	CEE 7/7 Schuko	28 lbs. (13 kg)
			240		458	1.9	BS-1363	
			220-230 (CE)		384-420	1.7-1.8	CEE 7/7 Schuko	
			230-240 (CE)		420-458	1.8-1.9	BS-1363	
GRSBF-24-I	25.5" x 21" x 2.25" (648 x 533 x 57 mm)	25.5" x 21" (648 x 533 mm)	100	Single	550	5.5	NEMA 5-15P	28 lbs. (13 kg)
			120		550	4.6	NEMA 5-15P	28 lbs. (13 kg)
			220		550	2.5	CEE 7/7 Schuko	28 lbs. (13 kg)
			240		550	2.3	BS-1363	
			220-230 (CE)		550-601	2.5-2.6	CEE 7/7 Schuko	
GRSBF-24-S	25.5" x 25.5" x 2.25" (648 x 648 x 57 mm)	25.5" x 25.5" (648 x 648 mm)	120	Single	700	5.8	NEMA 5-15P	32 lbs. (15 kg)
			220		640	2.9	CEE 7/7 Schuko	32 lbs. (15 kg)
			240		762	3.2	BS-1363	
			220-230 (CE)		640-700	2.9-3.0	CEE 7/7 Schuko	
			230-240 (CE)		700-762	3.0-3.2	BS-1363	
GRSBF-24-O	25.5" x 31.5" x 2.25" (648 x 800 x 57 mm)	25.5" x 31.5" (648 x 800 mm)	120	Single	790	6.6	NEMA 5-15P	35 lbs. (16 kg)
			220		722	3.3	CEE 7/7 Schuko	35 lbs. (16 kg)
			240		860	3.4	BS-1363	
			220-230 (CE)		722-790	3.3-3.4	CEE 7/7 Schuko	
			230-240 (CE)		790-860	3.4-3.6	BS-1363	
GRSBF-30-F	31.5" x 17" x 2.25" (800 x 432 x 57 mm)	31.5" x 17" (800 x 432 mm)	120	Single	505	4.2	NEMA 5-15P	24 lbs. (11 kg)
			220		462	2.1	CEE 7/7 Schuko	24 lbs. (11 kg)
			240		550	2.3	BS-1363	
			220-230 (CE)		462-505	2.1-2.2	CEE 7/7 Schuko	
			230-240 (CE)		505-550	2.2-2.3	BS-1363	
GRSBF-30-I	31.5" x 21" x 2.25" (800 x 533 x 57 mm)	31.5" x 21" (800 x 533 mm)	100	Single	665	6.7	NEMA 5-15P	30 lbs. (14 kg)
			120		665	5.6	NEMA 5-15P	30 lbs. (14 kg)
			220		665	3.0	CEE 7/7 Schuko	30 lbs. (14 kg)
			240		665	2.8	BS-1363	
			220-230 (CE)		665-727	3.0-3.2	CEE 7/7 Schuko	
GRSBF-30-S	31.5" x 25.5" x 2.25" (800 x 648 x 57 mm)	31.5" x 25.5" (800 x 648 mm)	120	Single	825	6.9	NEMA 5-15P	33 lbs. (15 kg)
			220		755	3.4	CEE 7/7 Schuko	33 lbs. (15 kg)
			240		898	3.7	BS-1363	
			220-230 (CE)		755-825	3.4-3.6	CEE 7/7 Schuko	
			230-240 (CE)		825-898	3.6-3.7	BS-1363	
GRSBF-30-O	31.5" x 31.5" x 2.25" (800 x 800 x 57 mm)	31.5" x 31.5" (800 x 800 mm)	120	Single	950	7.9	NEMA 5-15P	37 lbs. (17 kg)
			220		868	4.0	CEE 7/7 Schuko	37 lbs. (17 kg)
			240		985	4.5	BS-1363	
			220-230 (CE)		916-1001	4.2-4.4	CEE 7/7 Schuko	
			230-240 (CE)		904-985	3.9-4.1	BS-1363	
GRSBF-36-F	37.5" x 17" x 2.25" (953 x 432 x 57 mm)	37.5" x 17" (953 x 432 mm)	120	Single	590	4.9	NEMA 5-15P	32 lbs. (15 kg)
			220		540	2.5	CEE 7/7 Schuko	32 lbs. (15 kg)
			240		642	2.7	BS-1363	
			220-230 (CE)		540-590	2.5-2.6	CEE 7/7 Schuko	
			230-240 (CE)		590-643	2.6-2.7	BS-1363	
GRSBF-36-I	37.5" x 21" x 2.25" (953 x 533 x 57 mm)	37.5" x 21" (953 x 533 mm)	100	Single	780	7.8	NEMA 5-15P	30 lbs. (14 kg)
			120		780	6.5	NEMA 5-15P	30 lbs. (14 kg)
			220		780	3.5	CEE 7/7 Schuko	30 lbs. (14 kg)
			240		780	3.3	BS-1363	
			220-230 (CE)		780-853	3.5-3.7	CEE 7/7 Schuko	
GRSBF-36-I	37.5" x 21" x 2.25" (953 x 533 x 57 mm)	37.5" x 21" (953 x 533 mm)	230-240 (CE)		716-780	3.1-3.3	BS-1363	

* Shipping weight includes packaging.

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Glo-Ray® Flush Top Built-In Heated Shelves

Models: GRSBF-24-F, -I, -S, -O; -30-F, -I, -S, -O; -36-F, -I, -S, -O; -42-F, -I, -S, -O;
-48-F, -I, -S, -O; -60-F, -I, -S, -O; -72-F, -I, -S, -O

SPECIFICATIONS

Built-In Rectangular Heated Shelves with Flush Top

The shaded areas contain electrical information for international models

Model	Dimensions (W x D x H)	Usable Shelf (W x D)	Volts	Phase	Watts	Amps	Plug	Ship Weight*
GRSBF-36-S	37.5" x 25.5" x 2.25" (953 x 648 x 57 mm)	37.5" x 25.5" (953 x 648 mm)	120	Single	950	7.9	NEMA 5-15P	35 lbs. (16 kg)
			220		870	4.0	CEE 7/7 Schuko	35 lbs. (16 kg)
			240		1034	4.3	BS-1363	
			220-230 (CE)		870-951	4.0-4.1	CEE 7/7 Schuko	
			230-240 (CE)		950-1034	4.1-4.3	BS-1363	
GRSBF-36-O	37.5" x 31.5" x 2.25" (953 x 800 x 57 mm)	37.5" x 31.5" (953 x 800 mm)	120	Single	1110	9.3	NEMA 5-15P	37 lbs. (17 kg)
			220		1014	4.6	CEE 7/7 Schuko	37 lbs. (17 kg)
			240		1110	4.6	BS-1363	
			220-230 (CE)		1110-1213	5.0-5.3	CEE 7/7 Schuko	
			230-240 (CE)		1020-1110	4.4-4.6	BS-1363	
GRSBF-42-F	43.5" x 17" x 2.25" (1105 x 432 x 57 mm)	43.5" x 17" (1105 x 432 mm)	120	Single	685	5.7	NEMA 5-15P	38 lbs. (17 kg)
			220		627	2.9	CEE 7/7 Schuko	38 lbs. (17 kg)
			240		746	3.1	BS-1363	
			220-230 (CE)		627-685	2.9-3.0	CEE 7/7 Schuko	
			230-240 (CE)		685-746	3.0-3.1	BS-1363	
GRSBF-42-I	43.5" x 21" x 2.25" (1105 x 533 x 57 mm)	43.5" x 21" (1105 x 533 mm)	100	Single	885	8.9	NEMA 5-15P	32 lbs. (15 kg)
			120		885	7.4	NEMA 5-15P	32 lbs. (15 kg)
			220		885	4.0	CEE 7/7 Schuko	32 lbs. (15 kg)
			240		885	3.7	BS-1363	
			220-230 (CE)		885-967	4.0-4.2	CEE 7/7 Schuko	
GRSBF-42-S	43.5" x 25.5" x 2.25" (1105 x 648 x 57 mm)	43.5" x 25.5" (1105 x 648 mm)	120	Single	1100	9.2	NEMA 5-15P	40 lbs. (18 kg)
			220		1006	4.6	CEE 7/7 Schuko	40 lbs. (18 kg)
			240		1198	5.0	BS-1363	
			220-230 (CE)		1006-1100	4.6-4.8	CEE 7/7 Schuko	
			230-240 (CE)		1100-1198	4.8-5.0	BS-1363	
GRSBF-42-O	43.5" x 31.5" x 2.25" (1105 x 800 x 57 mm)	43.5" x 31.5" (1105 x 800 mm)	120	Single	1270	10.6	NEMA 5-15P	48 lbs. (22 kg)
			220		1161	5.3	CEE 7/7 Schuko	48 lbs. (22 kg)
			240		1305	5.4	BS-1363	
			220-230 (CE)		1236-1351	5.6-5.9	CEE 7/7 Schuko	
			230-240 (CE)		1198-1305	5.2-5.4	BS-1363	
GRSBF-48-F	49.5" x 17" x 2.25" (1257 x 432 x 57 mm)	49.5" x 17" (1257 x 432 mm)	120	Single	770	6.4	NEMA 5-15P	35 lbs. (16 kg)
			220		705	3.2	CEE 7/7 Schuko	35 lbs. (16 kg)
			240		828	3.5	BS-1363	
			220-230 (CE)		704-770	3.2-3.3	CEE 7/7 Schuko	
			230-240 (CE)		770-839	3.3-3.5	BS-1363	
GRSBF-48-I	49.5" x 21" x 2.25" (1257 x 533 x 57 mm)	49.5" x 21" (1257 x 533 mm)	100	Single	1000	10.0	NEMA 5-15P	40 lbs. (18 kg)
			120		1000	8.3	NEMA 5-15P	40 lbs. (18 kg)
			220		1000	4.5	CEE 7/7 Schuko	40 lbs. (18 kg)
			240		1000	4.2	BS-1363	
			220-230 (CE)		1000-1093	4.5-4.7	CEE 7/7 Schuko	
GRSBF-48-S	49.5" x 25.5" x 2.25" (1257 x 648 x 57 mm)	49.5" x 25.5" (1257 x 648 mm)	120	Single	1225	10.2	NEMA 5-15P	42 lbs. (19 kg)
			220		1121	5.1	CEE 7/7 Schuko	42 lbs. (19 kg)
			240		1334	5.6	BS-1363	
			220-230 (CE)		1121-1225	5.1-5.3	CEE 7/7 Schuko	
			230-240 (CE)		1225-1334	5.3-5.6	BS-1363	
GRSBF-48-O	49.5" x 31.5" x 2.25" (1257 x 800 x 57 mm)	49.5" x 31.5" (1257 x 800 mm)	120	Single	1430	11.9	NEMA 5-15P	48 lbs. (22 kg)
			220		1307	6.0	CEE 7/7 Schuko	48 lbs. (22 kg)
			240		1430	6.0	BS-1363	
			220-230 (CE)		1430-1562	6.5-6.8	CEE 7/7 Schuko	
			230-240 (CE)		1313-1430	5.7-6.0	BS-1363	

* Shipping weight includes packaging.

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Glo-Ray® Flush Top Built-In Heated Shelves

Models: GRSBF-24-F, -I, -S, -O; -30-F, -I, -S, -O; -36-F, -I, -S, -O; -42-F, -I, -S, -O;
-48-F, -I, -S, -O; -60-F, -I, -S, -O; -72-F, -I, -S, -O

SPECIFICATIONS

Built-In Rectangular Heated Shelves with Flush Top

The shaded areas contain electrical information for International models

Model	Dimensions (W x D x H)	Usable Shelf (W x D)	Volts	Phase	Watts	Amps	Plug	Ship Weight*
GRSBF-60-F	61.5" x 17" x 2.25" (1562 x 432 x 57 mm)	61.5" x 17" (1562 x 432 mm)	120	Single	950	7.9	NEMA 5-15P	41 lbs. (19 kg)
			220		870	4.0	CEE 7/7 Schuko	41 lbs. (19 kg)
			240		1034	4.3	BS-1363	
			220-230 (CE)		869-950	4.0-4.1	CEE 7/7 Schuko	
			230-240 (CE)		950-1035	4.1-4.3	BS-1363	
GRSBF-60-I	61.5" x 21" x 2.25" (1562 x 533 x 57 mm)	61.5" x 21" (1562 x 533 mm)	100	Single	1220	12.2	NEMA 5-15P	48 lbs. (22 kg)
			120		1220	10.2	NEMA 5-15P	48 lbs. (22 kg)
			220		1220	5.5	CEE 7/7 Schuko	48 lbs. (22 kg)
			240		1220	5.1	BS-1363	
			220-230 (CE)		1220-1333	5.5-5.8	CEE 7/7 Schuko	
			230-240 (CE)		1120-1220	4.9-5.1	BS-1363	
GRSBF-60-S	61.5" x 25.5" x 2.25" (1562 x 648 x 57 mm)	61.5" x 25.5" (1562 x 648 mm)	120	Single	1500	12.5	NEMA 5-20P	55 lbs. (25 kg)
			220		1372	6.2	CEE 7/7 Schuko	55 lbs. (25 kg)
			240		1634	6.8	BS-1363	
			220-230 (CE)		1372-1500	6.2-6.5	CEE 7/7 Schuko	
			230-240 (CE)		1501-1634	6.5-6.8	BS-1363	
GRSBF-60-O	61.5" x 31.5" x 2.25" (1562 x 800 x 57 mm)	61.5" x 31.5" (1562 x 800 mm)	120	Single	1750	14.6	NEMA 5-20P	64 lbs. (29 kg)
			220		1600	7.3	CEE 7/7 Schuko	64 lbs. (29 kg)
			240		1750	7.3	BS-1363	
			220-230 (CE)		1750-1912	8.0-8.3	CEE 7/7 Schuko	
			230-240 (CE)		1607-1750	7.0-7.3	BS-1363	
GRSBF-72-F	73.5" x 17" x 2.25" (1867 x 432 x 57 mm)	73.5" x 17" (1867 x 432 mm)	120	Single	1130	9.4	NEMA 5-15P	44 lbs. (20 kg)
			220		1034	4.7	CEE 7/7 Schuko	44 lbs. (20 kg)
			240		1230	5.1	BS-1363	
			220-230 (CE)		1034-1130	4.7-4.9	CEE 7/7 Schuko	
			230-240 (CE)		1130-1231	4.9-5.1	BS-1363	
GRSBF-72-I	73.5" x 21" x 2.25" (1867 x 533 x 57 mm)	73.5" x 21" (1867 x 533 mm)	120	Single	1440	12.0	NEMA 5-15P	52 lbs. (24 kg)
			220		1440	6.5	CEE 7/7 Schuko	52 lbs. (24 kg)
			240		1440	6.0	BS-1363	
			220-230 (CE)		1440-1574	6.5-6.8	CEE 7/7 Schuko	
			230-240 (CE)		1322-1440	5.8-6.0	BS-1363	
GRSBF-72-S	73.5" x 25.5" x 2.25" (1867 x 648 x 57 mm)	73.5" x 25.5" (1867 x 648 mm)	120	Single	1750	14.6	NEMA 5-20P	59 lbs. (27 kg)
			220		1602	7.3	CEE 7/7 Schuko	59 lbs. (27 kg)
			240		1906	7.9	BS-1363	
			220-230 (CE)		1602-1751	7.3-7.6	CEE 7/7 Schuko	
			230-240 (CE)		1750-1906	7.6-7.9	BS-1363	
GRSBF-72-O	73.5" x 31.5" x 2.25" (1867 x 800 x 57 mm)	73.5" x 31.5" (1867 x 800 mm)	208	Single	2070	10.0	NEMA 6-15P	68 lbs. (31 kg)
			240		2070	8.6		68 lbs. (31 kg)
			220		1894	8.6	CEE 7/7 Schuko	
			240		2070	8.6	BS-1363	
			220-230 (CE)		2070-2262	9.4-9.8	CEE 7/7 Schuko	
			230-240 (CE)		1901-2070	8.3-8.6	BS-1363	

* Shipping weight includes packaging.

PRODUCT SPECS

Glo-Ray® Built-In Heated Shelves with Flush Top

The Built-in Rectangular Heated Shelf with Flush Top shall be a Glo-Ray® Model ... as manufactured by the Hatco Corporation, Milwaukee, WI 53234 U.S.A.

The Rectangular Heated Shelf shall be rated at ... watts, ... volts, and ... inches (millimeters) in overall width.

It shall consist of thermostatically-controlled heated base with 3' (914 mm) conduit to control box and a 6' (1829 mm) cord with plug attached.

Warranty consists of 24/7 parts and service assistance (U.S. and Canada only).

HATCO CORPORATION

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Submittal Sheet

12/20/2017

ITEM# 113.1 - SNEEZE GUARD (1 EA REQ'D)

Versa-Gard VG3.3-SK

VG Series. Adjustable self service food protector with straight glass and top shelf. Adjustable in 7 different self-service positions. 1" OD Solid Supports. End glass panels are 1/4" clear tempered. All glass meets ANSI Z97.1 specifications for safety performance and ASTM C1048-04 specifications for heat treated glass. All hardware supplied in a brushed stainless steel finish. All glass with ground and polished edges. Conceal mount hardware.

ACCESSORIES

Mfr	Qty	Model	Spec
HEAT LAMP & LED LIGHT			



VG3.3-SK

Protected by US Patent 7,040,723
Other Patents Pending

Adjustable Self-Service Protector w/ Shelf

FINISH:

- ☐ Brushed Stainless Steel
☐ Clear Anodized Aluminum
☐ Powder Coat:

☐ Black ☐ Silver

RAL # _____

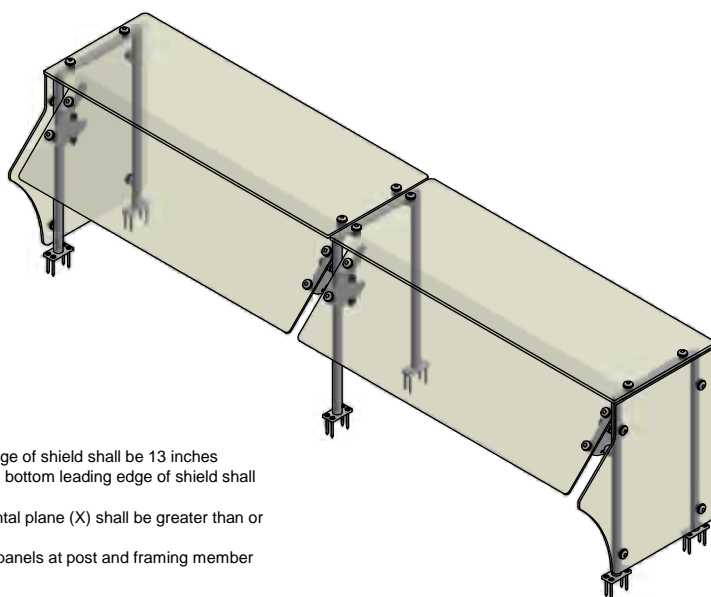
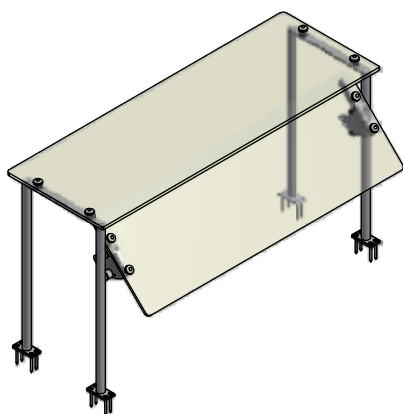
GLASS (Clear Tempered):

- ☐ 1/4" Front - Std
☐ 3/8" Top - Std
☐ 1/2" Top
☐ Frosted

OPTIONS(*):

- ☐ End Panel - LT
☐ End Panel - RT
☐ Light Fixture
☐ Warmer
☐ Shelf Kit

(*) Not all options available on all models
Contact factory for specific information
For Mounting Options see Mounting Hardware Guide



NSF/ANSI 2 - 2010 Standards Requirements:

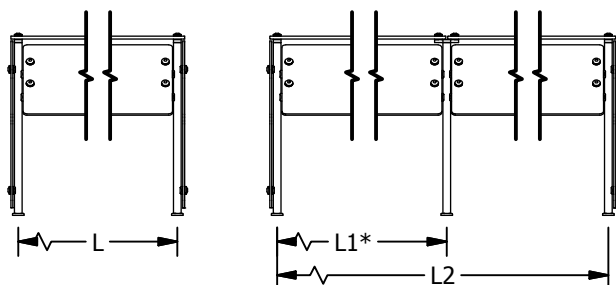
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5.35.7 Self service food shields

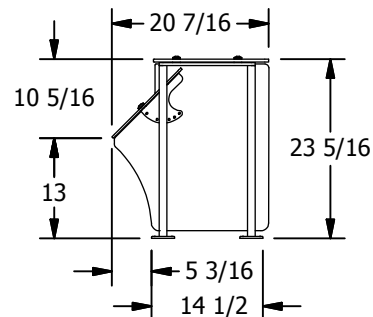
- 5.35.7.1** Maximum vertical distance between counter top and bottom leading edge of shield shall be 13 inches
5.35.7.2 Minimum horizontal distance between the front inside edge of food and bottom leading edge of shield shall be 3/4 of the Max. vertical distance of 5.35.7.1 (.75 x 13" = 9.75")
5.35.7.3 The sum of a shield's projected vertical plane (Y) and projected horizontal plane (X) shall be greater than or equal to 20 inches. Either (X) or (Y) may equal 0
5.35.7.5 Maximum horizontal distance between vertical, horizontal, and angled panels at post and framing member locations shall be 2 inches
5.35.7.10 Food shields for use on mobile buffet counters shall conform to 5.35.7
- 5.35.6** A vertical barrier (end shield) shall be provided at each end of a foodshield. The vertical barrier shall be a minimum of 18 inches deep (front to back) beginning at the bottom leading edge of the foodshield. The minimum height of the vertical barrier shall be equal to the overall height of the foodshield. The maximum distance from the bottom edge of the vertical barrier and counter top shall be 1.5 inches.
- 5.35.6.1** A foodshield intended to be installed a maximum of 3" (76mm) from a building wall perpendicular to the foodshield is exempt from the requirements of 5.35.6 provided that the height of the building wall is not lower than the overall height of the foodshield.

(2) End Panels per unit unless otherwise specified. End panels are 1/4" clear tempered glass unless otherwise specified.

-Centerline Dimensions -
L / L1 - 48" Max (1/4" Glass)



(* - Middle support is centered unless L1 dimension is specified)



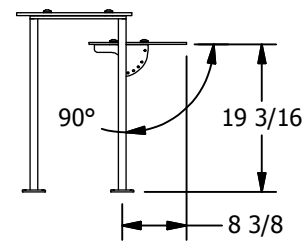
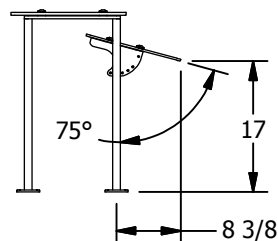
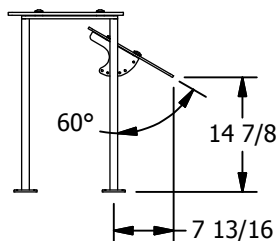
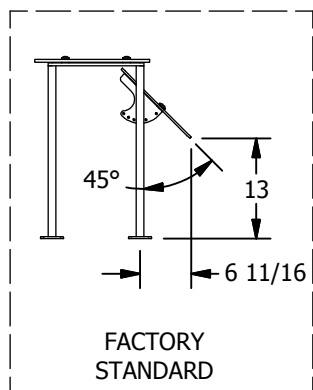


VG3.3-SK

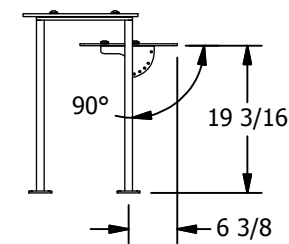
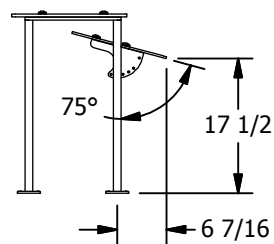
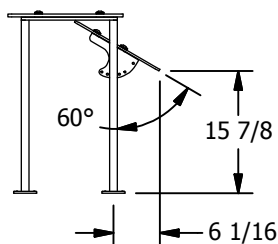
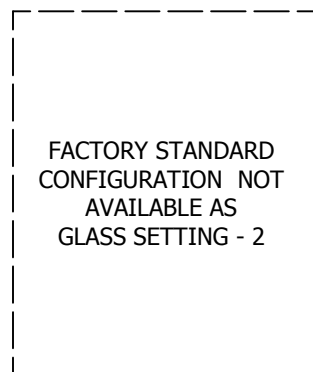
Protected by US Patent 7,040,723
Other Patents Pending

Adjustable Self-Service
Protector w/ Shelf

GLASS SETTING - 1



GLASS SETTING - 2



Submittal Sheet

12/20/2017

ITEM# 113.2 - SNEEZE GUARD (1 EA REQ'D)

Versa-Gard VG3.3-SK

VG Series. Adjustable self service food protector with straight glass and top shelf. Adjustable in 7 different self-service positions. 1" OD Solid Supports. End glass panels are 1/4" clear tempered. All glass meets ANSI Z97.1 specifications for safety performance and ASTM C1048-04 specifications for heat treated glass. All hardware supplied in a brushed stainless steel finish. All glass with ground and polished edges. Conceal mount hardware.

The spec sheet for this item can be viewed on item 113.1)

ACCESSORIES

Mfr	Qty	Model	Spec
LED LIGHT			

Submittal Sheet

12/20/2017

ITEM# 113.3 - SNEEZE GUARD (1 EA REQ'D)

Versa-Gard VG3.3-SK

VG Series. Adjustable self service food protector with straight glass and top shelf. Adjustable in 7 different self-service positions. 1" OD Solid Supports. End glass panels are 1/4" clear tempered. All glass meets ANSI Z97.1 specifications for safety performance and ASTM C1048-04 specifications for heat treated glass. All hardware supplied in a brushed stainless steel finish. All glass with ground and polished edges. Conceal mount hardware.

The spec sheet for this item can be viewed on item 113.1)

ACCESSORIES

Mfr	Qty	Model	Spec
LED LIGHT			

Submittal Sheet

12/20/2017

ITEM# 113.4 - SNEEZE GUARD (1 EA REQ'D)

Versa-Gard VG3.3-SK

VG Series. Adjustable self service food protector with straight glass and top shelf. Adjustable in 7 different self-service positions. 1" OD Solid Supports. End glass panels are 1/4" clear tempered. All glass meets ANSI Z97.1 specifications for safety performance and ASTM C1048-04 specifications for heat treated glass. All hardware supplied in a brushed stainless steel finish. All glass with ground and polished edges. Conceal mount hardware.

The spec sheet for this item can be viewed on item 113.1)

ACCESSORIES

Mfr	Qty	Model	Spec
HEAT LAMP & LED LIGHT			

Submittal Sheet

12/20/2017

ITEM# 120 - HAND SINK (3 EA REQ'D)

Eagle Group HSA-10-F

Hand Sink, wall mount, 13-1/2" wide x 9-3/4" front-to-back x 6-3/4" deep bowl, 304 stainless steel construction, splash mount gooseneck faucet, basket drain, deep-drawn seamless design-positive drain, inverted "V" edge, NSF

The spec sheet for this item can be viewed on item 24)

ACCESSORIES

Mfr	Qty	Model	Spec
Eagle Group	3	303987	Gooseneck Faucet, standard, splash mount, 4" O.C., NSF
Eagle Group	3	307120	Wrist Handles, for 303987 faucet, NSF

WATER

	HOT SIZE	HOT AFF	HOT GPH	COLD SIZE	COLD AFF	FILTERED SIZE	FILTERED AFF	CONDENSER INLET SIZE	CONDENSER OUTLET SIZE
1									
2	1/2"			1/2"					

WASTE

	INDIRECT SIZE	DIRECT SIZE
1		1-1/2"
2		

Submittal Sheet

12/20/2017

ITEM# 121 - SPREADER CABINET (1 EA REQ'D)

Frymaster 15MC

Spreader Cabinet, fryer match design, 15-1/2" W, free-standing design, stainless steel (HD50G)

ACCESSORIES

Mfr	Qty	Model	Spec
Frymaster	1		Solid Flat Top, standard



Food Warmers/Holding Stations/Spreader Cabinets

Project _____
 Item _____
 Quantity _____
 CSI Section 11400 _____
 Approval _____
 Date _____

Models

- ☐ FWH-1 Food warmer with cafeteria pan
☐ FWH-1A Food warmer with scoop pan

- ☐ Spreader Cabinet SD
☐ Spreader Cabinet SC



FWH-1 *

Food warmer and holding station with cafeteria pan.



FWH-1A *

Food warmer and holding station with scoop-type pan.



Spreader Cabinet with optional Food Warmer, holding station with cafeteria pan and casters. .

Standard Features

Food Warmer:

- Durable 6" W x 23-3/4" L (15.4 x 60.3 cm) aluminum alloy housing construction, easy to clean
- 750W radiant heat - 120V/60 Hz/1 Ph 6.3 A
- Ceramic heating element with wire guard
- "ON/OFF" toggle switch on front
- 6 ft. (1.8 M) cord with plug

Holding Stations:

- Stainless steel cafeteria pan, 12" x 20" x 2-1/2" (30.5 x 50.8 x 6.4 cm) with mesh screen
- Scoop-type, perforated pan, 13-1/2" x 18-1/2" x 5-1/4" (34.3 x 47.0 x 13.3 cm)

Food Warmers and Holding Stations available for:

Spreader Cabinets:

- Available in stainless steel (SC) and enamel (SD)
- 12" x 20" cutout standard (flat top option)
- Legs standard (casters option)

Specifications

Designed to keep prepared food fresh and hot

Food warmers and holding stations are optional accessories that can be used with Frymaster spreader cabinets and fryers to maintain optimal temperature of prepared food. Food Warmers are available separately to fit existing Frymaster spreader cabinets.

The rectangular food warmer produces an 18" (45.7 cm) heat pattern over the entire length of the unit to keep cooked food at optimal temperature with radiant heat to assure peak flavor without cooking or drying. The shell is manufactured with

durable aluminum alloys and is easy to clean. "ON/OFF" toggle switch, and a 6' (1.8 M) cord set are mounted in the shell. Mounting brackets and hardware are provided for installation.

The food warmers are NSF, cULus, and CE approved and can be used with either the cafeteria-style pan with mesh screen or with the perforated, curved scoop pan for quick, easy bagging.

*Frymaster food warmers and holding stations are designed to fit the Frymaster spreader cabinet; they are not free-standing accessories.



Agency approvals are for food warmers only.

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 Shreveport, LA 71106-6800
 USA

Tel: 318-865-1711
 Tel: 1-800-221-4583
 Fax: 318-868-5987
 E-mail: info@frymaster.com

www.frymaster.com
 Bulletin No. 818-0061
 Revised 6/26/13

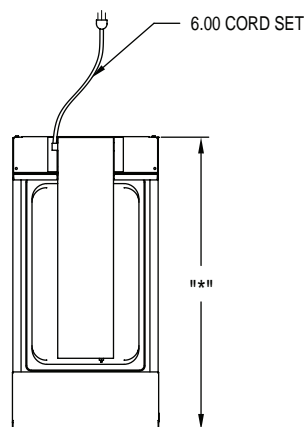


Food Warmers/Holding Stations/Spreader Cabinets

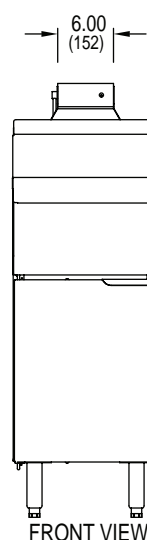


Food Warmers/Holding Stations/Spreaders

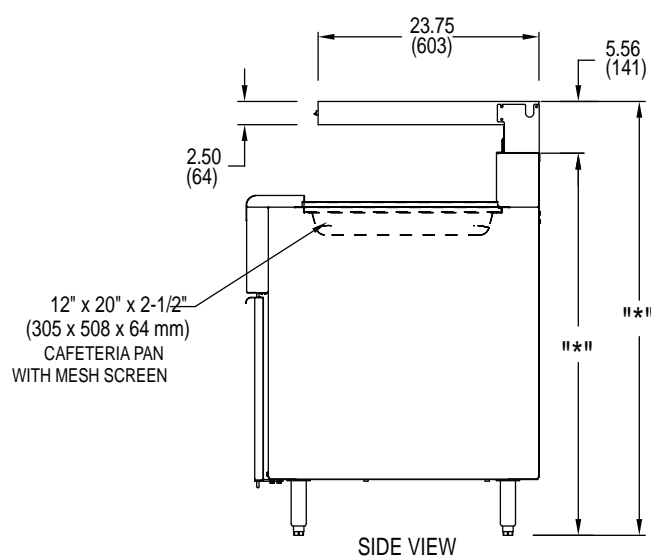
Model # _____
CSI Section 11400



TOP VIEW



FRONT VIEW



SIDE VIEW

DIMENSIONS

DESCRIPTION	HEIGHT	WIDTH	LENGTH
Food warmer	2-1/2" (6.4 cm)	6" (15.4 cm)	23-3/4" (60.3 cm)
Food warmer (CE)	2-1/4" (5.7 cm)		
Cafeteria-style holding pan	2-1/2" (6.4 cm)	12" (30.5 cm)	20" (50.8 cm)
Scoop-style perforated pan	5-1/4"*** (13.3 cm)	13-1/2" (34.3 cm)	18-1/2" (47.0 cm)

***Depth is shown for deepest point in pan.

SPREADER CABINETS SD & SC

MODEL	HEIGHT (CM)	WIDTH (CM)	LENGTH (CM)
H55/OCF30 gas	45-5/8" (*) (115.8)	15-5/8" (39.7)	31-1/2" (79.9)
MJ45/MJ45E/MJ35/MJ35E	46" (*) (116.8 cm)	15-5/8" (39.7)	31-1/2" (79.9)
RE14/17/22 / RE14TC/17TC/22TC/ OCF30 electric	45-1/2" (*) (115.2)	15-5/8" (39.7)	31" (78.6)
MJCF/MJCFE	46-1/8 H(*) (117.2)	20-7/8" (52.9)	39-7/8" (101.3)

POWER REQUIREMENTS

Domestic: 120V 1 Ph 6.3 A 750 W

CE: 230/240 1 Ph 2.1 A 500 W

CAUTION:

Locate heat lamp no closer than 3" (7.6 cm) to a side wall and 16-1/2" (42.0 cm) above a flammable surface.

HOW TO SPECIFY

The following description will assist with ordering the features desired for this equipment:

- FWH-1 Food warmer and holding station with cafeteria pan.
FWH-1A Food warmer and holding station with scoop pan.
SD Stainless steel door, enamel cabinet
SC Stainless steel door and cabinet

8700 Line Avenue
Shreveport, LA 71106-6800
USA

Tel: 318-865-1711
Tel: 1-800-221-4583
Fax: 318-868-5987
E-mail: info@frymaster.com

www.frymaster.com
Bulletin No. 818-0061
Revised 6/26/13
Litho in U.S.A. ©Frymaster



Submittal Sheet

12/20/2017

ITEM# 122 - RANGE, WOK, GAS (1 EA REQ'D)

Montague CRM-2

Legend Wok Range, gas, double bowl, 34" deep base, with 21" high back riser, stainless front, sides, and backguard, stainless steel pipe overshelf, perforated water line with valve, 9" wide fixed cutting board (one bowl included per hole)

ACCESSORIES

Mfr	Qty	Model	Spec
Montague	1		Standard warranty: one year parts and labor warranty
Montague	1		Natural gas
Montague	1		NOTE: NON-REFUNDABLE DEPOSIT of 25% required with orders (NO REVISIONS, NO CANCELLATION, NO RETURNS)
Montague	1		1st section 14" Wok with removable 12" cylinder
Montague	1		2nd section 14" Wok with removable 12" cylinder
Montague	1		Casters with 5" wheel 6" OA (set of 4) up to 48"

WATER

	HOT SIZE	HOT AFF	HOT GPH	COLD SIZE	COLD AFF	FILTERED SIZE	FILTERED AFF	CONDENSER INLET SIZE	CONDENSER OUTLET SIZE
1	1/2"			1/2"					

WASTE

	INDIRECT SIZE	DIRECT SIZE
1		



LEGEND™ Heavy-Duty Gas Custom Chinese Ranges: Modular Base (CRM) or Cabinet Base (CR)

Item No. _____

Project _____

Quantity _____



Model CRM-2 shown

SHORT/BID SPECIFICATION

Chinese Range shall be a Montague **Legend** Model [Specify]:

- ☐ **CRM** (Modular Style)
☐ **CR** (Enclosed Base)

[Specify Wok Size and Configuration in Left to Right Order]:

" " " " " " "

...a heavy duty, custom-built, gas-fired unit with unique double cylinder construction. Powerful cast iron 53,000 BTU/hr, 2- ring burners or 107,000 BTU/hr, 3- ring burners are standard. (Optional 80,000 BTU/hr or 120,000 BTU/hr Jet Burners available) Heavy Duty 10 gauge 304 stainless steel top plate with cold water top cooling, full- length rear drain, individual water fill faucets, a 9" (229mm) wide stainless steel plate shelf, stainless steel pipe over shelf, and 12-1/2" (318mm) height-adjustable legs standard; plus all the features listed and options/accessories checked:

STANDARD CONSTRUCTION FEATURES:

- Stainless steel front, sides, and back
- 304 Stainless steel top plate and fixed cylinder
- 304 Stainless steel plate shelf, rear drain trough with removable strainer
- Rear drain located at left side (optional right side)
- Perforated copper water line for top cooling with master water control valve
- Stainless steel drip tray below each burner
- Swing faucet, (1) per wok, cold water
- CR Models to have cabinet base with stainless steel front, sides, back, bottom shelf, and 6" (152mm) height adjustable legs
- 3/4" or 1" NPT rear gas connection(s) with pressure regulator(s) provided [shipped loose]

MODEL GUIDE (Model No./Wok Size)					
<input type="checkbox"/> CR-1 <input type="checkbox"/> CRM-1 [1 Burner]	<input type="checkbox"/> CR-2 <input type="checkbox"/> CRM-2 [2 Burners]	<input type="checkbox"/> CR-3 <input type="checkbox"/> CRM-3 [3 Burners]	<input type="checkbox"/> CR-4 <input type="checkbox"/> CRM-4 [4 Burners]	<input type="checkbox"/> CR-5 <input type="checkbox"/> CRM-5 [5 Burners]	<input type="checkbox"/> CR-6 <input type="checkbox"/> CRM-6 [6 Burners]
14" (356mm)	14" (356mm)	14" (356mm)	14" (356mm)	14" (356mm)	14" (356mm)
16" (406mm)	16" (406mm)	16" (406mm)	16" (406mm)	16" (406mm)	16" (406mm)
18" (457mm)	18" (457mm)	18" (457mm)	18" (457mm)	18" (457mm)	18" (457mm)
20" (508mm)	20" (508mm)	20" (508mm)	20" (508mm)	20" (508mm)	20" (508mm)
22" (559mm)	22" (559mm)	22" (559mm)	22" (559mm)	22" (559mm)	22" (559mm)
24" (610mm)	24" (610mm)	24" (610mm)	24" (610mm)	24" (610mm)	24" (610mm)
26" (660mm)	26" (660mm)	26" (660mm)	26" (660mm)	26" (660mm)	26" (660mm)
28" (711mm)	28" (711mm)	28" (711mm)	28" (711mm)	28" (711mm)	28" (711mm)

CUSTOM SIZING GUIDE			
WOK SIZE:	WELL SECTION:	SOUP POT SIZE:	RANGE LENGTH PER WOK/SOUP POT:
14" (356mm)	12" (305mm)	10" (254mm)	20" (508mm)
16" (406mm)	14" (356mm)	12" (305mm)	22" (559mm)
18" (457mm)	16" (406mm)	14" (356mm)	24" (610mm)
20" (508mm)	18" (457mm)	16" (406mm)	26" (660mm)
22" (559mm)	20" (508mm)	18" (457mm)	28" (711mm)
24" (610mm)	22" (559mm)	N/A	30" (762mm)
26" (660mm)	24" (610mm)	N/A	32" (813mm)
28" (711mm)	25" (635mm)	N/A	34" (864mm)

STANDARD BURNER FEATURES:

- 53,000 BTU/hr. (15.5kW) 2-ring cast iron burners for 14"-18" wok sizes
- 107,000 BTU/hr (31.4kW) 3-ring cast iron burners for 20"-28" wok sizes
- Manual gas control valve & standing pilot: (2) valves and (1) pilot for 2-ring burner, (3) valves and (2) pilots for 3-ring burner
- Master knee valves for hands free control

AGENCY APPROVALS

- NSF Listed
- CSA Design Certified to ANSI Z83.11



CR-1 [Rev. 1/13]

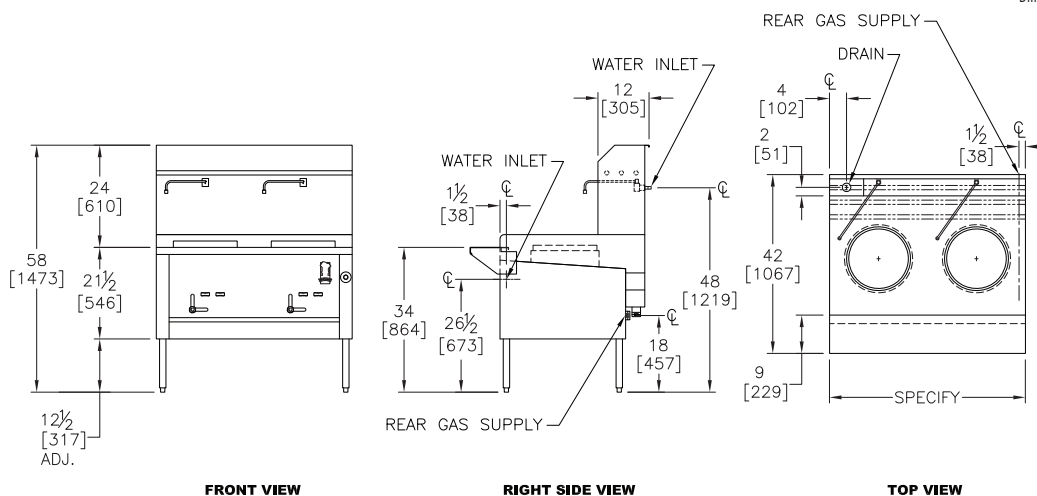
LEGEND™ Heavy-Duty Gas Custom Chinese Ranges: Modular Base (CRM) or Cabinet Base (CR)

Item No. _____

Project _____

Quantity _____

Dimensions in brackets are millimeters



OPTIONS GUIDE:

Jet Burners:

- ☐ ___ ea. 20 Jet, 80,000 BTU/hr (23.4 kW) in lieu of 2-ring 53,000 BTU/hr (15.5 kW) burner. Specify wok position _____
- ☐ ___ ea. 32 Jet, 120,000 BTU/hr (35.2 kW) in lieu of 3-ring. 107,000 BTU/hr (31.4 kW) burner. Specify wok position _____

Accessories:

- ☐ Additional Woks: qty : _____ size _____
- ☐ Wok Covers: qty: _____ size _____
- ☐ Adapter Ring: qty: _____
Reduces well size for use with smaller wok.
Reduce to size: _____
- Casters with 5" wheel. Set of (4), (6), or (8) depending on model.

Soup Pot Well:

- ☐ ___ ea. in lieu of wok. Specify position.
(Uses 2-ring 53,000 BTU/hr burner only)
Available for well sections up to 20"

INSTALLATION REQUIREMENTS & SHIPPING INFORMATION

- Ranges must be installed in accordance with local codes or in their absence with the National Fuel Gas Code: ANSI Z223.1. Compliance with codes is the responsibility of the Owner and Installer.
- An adequate ventilation system is required. Refer to National Fire Protection Association Standard No. 96, "Vapor Removal from Cooking Equipment."
- This appliance is intended for commercial use by professionally trained personnel. NOT intended for Residential Use.
- Specify installation elevation:** _____ if above 2000 feet (610m).
- GAS INLET SIZE (All Models):** 3/4" NPT connection (up to 360,000 BTU/hr); 1" NPT connection (up to 560,000 BTU/hr) or two 1" connections (over 560,000 BTU/hr must be provided. A properly sized gas pressure regulator(s) is/are shipped loose and must be installed (by others) when unit is connected to gas supply.
- The incoming gas line pressure into the regulator should be 8"-14" w.c. for natural gas, and 12"-14" w.c. for propane gas
- DRAIN CONNECTION REQUIRED:** 2" NPT connection positioned left (Optional right side).
- WATER CONNECTION REQUIRED:** 1/2" NPT water connection positioned on right for perforated copper water line. A 1/2" x 3/8" NPT hex bushing provided for each swing faucet.

Minimum Clearances	Noncombustible Construction ONLY
From Back Wall	0"
Left & Right Side	0"
For use in non-combustible locations only	

Specify Type of Gas:	<input type="checkbox"/> Natural	<input type="checkbox"/> Propane	QTY:	Shipping Weight	Shipping Class
Manifold Pressure:	4.0" WC	10.0" WC			
Model:	Burner Selection:				
CRM- _____	53,000 BTU/hr (15.5kW) 2-Ring		_____	Approx. 150 lbs (68 kg) per foot of unit width.	All Models Class 85
	107,000 BTU/hr (31.4kW) 3-Ring		_____		
CR- _____	80,000 BTU/hr (23.4kW) Jet Burner		_____		
	120,000 BTU/hr (35.2kW) Jet Burner		_____		
Entry Clearance: 31-1/4" (794mm) uncrated [All Models]					
TOTAL OUTPUT: _____ BTU/HR (_____ kW) TOTAL BURNERS: _____					



THE MONTAGUE COMPANY

1830 Stearman Avenue, Hayward, CA 94545
800 345-1830 • Fax: 510 785-3342
www.montaguecompany.com

Due to continuous product improvements, specifications are subject to change without notice.



CR-1 [Rev. 1/13]

Submittal Sheet

12/20/2017

ITEM# 123 - EQUIPMENT STAND, REFRIGERATED BASE (1 EA REQ'D)

Continental Refrigerator DL48G

Refrigerator Griddle Stand, one-section, (2) drawers - accommodates (2) 12" x 20" x 6", dial thermometer, stainless steel top with drip guard marine edge, stainless steel exterior and interior, 4" casters, self-contained refrigeration, 1/5 hp, 10' cord, cETLus, NSF, Made in USA

ACCESSORIES

Mfr	Qty	Model	Spec
Continental Refrigerator	1		Standard warranty (for the United States & Canada Only): 3 year parts and labor; 5 year compressor
Continental Refrigerator	1		115v/60/1-ph, 5.7 amps, cord, NEMA 5-15P, standard
Continental Refrigerator	1		Condensing unit on the right, standard
Continental Refrigerator	1		4" Casters, standard

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1									1/5		
2	115	60	1	Cord & Plug		5-15P	5.7				

GRIDDLE STAND REFRIGERATOR

Model: **DL48G**

48" Griddle Stand Refrigerator

Stainless steel exterior and interior.

Designed to maintain NSF-7 temperatures in 100°F ambient.



Options and Accessories

(upcharge and lead times may apply)

Doors in lieu of drawers	Integral heat shield
Flat top in lieu of marine edge	Adjustable legs
16-gauge stainless steel top (flat or marine)	Digital thermometer
Condensing unit left or right	Cylinder locks
Automatic, electric condensate evaporator	Stainless steel pans
Stainless steel top extensions (flat or marine)	Special electrical requirements (consult factory)

Consult factory for other model configurations, options and accessories.

Continental
Refrigerator

Toll-Free: 800-523-7138
Phone: 215-244-1400
Fax: 215-244-9579

539 Dunksferry Road
Bensalem, PA 19020
www.continentalrefrigerator.com

Project Name:

Model Specified:

Location:

Item No:

Quantity:

AIA #:

SIS #:

Standard Model Features

REFRIGERATION SYSTEM

- Performance-rated refrigeration system
- Environmentally-safe R-134a refrigerant
- Side-mounted, automatic, energy saving non-electric condensate evaporator
- Non-corrosive, plasticized fin evaporator coil
- Easily serviceable, front slide-out condensing unit

CABINET ARCHITECTURE

- High density, non-CFC polyurethane foamed-in-place insulation
- Easy glide, fully extendable drawers designed to hold 6" deep pans side-by-side
- One-piece, snap-in magnetic drawer gaskets
- Heavy-duty drawer track with built-in drawer safety clips
- Drawers designed to hold 250 lb. capacity
- 4" casters on support plates
- Stainless steel case back
- Reinforced stainless steel work top with drip guard marine edge

MODEL FEATURES

- Capillary dial thermometer
- Front breathing

APPROVAL:

Model Specifications

DIMENSIONAL DATA

Net Capacity (cu. ft.)	9.0 (255 cu l)
Width, Overall (in.)	48 (1219 mm)
Depth, Overall (incl. handles) (in.)	34 3/4 (883 mm)
Height, Overall (in.) (incl. 4" casters)	26 3/8 (670 mm)
No. of Drawers	2

REFRIGERANT DATA

Condensing Unit Size (H.P.)	1/5
Capacity (BTU/Hr)*	1725

ELECTRICAL DATA

Voltage (int'l)	115/60/1 (220/50/1)
Fans	1
Feed Wires (incl. ground)	3
Total Amps (int'l)	5.7 (3.1)
10 ft. Cord/Plug [attached] (int'l)	Yes (No)

SHIPPING DATA

Weight (lbs.)	450 (204 kg)
Height - Crated (in.)	44 (1118 mm)
Width - Crated (in.)	64 (1626 mm)
Depth - Crated (in.)	39 (991 mm)

TOP WEIGHT CAPACITY

Max. Top Weight Capacity (lbs.)	775 (352 kg)
---------------------------------	--------------

* Rating @ +25°F evaporator, 90°F ambient

Figures in parentheses reflect metric equivalents rounded to the nearest whole unit.



Equipped with one NEMA-5-15P Plug
(varies by country)

Continental
Refrigerator

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Phone: 215-244-1400
Fax: 215-244-9579

539 Dunkserry Road
Bensalem, PA 19020
www.continentalrefrigerator.com

Due to our continued efforts in developing innovative products, specifications subject to change without notice.



Intertek

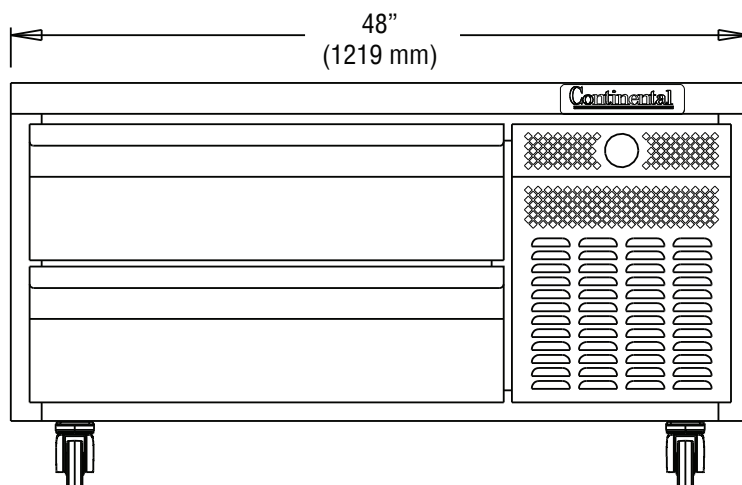
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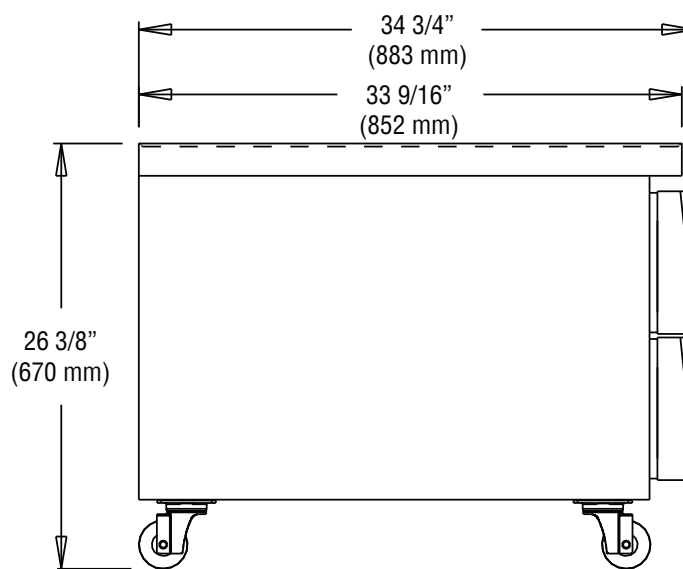


MADE IN THE U.S.A.

Model Plan Views

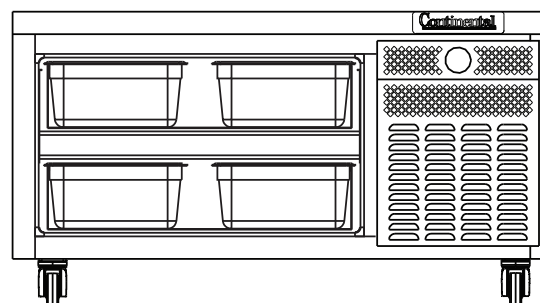


FRONT VIEW



SIDE VIEW

Shown with (4) 12 x 20 x 6 pans (not furnished)



DRAWER PAN CONFIGURATION

Submittal Sheet

12/20/2017

ITEM# 124 - CHARBROILER, GAS, COUNTERTOP (1 EA REQ'D)

Southbend HDC-24

Charbroiler, gas, countertop, 24", cast iron radiants, stainless steel burners, two-position, two sided cooking grid, removable crumb tray, stainless steel front, sides & 4" adjustable legs, 80,000 BTU, CSA, NSF

The spec sheet for this item can be viewed on item 70)

ACCESSORIES

Mfr	Qty	Model	Spec
Southbend	1		Domestic Shipping, inside of North America (Contact factory for price)
Southbend	1		Standard one year limited warranty
Southbend	1		Natural Gas
Southbend	1		Battery spark ignition

GAS

	SIZE	MBTU	KW
1	3/4"	80.0	

STEAM

	INLET SIZE	RETURN SIZE	LB/HR	PSIG (min)	PSIG (max)
1					

Submittal Sheet

12/20/2017

ITEM# 125 - GAS COUNTERTOP GRIDDLE (1 EA REQ'D)

Southbend HDG-24

Griddle, countertop, gas, 24" W x 24" D cooking surface, 1" thick polished steel plate, thermostatic controls, battery spark ignition, stainless steel front, sides & 4" adjustable legs, 60,000 BTU, CSA, NSF

The spec sheet for this item can be viewed on item 69)

ACCESSORIES

Mfr	Qty	Model	Spec
Southbend	1		Domestic Shipping, inside of North America (Contact factory for price)
Southbend	1		Standard one year limited warranty
Southbend	1		Natural Gas
Southbend	1		400° thermostat control, standard

GAS

	SIZE	MBTU	KW
1	3/4"	60.0	

STEAM

	INLET SIZE	RETURN SIZE	LB/HR	PSIG (min)	PSIG (max)
1					

Submittal Sheet

12/20/2017

ITEM# 126 - COMBI OVEN, GAS (2 EA REQ'D)

RATIONAL B619206.27E202

(CMP 61NG – 120V) CombiMaster® Plus, Combi Oven/Steamer, natural gas, (6) 12" x 20" full size hotel or (6) 13" x 18" half size sheet pan capacity, mode selector control, 100 cooking programs, automatic cleaning, LED display, 5-speed programmable fan, core temperature probe, hand shower with automatic retracting system, interface USB, hinging rack 2-5/8", 120v/60/1-ph, 8'cord, NEMA 5-15P, 49,000 BTU, cCSAus, NSF/ANSI 4, IPX5, ENERGY STAR®

The spec sheet for this item can be viewed on item 91)

ACCESSORIES

Mfr	Qty	Model	Spec
RATIONAL	2		NOTE: All discounts subject to approval by manufacturer
RATIONAL	2		2 years parts and labor warranty
RATIONAL	2	CAP	Chef Assistance Program, a RATIONAL certified Chef conducts 4 hours/location specialized application training with personnel, no charge
RATIONAL	2	8720.1560US	Installation Kit, for gas SCC WE/CMP 101G (120/60/1ph); gas SCC WE/CMP 62G (208-240/60/1ph); gas SCC WE/CMP 61G (120/60/1ph) THIS ITEM IS NON-DISCOUNTABLE, USA ONLY (NET)
RATIONAL	2		Note: The Combination of two RATIONAL appliances simply mounted on top of each other opens up new possibilities, even when space in the kitchen is limited. The following descriptions are laid out in this order: First: Closed or Open; Second: Stationary or Mobile; Third: Top unit - Gas or Electric; Fourth: stacked on Gas or Electric. The bottom RATIONAL (fourth item) is the one that dictates which type of Stacking Kit must be used.
RATIONAL	2	60.71.929	Combi-Duo Closed Stacking Kit, Stationary, 6" feet, for gas SCC 61 or CMP 61 stacked on gas SCC 61, SCC 101, CMP 61, or CMP 101 (gas unit stacked on a gas 101 unit is not recommended)
RATIONAL	2	9999.9959	RCI Rational Certified Installation, new certified installation cost for a Combi-Duo stacked unit is \$200 for the first two units for double-stack (Pricing based on a 50 mile radius, Additional charges may apply, See attached installation flyer for details) THIS ITEM IS NON-DISCOUNTABLE. USA ONLY (NET)
RATIONAL	2		Door hinged on right std.

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCp
1	120	60	1	Cord & Plug		5-15P					

GAS

	SIZE	MBTU	KW
1	3/4"	49.0	

STEAM

	INLET SIZE	RETURN SIZE	LB/HR	PSIG (min)	PSIG (max)
1					

WATER

	HOT SIZE	HOT AFF	HOT GPH	COLD SIZE	COLD AFF	FILTERED SIZE	FILTERED AFF	CONDENSER INLET SIZE	CONDENSER OUTLET SIZE
1				3/4"					
2				3/4"		3/4"			

WASTE

	INDIRECT SIZE	DIRECT SIZE
1	2"	
2		

PLUMBING 1 REMARKS

Common Water Connection

PLUMBING 2 REMARKS

Optional Split Connection

Submittal Sheet

12/20/2017

ITEM# 127 - EXHAUST HOOD (1 EA REQ'D)

Captive-Aire ND

Wall Type Exhaust Hood: 18 gauge 304 series stainless steel construction in accord with N.F.P.A. 96. Stainless steel baffle type U.L. classified grease extracting filters, with handles. Vapor-proof U.L. listed light fixtures as indicated on drawings. Provide stainless steel wall cabinet (located as shown on plan) for fire suppression system and control package. Fan and light switches to be located on face of hood in an accessible location. Hood to be furnished complete with Starter/contactor package for exhaust fan and make-up air fan (fans furnished by mechanical contractor, coordination of electrical service is required). Provide and install removable stainless steel perimeter trim and/or closure panels from top of hood to ceiling and 18 gauge stainless steel wall panels from floor to bottom of hood. Provide and install any secondary supporting members required to suspend hoods. Supports shall include seismic bracing, if required, in accord with SMACNA guidelines. Furnish unit complete with all standard accessories as normally supplied by the manufacturer.

The spec sheet for this item can be viewed on item 73)

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1	120	60	1	JB	CLG		10.0				
2	120	60	1	JB	CLG		10.0				

ELECTRICAL 1 REMARKS

LIGHTS

ELECTRICAL 2 REMARKS

FAN CONTROLS

Submittal Sheet

12/20/2017

ITEM# 127.1 - FIRE SUPPRESSION SYSTEM (1 EA REQ'D)

Ansul R-102

Wet chemical type fire suppression system. Installation in accord with N.F.P.A. 17A code requirements. Suppression system to be pre-piped at factory and hooked up in field by a local licensed agency. Local agency to perform certifications tests as required by local authorities. Furnish manual strike mechanism in accessible location. Furnish unit complete with all tanks, piping, relays, cable, fusible links, nozzles, etc. as required for a complete system.

Submittal Sheet

12/20/2017

ITEM# 128 - REACH-IN FREEZER (1 EA REQ'D)

Continental Refrigerator 1FES-GD

Extra-Wide Freezer, reach-in, 28-1/2" wide one-section, self-contained refrigeration, stainless steel front, aluminum exterior & interior, shallow depth, full-height glass door, electronic controller w/ digital display, 5" casters, 1/2 hp, cETLus, NSF, Made in USA

ACCESSORIES

Mfr	Qty	Model	Spec
Continental Refrigerator	1		Standard warranty (for the United States & Canada Only): 3 year parts and labor; 5 year compressor
Continental Refrigerator	1		115v/60/1-ph, 6.3 amps, cord, NEMA 5-15P, standard
Continental Refrigerator	1		Door hinged on right, standard
Continental Refrigerator	1		5" Casters, standard

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1									1/2		
2	115	60	1	Cord & Plug		5-15P	6.3				

REACH-IN FREEZER (0°F)

Model: 1FES

1-Section Extra-Wide Reach-In Freezer Shallow Depth

1FES - Stainless steel front, aluminum end panels and interior

1FES-SA - Stainless steel exterior, aluminum interior

1FES-SS - Stainless steel exterior and interior

Designed to maintain NSF-7 temperatures in 100°F ambient.



Options and Accessories

(upcharge and lead times may apply)

Stainless steel case back	Pass-Thru
Additional epoxy-coated steel shelves	Standard depth
Chrome or stainless steel shelves	Hinged glass door
Rehinging of door (consult factory)	Increased refrigeration systems
Expansion valve system	Special electrical req. (consult factory)
Adjustable legs	Correctional Facility Options
Digital thermometer	• One way security screws
Remote models	• Locking hasp (lock not included)
Custom laminates	• Stainless steel mesh cover
Half doors	• Coverless hinges

Consult factory for other model configurations, options and accessories.

Continental
Refrigerator

Toll-Free: 800-523-7138

Phone: 215-244-1400

Fax: 215-244-9579

539 Dunksferry Road

Bensalem, PA 19020

www.continentalrefrigerator.com

Project Name:

Model Specified:

Location:

Item No:

Quantity:

AIA #:

SIS #:

Standard Model Features

REFRIGERATION SYSTEM

Environmentally-safe R-404A refrigerant

Self contained, performance-rated refrigeration system

Automatic, energy saving, electric condensate evaporator

CABINET ARCHITECTURE

3" non-CFC polyurethane foam insulation

Chrome-plated flow line handle

Cam action, lift off hinges

Self-closing door

Magnetic snap-in door gasket

Cylinder lock in door

Heavy-duty, epoxy-coated steel shelves

5" casters

MODEL FEATURES

LED interior lighting

External dial thermometer

Energy saving switch for door heater

Automatic electric defrost

APPROVAL:

Model Specifications

DIMENSIONAL DATA

Net Capacity (cu. ft.)	18 (510 cu l)
Width, Overall (in.)	28 1/2 (724 mm)
Depth, Overall (incl. handle) (in.)	29 1/4 (743 mm)
Depth [less door] (in.)	25 7/8 (657 mm)
Depth [door open 90°] (in.)	49 1/2 (1257 mm)
Clear Door Width (in.)	21 7/8 (556 mm)
Clear Door Height (in.)	58 5/8 (1489 mm)
Height, Overall (incl. 5" casters) (in.)	82 1/4 (2096 mm)
No. of Doors	1
No. of Shelves	3
Shelf Area (sq. ft.)	20.4 (1.9 sq m)

REFRIGERANT DATA

Condensing Unit Size (H.P.)	1/3
Capacity (BTU/Hr)*	1590

ELECTRICAL DATA

Voltage	115/60/1 (220/50/1)
Feed Wires (incl. ground)	3
Total Amps (int'l)	6.3 (3.8)
Defrost Amps (int'l)	5.2 (2.6)
10 ft. Cord/Plug [attached]	Yes (No)

SHIPPING DATA

Height - Crated (in.)	85 1/2 (2172 mm)
Width - Crated (in.)	31 5/8 (803 mm)
Depth - Crated (in.)	42 (1067 mm)
Volume - Crated (cu. ft.)	63 (1784 cu l)
Weight Std - Crated (lbs.)	345 (156 kg)
Weight SS - Crated (lbs.)	370 (168 kg)
Weight Std - Uncrated (lbs.)	210 (95 kg)
Weight SS - Uncrated (lbs.)	270 (122 kg)

* Rating @ -15°F evaporator, 90°F ambient

Figures in parentheses reflect metric equivalents rounded to the nearest whole unit.



Equipped with one NEMA-5-15P Plug
(varies by country)

Continental
Refrigerator

Toll-Free: 800-523-7138
Phone: 215-244-1400
Fax: 215-244-9579

539 Dunksferry Road
Bensalem, PA 19020
www.continentalrefrigerator.com

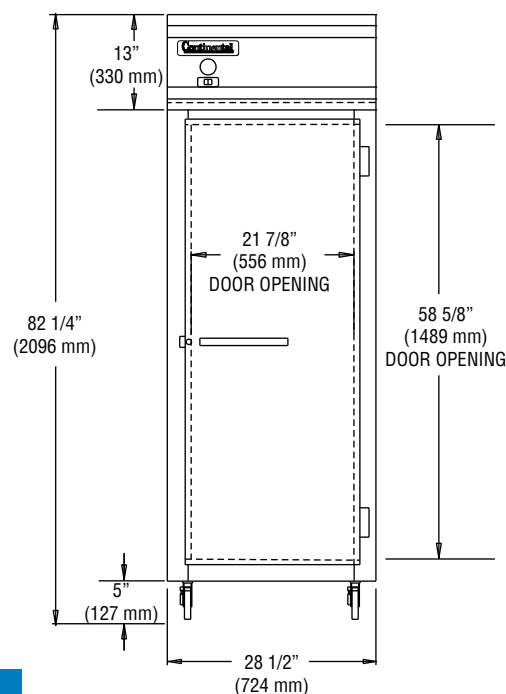
Due to our continued efforts in developing innovative products, specifications subject to change without notice.



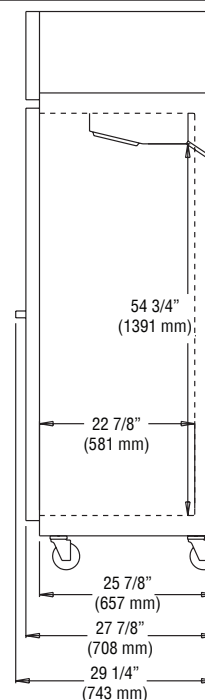
MADE IN THE U.S.A.

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Model Plan Views



FRONT VIEW



SIDE VIEW

IMPORTANT NOTE: If the cabinet is located directly against a wall and/or under a low ceiling, a minimum clearance of 12" is required.

Submittal Sheet

12/20/2017

ITEM# 129 - REFRIGERATED SELF-SERVICE UNDER COUNTER HEIGHT CASE (1 EA REQ'D)

Structural Concepts CO53R-UC

Oasis® Self-Service Refrigerated Under Counter Height Case, 59-1/4"W, 32-3/4"H, Breeze-E (Type II) with EnergyWise self-contained refrigeration system, Blue Fin coated coil, top light, one piece formed ABS plastic tub, black interior, (2) square full end panels, casters with levelers, front panel extends over end panels to blend with adjacent counters (supplied by others), counter surface (supplied by others) extends over top of unit, cETLus, ETL-Sanitisation
The spec sheet for this item can be viewed on item 111)

ACCESSORIES

Mfr	Qty	Model	Spec
Structural Concepts	1		NOTE: If GFCI is required, a GFCI breaker MUST be used in lieu of a GFCI receptacle
Structural Concepts	1		1 yr. parts & labor warranty, 5 yr. compressor warranty, standard
Structural Concepts	1		Breeze-E (Type II) with EnergyWise refrigeration - NSF Type II compliant, standard
Structural Concepts	1		110-120v/60/1ph, 14.58 amps, standard
Structural Concepts	1		6 ft straight blade power cord with NEMA 5-20P, standard
Structural Concepts	1		NOTE: Compressor air rear intake, front discharge at toe kick, unit MUST remain 4" from wall & front & rear panels cannot be blocked (Not applicable with remote refrigeration option)
Structural Concepts	1		Interior: Stainless steel, in lieu of standard black
Structural Concepts	1		Exterior: Stainless steel
Structural Concepts	1		Exterior back panel: Solid back panel - stainless steel
Structural Concepts	1		Left end panel: Square full with mirrored interior, standard
Structural Concepts	1		Right end panel: Square full with mirrored interior, standard
Structural Concepts	1		Night curtain, retractable, non-locking (not available with security cover)

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1	110-120	60	1	Cord & Plug			14.58				
2						5-20P					

Submittal Sheet

12/20/2017

ITEM# 130 - HOT / COLD FOOD WELL UNIT, DROP-IN, ELECTRIC (4 EA REQ'D)

Low Temp QSCHP-3

QuickSwitch™ Hot/Cold/Freeze Food Well, drop-in, 49-1/2"W x 26-3/4"D x 21-16/25"H, accommodates (3) 12" x 20" pan size, wired remote, individual wired remote digital controls for hot or cold operation, manifold drain, stainless steel top & wells, galvanized exterior, cULus, ANSI/NSF 4, ANSI/NSF 7

ACCESSORIES

Mfr	Qty	Model	Spec
Low Temp	4		"Some options may increase lead times"
Low Temp	4		120/208v/60/1-ph, 12.0 amps, NEMA 14-20P
Low Temp	4	HUG	Hugged edge

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1	120/208	60	1	Cord & Plug		14-20P	12				

WATER

	HOT SIZE	HOT AFF	HOT GPH	COLD SIZE	COLD AFF	FILTERED SIZE	FILTERED AFF	CONDENSER INLET SIZE	CONDENSER OUTLET SIZE
1									

WASTE

	INDIRECT SIZE	DIRECT SIZE
1	3/4"	

Hot-Cold-Freeze Drop-Ins



Project: _____

Item: _____

Quantity: _____

Date: _____

Drop-in Models Pans

<input type="checkbox"/> DI-QSCHP-1	1
<input type="checkbox"/> DI-QSCHP-2	2
<input type="checkbox"/> DI-QSCHP-3	3
<input type="checkbox"/> DI-QSCHP-4	4

Standard Features

- ✓ Individual solid state digital controls
- ✓ Full sealing gasket
- ✓ 500 watts heat source(at 208V)
- ✓ Single power source
- ✓ Manifold drains

Optional Features (specify)

- ☐ Hugged edge (H)
- ☐ Slim line configuration
- ☐ Other voltage, phase, cycle
(specify_____)

- ▶ Switch from hot to cold in a matter of minutes!
- ▶ Individual well flexibility
- ▶ Fully insulated, for use in any counter
- ▶ Fast, easy installation
- ▶ Labor saving easy to clean design



LTI, Inc.
P.O. Box 795
Jonesboro, GA 30237

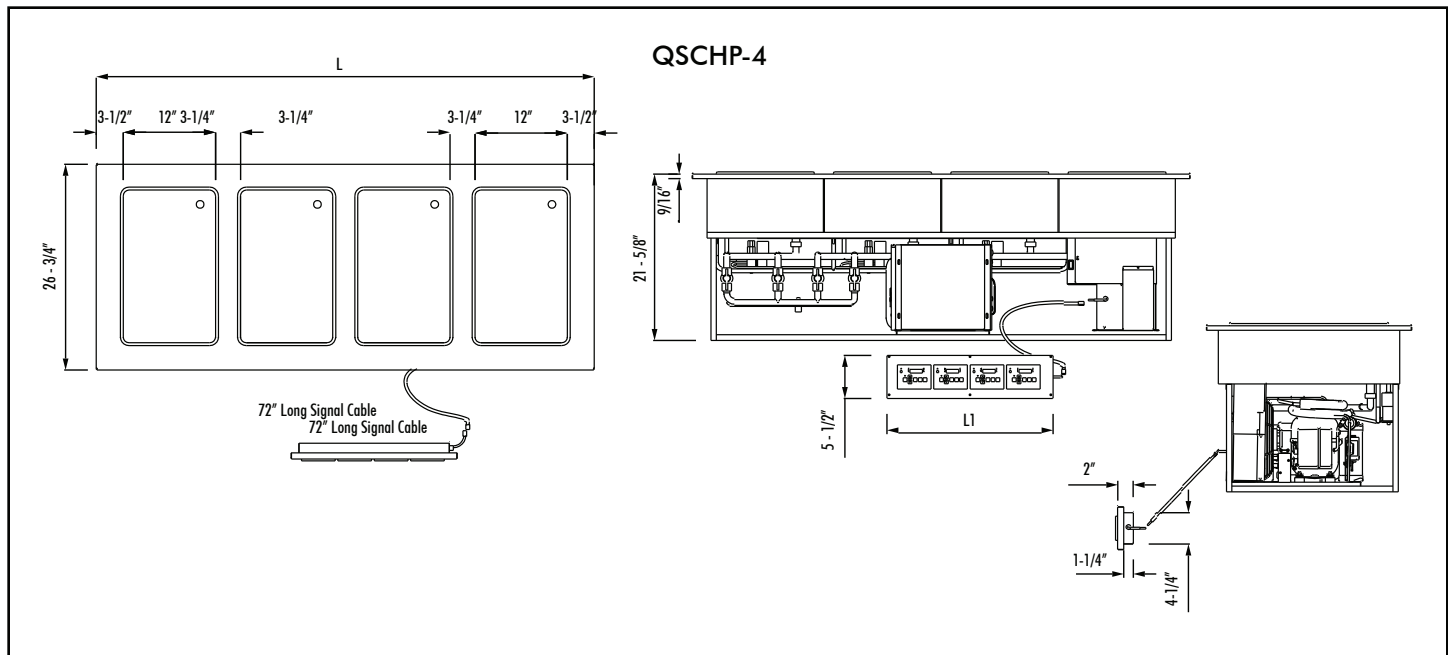
T 770 478 8803
F 770 471 3715
W lowtempind.com



U.L. Sanitation Classified to NSF Standards

REV 11/11/16

Hot-Cold-Freeze Drop-Ins



Model #	L - Top	L - Frame	Cut-out size	Control Panel Cut-out size	120V/1		120/208V/1		120/240V/1	
					Amps	Plug	Amps	Plug	Amps	Plug
DI-QSCHP-1	17 1/4"	15"	15 3/8" x 24"	6 1/4" x 4 1/4"	7.2	5-15P	7.2	14-20P	7.2	14-20P
DI-QSCHP-2	34 1/4"	30 11/4"	30 5/8" x 24"	11" x 4 1/4"	12.7	5-20P	9.6	14-20P	10.0	14-20P
DI-QSCHP-3	49 1/2"	45 1/2"	45 7/8" x 24"	15 3/4" x 4 1/4"	18.2	5-30P	12.0	14-20P	12.7	14-20P
DI-QSCHP-4	64 31/4"	60 31/4"	61 1/8" x 24"	20 1/2" x 4 1/4"	23.7	5-30P	14.4	14-20P	15.5	14-20P

General Specifications

Top perimeter frame to be constructed of 14 gauge stainless steel, welded, ground and polished with a thermal break provided between the top and refrigerated interior. Interior pan to be 18 gauge stainless steel, fully welded, ground and polished with a 3/4" open drain. To be fully insulated with 1 1/2" to 2" urethane insulation. The exterior jacket to be constructed of heavy gauge galvanized steel.

Refrigeration system to be 1/3 hermetically sealed compressor operating on R-507 (HFC) refrigerant, and will include controls. New energy efficient hot food wells use digitally controlled, 500 watt heat source. All switches and controls are fully accessible and are provided with cord and plug.

Units to be UL listed and shall bear the UL classified EPH label for sanitation meeting all NSF4 and NSF7 requirements.

Note: To ensure proper operation, adequate airflow must be provided.

Approval/Submittal (signature required)

Model # _____

Flange Edge Detail:

Turned (T) _____ Hugged(H) _____

(T)= 1/2" 90° turn down
(H)= 14 gauge thickness

Voltage _____

Compressor standard location is right end (from control side).

Adherence to LTI installation instructions is required.

Failure to do so may void the warranty.

Signature _____

Date _____

We reserve the right to change specifications and product design without notice. Such revisions do not entitle the buyer to corresponding changes, improvements, additions or replacement for previously purchased equipment.

All equipment to be built in accordance with the Underwriters Laboratories, Inc. and the National Sanitation Foundation, Inc. standards and shall bear the Underwriters Laboratories, Inc. listing label for safety and the Underwriters Laboratories classification label for sanitation.

Submittal Sheet

12/20/2017

ITEM# 131 - HOT / COLD FOOD WELL UNIT, DROP-IN, ELECTRIC (1 EA REQ'D)

Low Temp QSCHP-2

QuickSwitch™ Hot/Cold/Freeze Food Well, drop-in, 34-1/4"W x 26-3/4"D x 21-16/25"H, accommodates (2) 12" x 20" pan size, wired remote, individual wired remote digital controls for hot or cold operation, manifold drain, stainless steel top & wells, galvanized exterior, cULus, ANSI/NSF 4, ANSI/NSF 7

The spec sheet for this item can be viewed on item 130)

ACCESSORIES

Mfr	Qty	Model	Spec
Low Temp	1		"Some options may increase lead times"
Low Temp	1		120/208v/60/1-ph, 9.6 amps, NEMA 14-20P
Low Temp	1	HUG	Hugged edge

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1	120/208	60	1	Cord & Plug		14-20P	9.6				

WATER

	HOT SIZE	HOT AFF	HOT GPH	COLD SIZE	COLD AFF	FILTERED SIZE	FILTERED AFF	CONDENSER INLET SIZE	CONDENSER OUTLET SIZE
1									

WASTE

	INDIRECT SIZE	DIRECT SIZE
1	3/4"	

Submittal Sheet

12/20/2017

ITEM# 132 - OMS SCREEN - WALL MOUNT (2 REQ'D)

Provided by Operations CONTACT OPERATIONS

Submittal Sheet

12/20/2017

ITEM# 133 - COMBINATION PREPARATION/REFRIGERATED AIR-SCREEN (1 EA REQ'D)

Structural Concepts GP441RR

Fusion® Preparation/Self-Serve Air-Screen Refrigerated Case, 51"W, adjustable condiment pan rail, 16"D work surface, self-serve refrigerated base with Breeze™ with EnergyWise self-contained refrigeration system, full end panels with mirror, laminated upper front panel, stainless steel rear exterior, open non-refrigerated rear storage area, cETLus, ETL-Sanitation

ACCESSORIES

Mfr	Qty	Model	Spec
Structural Concepts	1		NOTE: If GFCI is required, a GFCI breaker MUST be used in lieu of a GFCI receptacle
Structural Concepts	1		NOTE: 52" Minimum entry door clearance required (with out shipping skid)
Structural Concepts	1		1 yr. parts & labor warranty, 5 yr. compressor warranty, standard
Structural Concepts	1		Breeze with EnergyWise self-contained refrigeration system, standard
Structural Concepts	1		120/230v/60/1-ph, 11.14 amps, 3-wire plus ground required, standard
Structural Concepts	1		6 ft straight blade power cord with NEMA 14-20P (self-contained), standard
Structural Concepts	1		NOTE: Compressor air intake from rear & out front panel, front panel cannot be blocked (Not applicable with remote refrigeration option)
Structural Concepts	1		Base Support: Casters with levelers (may increase height of case) (not available with remote refrigeration)
Structural Concepts	1		Interior: Stainless steel in lieu of standard black
Structural Concepts	1		Exterior: Stainless steel (available with standard flat front panel only)
Structural Concepts	1		Lower Front panel: Standard black
Structural Concepts	1		Silver sneeze guard post
Structural Concepts	1		Night curtain, retractable, non-locking

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1	120/230	60	1	Cord & Plug			11.14				
2						14-20P					

Fusion

Product Specifications

Combination Prep/Refrigerated Self-Service Case w/ Rear Storage



MODEL SHOWN: GP441RR

NOTE: INTERIOR PANS NOT PROVIDED W/CASE GP441RR HOLDS (2) FULL SIZE 4"D PANS
GP641RR = (3) PANS - GP841RR = (4) PANS

- ☐ GP441RR
- ☐ GP641RR
- ☐ GP841RR

Lengths include end panels

51"L x 51-3/4"D x 43"H

75-3/8"L x 51-3/4"D x 43"H

99-3/4"L x 51-3/4"D x 43"H

STANDARD FEATURES

- Breeze™ w/EnergyWise s/c refrigeration
- Compressor air intake from rear and out front panel at toe kick.
Front panel cannot be blocked.
- Condiment pan support rails
- Integrated average product temperature of 40°F or less
- LED 4000K top light(s)
- NOTE: Pans not supplied with case.
- NOTE: Remote only available w/rail base w/shims. N/A w/levelers, casters or legs.
- One year parts & labor; 5 year compressor warranty
- Shelving removable and adjustable on 1" centers
- Stainless steel rear exterior

Features	Standard	Options
EXTERIOR COLOR	<input type="checkbox"/> Laminated (non-premium) Confirm pattern/grain direction	<input type="checkbox"/> Laminated (premium) Confirm pattern/grain direction <input type="checkbox"/> Stainless steel
INTERIOR COLOR	<input type="checkbox"/> Black	<input type="checkbox"/> Stainless steel <input type="checkbox"/> White
LOWER FRONT PANEL COLOR	<input type="checkbox"/> Painted - Black	<input type="checkbox"/> Stainless steel
BASE	<input type="checkbox"/> Casters w/ levelers (n/a w/ remote ref.)	<input type="checkbox"/> 6"H legs (n/a w/ remote ref.)
END PANEL LEFT	<input type="checkbox"/> Full end panel w/mirror interior	<input type="checkbox"/> No end panel (for same case to case connect)
END PANEL RIGHT	<input type="checkbox"/> Full end panel w/mirror interior	<input type="checkbox"/> No end panel (for same case to case connect)
REAR STORAGE	<input type="checkbox"/> Non-refrigerated rear storage (w/o doors)	<input type="checkbox"/> Non-refrigerated rear storage (w/doors) <input type="checkbox"/> Refrigerated rear storage (w/doors)
REAR WORK LEDGE	<input type="checkbox"/> White Sanalite®	<input type="checkbox"/> Stainless steel
SNEEZE GUARD POSTS	<input type="checkbox"/> Black	<input type="checkbox"/> Silver
SNEEZE GUARD	<input type="checkbox"/> Clear glass with top serving shelf	<input type="checkbox"/> No sneeze guard (to be supplied by others in the field)
ELECTRICAL CONNECT	<input type="checkbox"/> 6' straight blade power cord (self-cont.)	<input type="checkbox"/> 6' locking power cord (self-cont.) <input type="checkbox"/> Electrical leads (remote)
REFRIGERATION	<input type="checkbox"/> Breeze™ w/EnergyWise s/c refrigeration	<input type="checkbox"/> NOTE: Remote only available w/rail base w/shims. N/A w/levelers, casters or legs. <input type="checkbox"/> Note: Remote doesn't incl Conds unit. Floor drain reqd. <input type="checkbox"/> Remote w/thermostat, solenoid & TXV
MISCELLANEOUS		<input type="checkbox"/> Second year parts & labor warranty (excludes compressor)
ACCESSORIES		<input type="checkbox"/> Additional non-lighted metal shelf <input type="checkbox"/> Clean Sweep® coil cleaner (n/a w/remote) <input type="checkbox"/> Night curtain, retractable, non-locking <input type="checkbox"/> Removable wire security cover, locking

Fusion

Product Specifications

Intended Environment: Type I - Designed to operate in ambient conditions of 75°F with 55% relative humidity unless noted otherwise in system information below.

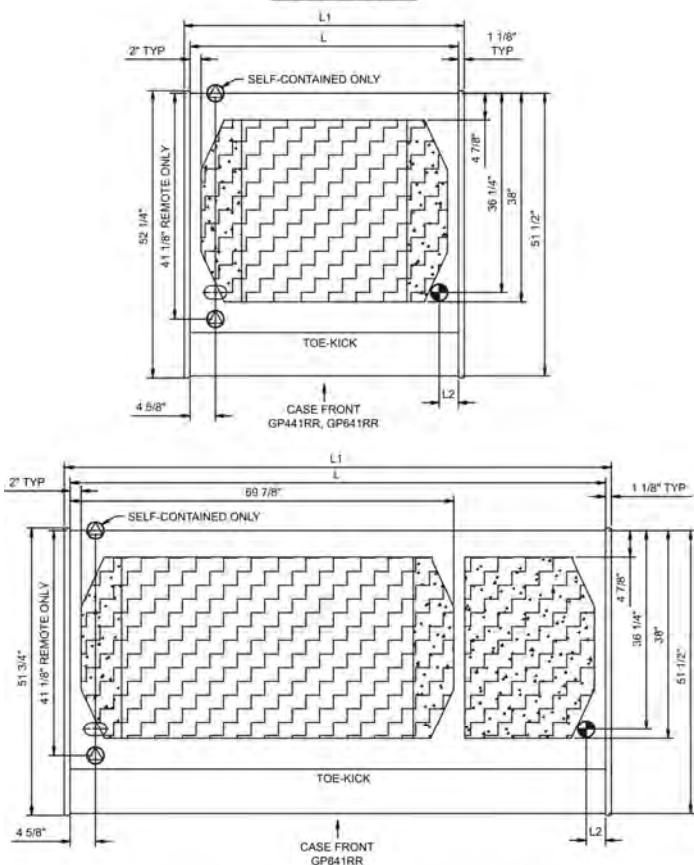
Zone **Intended Product To Be Displayed**

All Packaged / unpackaged refrigerated products

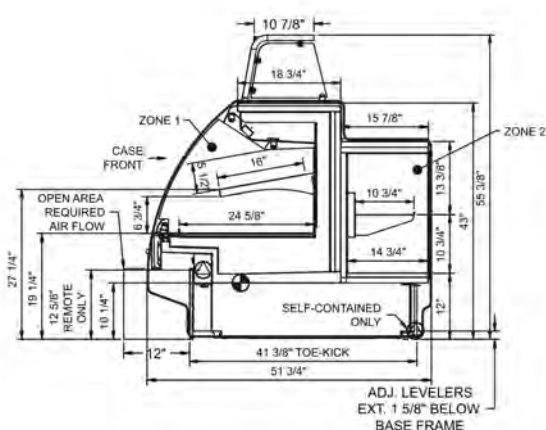
Warmest Avg Prod Temp ° F

40

PLAN VIEW



SIDE VIEW



NOTE: ALL DIMENSIONS APPROXIMATE

ELECTRICAL JUNCTION BOX

(SUPPLIED WITH 6\"/>

LOCATION OF DRAIN TUBE FOR REMOTE REF.

ONLY (SUPPLIED WITH 3/4\"/>

REFRIGERATION LINE CONNECTION.

REMOTE FLOOR SINK & UTILITIES

ACCESS AREA.

SELF-CONTAINED CASE SERVICE ACCESS AREA.

DRY CASE SERVICE ACCESS AREA.

Model Technical Specifications

Model	L"	L1"	L2"	System Circuit Volts			Phs	Freq	Amps ***	Watts	Wires	NEMA Plug	SST	BTUH	Est Wt
GP441RR	N/A	51.00	3.50	Remote(Type I)	Circuit #1	110-120	1	60	3.25	262	2+G	Leads Multiple	20.00	5150	1,300
				Self-Contained	Circuit #1	120/230V	1	60	11.14	2,200	3+G	14-20P or L14-20P	N/A	N/A	
GP641RR	N/A	75.38	3.50	Remote(Type I)	Circuit #1	110-120	1	60	6.32	551	2+G	Leads Multiple	20.00	6350	1,400
				Self-Contained	Circuit #1	120/230V	1	60	15.59	2,664	3+G	14-20P or L14-20P	N/A	N/A	
GP841RR	N/A	99.75	3.50	Remote(Type I)	Circuit #1	110-120	1	60	5.86	656	2+G	Leads Multiple	20.00	8900	1,600
				Self-Contained	Circuit #1	120/230V	1	60	14.87	3,177	3+G	14-20P or L14-20P	N/A	N/A	

*** Does not include electric defrost on freezer models.

Regulatory Approvals:

All Models
 Accordance with AHRI Std 1200
 ETL Listed to UL 471
 ETL Listed to CAN/CSA 22.2 No. 120
 ETL Sanitation to NSF 7



In Accordance with
AHRI Std 1200

DOE 2017
 Energy Efficiency
 Compliant

Important Notes:

- 1) ELECTRICAL NOTE: If GFCI is required, a GFCI breaker MUST be used in lieu of a GFCI receptacle
- 2) 52" minimum door entry clearance required (without shipping skid).
- 3) Units are supplied with levelers. They must be adjusted during installation to ensure the unit is level and plumb. Dimensions reflect levelers extended 1 1/4".

Submittal Sheet

12/20/2017

ITEM# 134.1 - SNEEZE GUARD (1 EA REQ'D)

Versa-Gard VG3.3-SK

VG Series. Adjustable self service food protector with straight glass and top shelf. Adjustable in 7 different self-service positions. 1" OD Solid Supports. End glass panels are 1/4" clear tempered. All glass meets ANSI Z97.1 specifications for safety performance and ASTM C1048-04 specifications for heat treated glass. All hardware supplied in a brushed stainless steel finish. All glass with ground and polished edges. Conceal mount hardware.

The spec sheet for this item can be viewed on item 113.1)

ACCESSORIES

Mfr	Qty	Model	Spec
HEAT LAMP & LED LIGHT			

Submittal Sheet

12/20/2017

ITEM# 134.2 - SNEEZE GUARD (1 EA REQ'D)

Versa-Gard VG3.3-SK

VG Series. Adjustable self service food protector with straight glass and top shelf. Adjustable in 7 different self-service positions. 1" OD Solid Supports. End glass panels are 1/4" clear tempered. All glass meets ANSI Z97.1 specifications for safety performance and ASTM C1048-04 specifications for heat treated glass. All hardware supplied in a brushed stainless steel finish. All glass with ground and polished edges. Conceal mount hardware.

The spec sheet for this item can be viewed on item 113.1)

ACCESSORIES

Mfr	Qty	Model	Spec
HEAT LAMP & LED LIGHT			

Submittal Sheet

12/20/2017

ITEM# 135 - LCD SCREEN (3 REQ'D)

Provided by Operations CONTACT OPERATIONS

Submittal Sheet

12/20/2017

ITEM# 140 - ONE (1) COMPARTMENT SINK (1 EA REQ'D)

Eagle Group FN2018-1-36L14/3

Spec-Master® FN Series Sink, one compartment, 57-1/2"W x 27"D, 14/304 stainless steel top, 18" wide x 20" front-to-back x 14" deep compartment, 36" drainboard on left, 9-1/2"H backsplash with 1" upturn & tile edge, 8" O.C. splash mount faucet holes, rolled edges on front & sides, includes 3-1/2" basket drain, stainless steel crossbracing on all sides, stainless steel legs & adjustable bullet feet, NSF

The spec sheet for this item can be viewed on item 21)

ACCESSORIES

Mfr	Qty	Model	Spec
Eagle Group	1	340380	T&S Faucet, splash-mounted, 8" centers, 10" swing nozzle, extra heavy-duty
Eagle Group	1	341189	Twist Handle Drain, 1-1/2 or 2" NPS connection
Eagle Group	1	-TB	Twist bracket, per drain

WATER

	HOT SIZE	HOT AFF	HOT GPH	COLD SIZE	COLD AFF	FILTERED SIZE	FILTERED AFF	CONDENSER INLET SIZE	CONDENSER OUTLET SIZE
1									
2	1/2"			1/2"					
3									

WASTE

	INDIRECT SIZE	DIRECT SIZE
1	1-1/2"	
2		
3	2"	

PLUMBING 1 REMARKS

(1) set of 1-1/8" faucet holes, 8" O.C.

Submittal Sheet

12/20/2017

ITEM# 141 - HERB & MICROGREEN GROWING CABINET (1 EA REQ'D)

Carter-Hoffmann GC42

Gardenchef herb and microgreen growing cabinet; automated growing system for lights, watering and monitoring pH and TDS levels; Two-door cabinet with 8 separate growing zones. 3/8" NPT drain and fill connections; 120v/60/1-ph, 4.4 Amps, NEMA 5-15P, NSF, cULus

ACCESSORIES

Mfr	Qty	Model	Spec
Carter-Hoffmann	1	GARDENCHEF STARTER KIT	Starter kit: -Growing trays -Mats & domes -Sifter -TDS Calibration solution -pH kit -Hydrogen peroxide -20 gallon plastic tub -Measuring syringe

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1	120	60	1			5-15P	4.4				

WATER

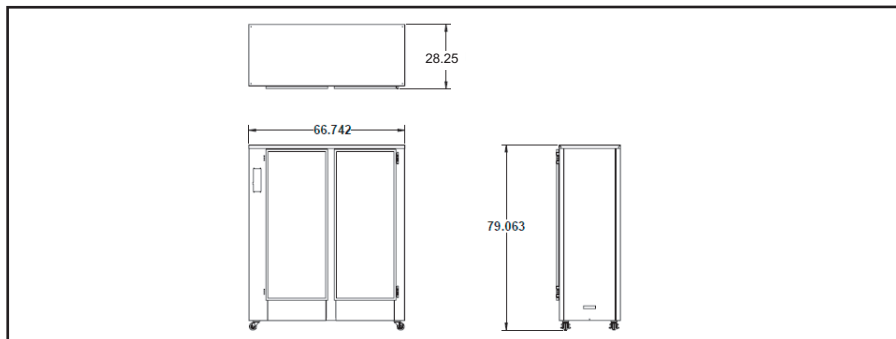
	HOT SIZE	HOT AFF	HOT GPH	COLD SIZE	COLD AFF	FILTERED SIZE	FILTERED AFF	CONDENSER INLET SIZE	CONDENSER OUTLET SIZE
1				3/8"					

WASTE

	INDIRECT SIZE	DIRECT SIZE
1	3/8"	



GARDENCHEF™ HERB & MICRO GREEN GROWING CABINETS



Model Number	Growing Flat Capacity		Shelf Spacing		Inside Working Height		Overall Dimensions						Caster Diameter		Shipping Weight	
							Height		Depth		Width					
	10"x20" Flats	Zones	in	mm	in	mm	in	mm	in	mm	in	mm	lbs	kg		
GC42	16	8	*	*	63	1600	79	2007	28 ¹ / ₄	718	66 ³ / ₄	1695	3	76	525	238
GC41	8	4	*	*	63	1600	79	2007	28 ¹ / ₄	718	37 ¹ / ₂	953	3	76	275	125
GC12	4	2	16 ³ / ₄	425	16 ³ / ₄	425	33 ¹ / ₂	851	28 ¹ / ₄	718	66 ³ / ₄	1695	3	76	200	91
GC11	2	1	16 ³ / ₄	425	16 ³ / ₄	425	33 ¹ / ₂	851	28 ¹ / ₄	718	37 ¹ / ₂	953	3	76	165	75

*See table in description below.

CONSTRUCTION...Welded & riveted double wall, non-insulated cabinet construction.

CABINET MATERIAL... 430 series stainless steel exterior; 301 series interior with reflective finish

BASE FRAME... 12 gauge stainless steel full depth bolsters.

CASTERS... 3" diameter polyurethane casters. All swivel; front casters fitted with brakes.

LEGS... Four adjustable legs for leveling the cabinet.

DOORS...Single panel tempered glass doors set in extruded aluminum frame. Magnetic gasket. Full length integrated handle(s).

HINGES...Adjustable edge mount hinges with chrome plate finish.

GROWING SHELVES... Removable growing shelves. Each shelf is on rollers and pulls out for complete access to flats of plants. Will accommodate standard 10"x20" flats with up to 7" propagation domes for sprouting. Includes one set of growing trays and 5" domes. GC41 & GC42 have 4 levels with different spacing. GC11 and GC12 have 16.75" of growing space.

Level	Shelf Spacing
1 (top)	9.875"
2	11.5"
3	13"
4 (bottom)	16.75"

CONTROLS...Touchscreen digital controls. Automated system provides correct measures of water, nutrients, relative humidity, lighting on optimum cycle for plant growth and nutrient data. Preprogrammed default settings for most growing needs; programmable for other growing situations.

ENVIRONMENT: Digital controls for automatic light, watering schedule and humidity levels for growing. Temperature based on ambient temperature.

AIR CIRCULATION...One fan for each growing zone, with rear venting to create a gentle indoor breeze and keep plants in a stable, fresh environment.

WATERING SYSTEM... Automatic filtered pump/aerator irrigation system delivers water and nutrients from the reservoir to the plants. Programmable watering cycle. Autofill reservoir. 3/8" NPT fill connection; 3/8" NPT drain connection. Sensors for water level, pH and TDS (total dissolved solids). pH & TDS testing meters not included.

GROWING LIGHTS... Equipped with 18" T5 high output fluorescent light fixtures. Each fixture includes an integrated electronic ballast, 6400°K lamp with a nano-tech reflector for maximum reflection. Light's imitate the sun's rays for optimum growing. Removable plastic light diffusing shields. Programmable light cycles.

ELECTRICAL CHARACTERISTICS...

GC42: 120 volts, 4.4 amps
GC41: 120 volts, 2.5 amps
GC12: 120 volts, 1.4 amps
GC11: 120 volts, 1.0 amps
60 cycle, single phase, six foot rubber cord with 3 prong grounding plug. NEMA 5-15P.

ACCESSORIES/OPTIONS...

- ☐ Starter kit: Includes growing trays, mats and domes, sifter, TDS and pH calibration solutions, hydrogen peroxide, 20 gallon plastic tub, measuring syringe
- ☐ Lockout access code on controller

**PATENT
PENDING**

Specifications subject to change through product improvement & innovation.



CARTER-HOFFMANN
1551 McCormick Ave., Mundelein, IL 60060
(847) 362-5500 • (800) 323-9793 • Fax (847) 367-8981
www.carter-hoffmann.com

FEATURES & BENEFITS

1551 McCormick Avenue, Mundelein, Illinois 60060
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GARDEN CHEF™ HERB & MICROGREEN GROWING CABINET

Since 1947, Foodservice Equipment That Delivers!



Daikon Radish Sprouts
4 days old

BRING THE GARDEN TO YOUR KITCHEN... Grow your own herbs and microgreens for the best flavor and freshest presentation. Make your kitchen a showcase for fresh food and locally grown ingredients. Have fresh herbs and microgreens in as little as seven days. By growing in your kitchen you can save time and money while controlling the supply of greens available for your menu. Suitable for traditional soil or hydroponic growing.

GROWING IS EASY... Accepts traditional 10"x20" growing flats and vented humidity domes. Full set of trays and domes included with cabinet.



GC41

HIGH OUTPUT LIGHT FIXTURES... Equipped with T5 fluorescent bulbs to replicate the sun's rays and get the best growth possible. Removable plastic light diffuser panels.



GC42

AUTOMATED SYSTEM... Digitally controlled automated system regulates watering and light cycles, nutrients, and air circulation for optimal growth. Automatic filtered water pump/aerator irrigation system. Plumbing and drain connections to hook up to municipal system. Separate growing zones with individual settings.



Submittal Sheet

12/20/2017

ITEM# 150 - REACH-IN FREEZER (1 EA REQ'D)

Continental Refrigerator 1F

Freezer, reach-in, one-section, 20 cu. ft., self-contained refrigeration, stainless steel front, aluminum interior & ends, standard depth, full-height solid door, electronic controller w/ digital display, electric condensate evaporator, 5" casters, 1/3 hp, cETLus, NSF, Made in USA

ACCESSORIES

Mfr	Qty	Model	Spec
Continental Refrigerator	1		Standard warranty (for the United States & Canada Only): 3 year parts and labor; 5 year compressor
Continental Refrigerator	1		115v/60/1-ph, 6.3 amps, cord, NEMA 5-15P, standard
Continental Refrigerator	1		Door hinged on right, standard
Continental Refrigerator	1		5" Casters, standard

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1									1/3		
2	115	60	1	Cord & Plug		5-15P	6.3				

REACH-IN FREEZER (0°F)

Model: 1F

1-Section Reach-In Freezer

1F - Stainless steel front, aluminum end panels and interior

1F-SA - Stainless steel exterior, aluminum interior

1F-SS - Stainless steel exterior and interior

Designed to maintain NSF-7 temperatures in 100°F ambient.



Options and Accessories

(upcharge and lead times may apply)

Stainless steel case back	Shallow depth
Add'l epoxy-coated steel shelves	Hinged glass door
Chrome or stainless steel shelves	Increased refrigeration systems
Heavy-duty pilaster strips	Special electrical req. (consult factory)
Pan slide assemblies	Correctional Facility Options
Expansion valve system	• One way security screws
Adjustable legs	• Locking hasp (lock not included)
Custom laminates	• Stainless steel mesh cover
Half doors	• Coverless hinges
Pass-Thru	

Consult factory for other model configurations, options and accessories.

Continental
Refrigerator

Toll-Free: 800-523-7138

Phone: 215-244-1400

Fax: 215-244-9579

539 Dunksferry Road

Bensalem, PA 19020

www.continentalrefrigerator.com

Project Name:

Model Specified:

Location:

Item No:

Quantity:

AIA #:

SIS #:

Standard Model Features

REFRIGERATION SYSTEM

Environmentally-safe R-404A refrigerant

Self contained, performance-rated refrigeration system

Automatic, electric condensate evaporator

CABINET ARCHITECTURE

3" non-CFC polyurethane foam insulation

Smooth, polished chrome workflow door handle

Cam action, lift off hinges

Self-closing door

Magnetic snap-in door gasket

Cylinder lock in door

Heavy-duty, epoxy-coated steel shelves

5" casters

MODEL FEATURES

LED interior lighting

Electronic controller w/ digital display & hi-low alarm

Automatic electric defrost

Rehinging of door (in the field)

APPROVAL:

Model Specifications

DIMENSIONAL DATA

Net Capacity (cu. ft.)	20 (566 cu l)
Width, Overall (in.)	26 (660 mm)
Depth, Overall (in.) (incl. handle)	35 3/8 (899 mm)
Depth [less door] (in.)	32 (813 mm)
Depth [door open 90°] (in.)	55 1/2 (1410 mm)
Clear Door Width (in.)	19 3/8 (492 mm)
Clear Door Height (in.)	58 5/8 (1489 mm)
Height, Overall (in.) (incl. 5" casters)	82 1/4 (2096 mm)
No. of Doors	1
No. of Shelves	3
Shelf Area (sq. ft.)	20.4 (1.9 sq m)
Tray Slide Capacity	24

REFRIGERANT DATA

Condensing Unit Size (H.P.)	1/3
Capacity (BTU/Hr)*	1590

ELECTRICAL DATA

Voltage (int'l)	115/60/1 (220/50/1)
Feed Wires (incl. ground)	3
Total Amps (int'l)	6.3 (3.8)
Defrost Amps (int'l)	5.2 (2.6)
10 ft. Cord/Plug [attached] (int'l)	Yes (No)

SHIPPING DATA

Height - Crated (in.)	85 1/2 (2172 mm)
Width - Crated (in.)	31 5/8 (803 mm)
Depth - Crated (in.)	42 (1067 mm)
Volume - Crated (cu. ft.)	65 (1841 cu l)
Weight Std - Crated (lbs.)	325 (147 kg)
Weight SS - Crated (lbs.)	385 (175 kg)
Weight Std - Uncrated (lbs.)	225 (102 kg)
Weight SS - Uncrated (lbs.)	285 (129 kg)

* Rating @ -15°F evaporator, 90°F ambient

Figures in parentheses reflect metric equivalents rounded to the nearest whole unit.



Equipped with one NEMA-5-15P Plug
(varies by country)

Continental
Refrigerator

Toll-Free: 800-523-7138
Phone: 215-244-1400
Fax: 215-244-9579

539 Dunkserry Road
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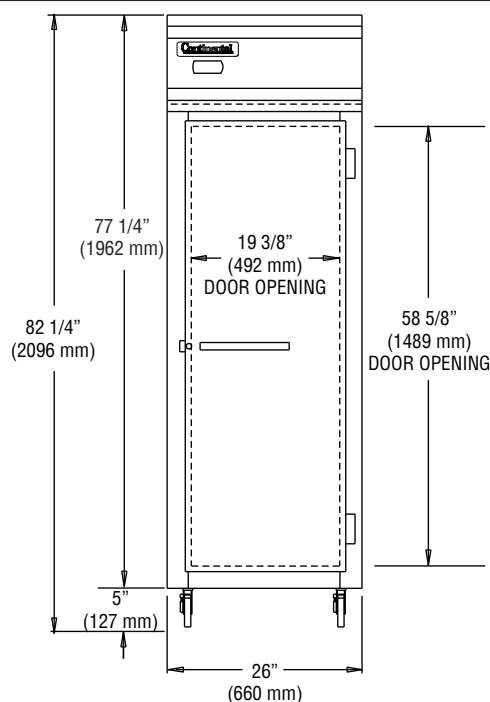
Due to our continued efforts in developing innovative products, specifications subject to change without notice.



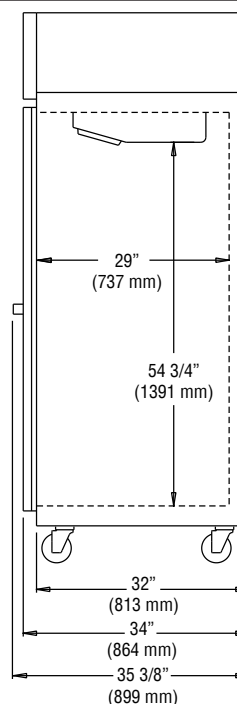
MADE IN THE U.S.A.

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Model Plan Views



FRONT VIEW



SIDE VIEW

IMPORTANT NOTE: If the cabinet is located directly against a wall and/or under a low ceiling, a minimum clearance of 12" is required on top and 3" on sides and rear.

Submittal Sheet

12/20/2017

ITEM# 151 - EQUIPMENT STAND, REFRIGERATED BASE (1 EA REQ'D)

Continental Refrigerator DL72G

Refrigerator Griddle Stand, two-section, (4) drawers - two drawers accommodates (1) 12" x 20" x 6" & (1) 6" x 20" x 6", two drawers accommodates (2) 12" x 20" x 6", dial thermometer, stainless steel top with drip guard marine edge, stainless steel exterior and interior, 4" casters, self-contained refrigeration, 1/4 hp, 10' cord, cETLus, NSF, Made in USA

The spec sheet for this item can be viewed on item 68)

ACCESSORIES

Mfr	Qty	Model	Spec
Continental Refrigerator	1		Standard warranty (for the United States & Canada Only): 3 year parts and labor; 5 year compressor
Continental Refrigerator	1		115v/60/1-ph, 6.1 amps, cord, NEMA 5-15P, standard
Continental Refrigerator	1		Condensing unit on the right, standard
Continental Refrigerator	1		4" Casters, standard

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1									1/4		
2	115	60	1	Cord & Plug		5-15P	6.1				

Submittal Sheet

12/20/2017

ITEM# 152 - HOTPLATE, COUNTERTOP, GAS (1 EA REQ'D)

Southbend HDO-24

Hotplate, gas, countertop, 24", (4) 33,000 BTU open burners, manual controls, removable cast iron grates & crumb tray, stainless steel front, sides & 4" adjustable legs, 132,000 BTU, CSA, NSF

The spec sheet for this item can be viewed on item 71)

ACCESSORIES

Mfr	Qty	Model	Spec
Southbend	1		Domestic Shipping, inside of North America (Contact factory for price)
Southbend	1		Standard one year limited warranty
Southbend	1		Natural Gas
Southbend	1		Battery spark ignition

GAS

	SIZE	MBTU	KW
1	3/4"	132.0	

STEAM

	INLET SIZE	RETURN SIZE	LB/HR	PSIG (min)	PSIG (max)
1					

Submittal Sheet

12/20/2017

ITEM# 153 - CHARBROILER, GAS, COUNTERTOP (1 EA REQ'D)

Southbend HDC-24

Charbroiler, gas, countertop, 24", cast iron radiants, stainless steel burners, two-position, two sided cooking grid, removable crumb tray, stainless steel front, sides & 4" adjustable legs, 80,000 BTU, CSA, NSF

The spec sheet for this item can be viewed on item 70)

ACCESSORIES

Mfr	Qty	Model	Spec
Southbend	1		Domestic Shipping, inside of North America (Contact factory for price)
Southbend	1		Standard one year limited warranty
Southbend	1		Natural Gas
Southbend	1		Battery spark ignition

GAS

	SIZE	MBTU	KW
1	3/4"	80.0	

STEAM

	INLET SIZE	RETURN SIZE	LB/HR	PSIG (min)	PSIG (max)
1					

Submittal Sheet

12/20/2017

ITEM# 154 - GAS COUNTERTOP GRIDDLE (1 EA REQ'D)

Southbend HDG-24

Griddle, countertop, gas, 24" W x 24" D cooking surface, 1" thick polished steel plate, thermostatic controls, battery spark ignition, stainless steel front, sides & 4" adjustable legs, 60,000 BTU, CSA, NSF

The spec sheet for this item can be viewed on item 69)

ACCESSORIES

Mfr	Qty	Model	Spec
Southbend	1		Domestic Shipping, inside of North America (Contact factory for price)
Southbend	1		Standard one year limited warranty
Southbend	1		Natural Gas
Southbend	1		400° thermostat control, standard

GAS

	SIZE	MBTU	KW
1	3/4"	60.0	

STEAM

	INLET SIZE	RETURN SIZE	LB/HR	PSIG (min)	PSIG (max)
1					

Submittal Sheet

12/20/2017

ITEM# 155 - FRYER BATTERY, GAS (1 EA REQ'D)

Pitco SG14RS-1FD

Solstice™ Prepackaged Fryer System with Solstice™ Solo Filter System, High Power, gas, (1) 40-50 lb. oil capacity full tank, millivolt control, stainless steel tank, front & sides, under-fryer drawer filtration, 10" adjustable legs, 122,000 BTU (-F), NSF, CE, CSA Flame, CSA Star, AuGA

The spec sheet for this item can be viewed on item 83)

ACCESSORIES

Mfr	Qty	Model	Spec
Pitco	1		1 year parts and labor warranty from the date of installation up to a maximum of 15 months from the date of manufacture (with appropriate documentation), standard
Pitco	1		Natural gas
Pitco	1		Millivolt Thermostat, standard
Pitco	1		115v/60/1-ph, 6.1 amps
Pitco	1		Contact factory for cord information
Pitco	1	P6072145	Basket, (2) oblong/twin size, 13-1/2" x 6-1/2" x 5-1/2" deep, long handle, regular mesh (shipped std (n/c) with models "T" SG14, SG14R, SSH55, SE14, SE14X, SE14B, SG14T, 35+, 45+, fryer batteries shipped with (1) per fryer
Pitco	1	B3902303	Castors, 10", rigid, (each) locking, for fryers with Solo Filter (excludes Mega Fryers and ROV)
Pitco	1	B8003103	Gas Connector Hose, 3/4" connection, 48" long, with quick disconnect couplings, restraining device & thermal shut-off, for single unit 240,000 BTU

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1									1/3		
2	115	60	1				6.1				

ELECTRICAL 1 REMARKS

1/3 HP for filter pump

ELECTRICAL 2 REMARKS

Fryer/Solo Filter

GAS

	SIZE	MBTU	KW
1	3/4"	122.0	
2		240.0	

STEAM

	INLET SIZE	RETURN SIZE	LB/HR	PSIG (min)	PSIG (max)
1					
2					

Submittal Sheet

12/20/2017

ITEM# 156 - FRYER DUMP STATION (1 EA REQ'D)

Pitco BNB-SG14

Solstice™ Bread & Batter Cabinet, with BNB dump station, fryer match design, approximately 15-5/8" wide, includes 4-5/8" recessed pan and screen, standard finish, stainless steel front, sides & door, for prepackage system SG 14 gas fryers, NSF

The spec sheet for this item can be viewed on item 84)

ACCESSORIES

Mfr	Qty	Model	Spec
Pitco	1		1 year parts and labor warranty from the date of installation up to a maximum of 15 months from the date of manufacture (with appropriate documentation), standard
Pitco	1	PFW-1	Food Warmer, built-in, 750watt, CSA, NSF, UL
Pitco	1		120v/60/1-ph, 6.3 amps, 750 watts, NEMA 5-15P

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1	120	60	1	Cord & Plug		5-15P	6.3	0.75			

Submittal Sheet

12/20/2017

ITEM# 157 - EXHAUST HOOD (1 EA REQ'D)

Captive-Aire ND

Wall Type Exhaust Hood: 18 gauge 304 series stainless steel construction in accord with N.F.P.A. 96. Stainless steel baffle type U.L. classified grease extracting filters, with handles. Vapor-proof U.L. listed light fixtures as indicated on drawings. Provide stainless steel wall cabinet (located as shown on plan) for fire suppression system and control package. Fan and light switches to be located on face of hood in an accessible location. Hood to be furnished complete with Starter/contactor package for exhaust fan and make-up air fan (fans furnished by mechanical contractor, coordination of electrical service is required). Provide and install removable stainless steel perimeter trim and/or closure panels from top of hood to ceiling and 18 gauge stainless steel wall panels from floor to bottom of hood. Provide and install any secondary supporting members required to suspend hoods. Supports shall include seismic bracing, if required, in accord with SMACNA guidelines. Furnish unit complete with all standard accessories as normally supplied by the manufacturer.

The spec sheet for this item can be viewed on item 73)

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1	120	60	1	JB	CLG		10.0				
2	120	60	1	JB	CLG		10.0				

ELECTRICAL 1 REMARKS

LIGHTS

ELECTRICAL 2 REMARKS

FAN CONTROLS

Submittal Sheet

12/20/2017

ITEM# 157.1 - FIRE SUPPRESSION SYSTEM (1 EA REQ'D)

Ansul R-102

Wet chemical type fire suppression system. Installation in accord with N.F.P.A. 17A code requirements. Suppression system to be pre-piped at factory and hooked up in field by a local licensed agency. Local agency to perform certifications tests as required by local authorities. Furnish manual strike mechanism in accessible location. Furnish unit complete with all tanks, piping, relays, cable, fusible links, nozzles, etc. as required for a complete system.

Submittal Sheet

12/20/2017

ITEM# 158 - SELF-SERVICE REFRIGERATED MERCHANDISER (2 EA REQ'D)**Structural Concepts B42**

Oasis® Self-Service Refrigerated Merchandiser, 45-1/2"W, high profile, open front, (4) non-lighted metal shelves, top light, Breeze™ with EnergyWise self-contained refrigeration system, Blue Fin coated coil, one piece formed ABS plastic tub, black interior, laminate exterior, full end panels with mirror, cETLus, ETL-Sanitation

ACCESSORIES

Mfr	Qty	Model	Spec
Structural Concepts	2		NOTE: If GFCI is required, a GFCI breaker MUST be used in lieu of a GFCI receptacle
Structural Concepts	2		1 yr. parts & labor warranty, 5 yr. compressor warranty, standard
Structural Concepts	2		Breeze with EnergyWise self-contained refrigeration, lower front air intake/upper front air discharge, standard
Structural Concepts	2		110-120v/60/1ph, 16.0 amps, standard
Structural Concepts	2		6 ft straight blade power cord NEMA 5-20P (base exit), standard
Structural Concepts	2		NOTE: Compressor air intake through lower front & channeled up rear & out upper front, front panel cannot be blocked
Structural Concepts	2		Base Support: Casters, with levelers, standard
Structural Concepts	2		Interior: Stainless steel, in lieu of standard black
Structural Concepts	2		Exterior: Stainless steel
Structural Concepts	2		Header style: Square header, standard
Structural Concepts	2		Upper front panel style: Flat front, standard
Structural Concepts	2		Lower front panel: Stainless steel (with stainless steel exterior only)
Structural Concepts	2		Left end panel: Full with mirrored interior, metal edging, standard
Structural Concepts	2		Right end panel: Full with mirrored interior, metal edging, standard
Structural Concepts	2		Back Panel: Solid back panel, black, standard
Structural Concepts	2		Add Lights (LED) to standard shelves (4)

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1	110-120	60	1	Cord & Plug			16.0				
2						5-20P					

Refrigerated Self-Service Case 24"D



MODEL SHOWN: B32

- ☐ B32
- ☐ B42
- ☐ B62
- ☐ B82

Lengths include end panels

- 34-1/2"L x 24"D x 82-3/8"H
- 45-1/2"L x 24"D x 82-3/8"H
- 66-3/8"L x 24"D x 82-3/8"H
- 88-3/8"L x 24"D x 82-3/8"H

STANDARD FEATURES

- Breeze™ w/EnergyWise s/c refrigeration
- Blue Fin coated coil
- Compressor air lower front intake and upper front discharge.
Front panel cannot be blocked
- Condensate pan (self-contained refig. only)
- Integrated average product temperature of 40°F or less
- LED 4000K top light(s)
- One piece formed ABS plastic tub (n/a B82)
- One year parts & labor; 5 year compressor warranty
- Removable deck pans provide complete access to evaporator coil & refrigeration connections
- Shelving removable and adjustable on 1" centers
- Solid back panel, black

Features	Standard	Options
EXTERIOR COLOR	<input type="checkbox"/> Laminated (non-premium) Confirm pattern/grain direction	<input type="checkbox"/> Laminated (premium) Confirm pattern/grain direction <input type="checkbox"/> Stainless steel (includes lower front panel)
INTERIOR COLOR	<input type="checkbox"/> Black	<input type="checkbox"/> Stainless steel
LWR LOUVERED FRNT PANEL	<input type="checkbox"/> Painted - Black	<input type="checkbox"/> Stainless steel (w/stainless ext. only)
BASE	<input type="checkbox"/> Casters w/ levelers (n/a w/ remote ref.)	<input type="checkbox"/> Levelers (only) <input type="checkbox"/> Seismic levelers (Q4695)
END PANEL LEFT	<input type="checkbox"/> Full end panel w/mirror interior (metal edge matches interior color)	<input type="checkbox"/> Cutaway end panel (vinyl edge matches interior color) <input type="checkbox"/> No end panel w/ synchronized defrost
END PANEL RIGHT	<input type="checkbox"/> Full end panel w/mirror interior (metal edge matches interior color)	<input type="checkbox"/> Cutaway end panel (vinyl edge matches interior color) <input type="checkbox"/> No end panel w/ synchronized defrost
HEADER STYLE	<input type="checkbox"/> Flat	<input type="checkbox"/> Curved header
UPPER FRONT PANEL	<input type="checkbox"/> Flat front panel	<input type="checkbox"/> Black slatwall (flat front only) <input type="checkbox"/> Curved front panel
SHELVING	<input type="checkbox"/> Metal shelves, non-lighted	<input type="checkbox"/> Metal shelves, lighted (LED 4000K)
ELECTRICAL CONNECT	<input type="checkbox"/> 6' power cord (base exit)	<input type="checkbox"/> 6' power cord (top exit)
REFRIGERATION	<input type="checkbox"/> Breeze™ w/EnergyWise s/c refrigeration	<input type="checkbox"/> Breeze™ w/ EnergyWise s/c refrigeration (w/ floor drain) <input type="checkbox"/> Note: Remote doesn't incl Conds unit. Floor drain reqd. <input type="checkbox"/> Remote w/thermostat, solenoid & TXV
MISCELLANEOUS		<input type="checkbox"/> Second year parts & labor warranty (excludes compressor)
ACCESSORIES		<input type="checkbox"/> Clean Sweep® coil cleaner (n/a w/remote) <input type="checkbox"/> Night curtain, retractable, non-locking <input type="checkbox"/> Price tag moulding (matches interior color) <input type="checkbox"/> Solid security cover, removable, locking

Oasis®

Product Specifications

Intended Environment: Type I - Designed to operate in ambient conditions of 75°F with 55% relative humidity unless noted otherwise in system information below.

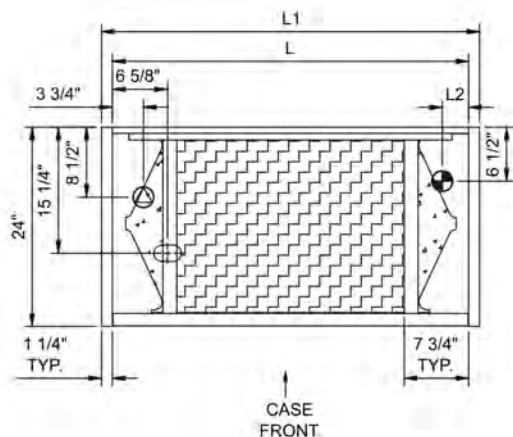
Zone **Intended Product To Be Displayed**

All Packaged refrigerated products

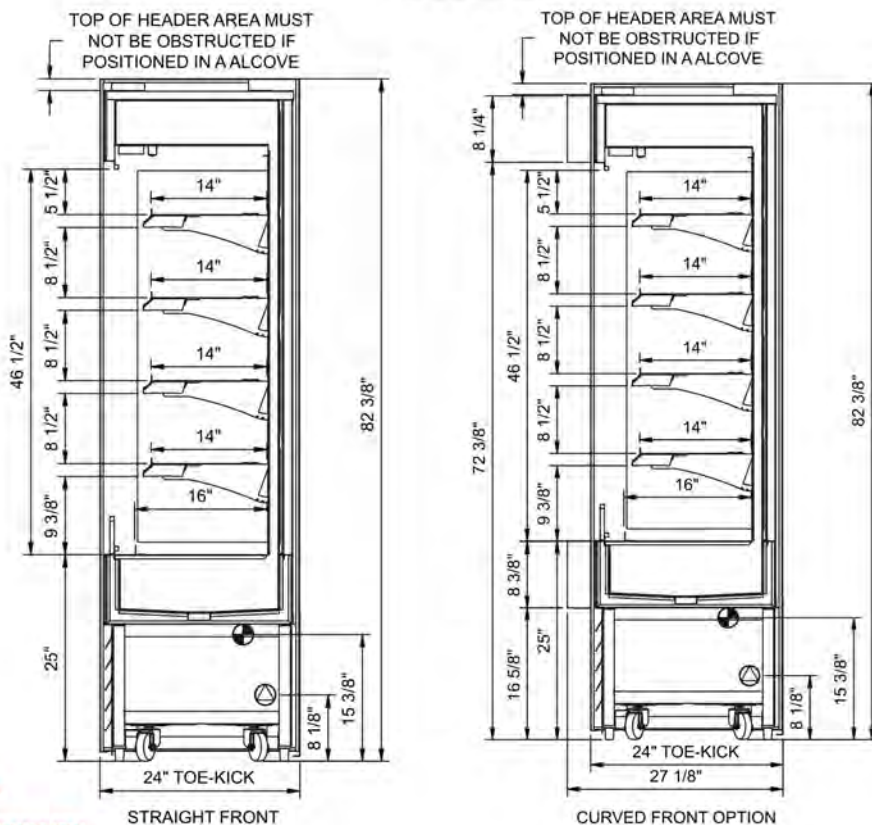
Warmest Avg Prod Temp ° F

40

PLAN VIEW



SIDE VIEW



NOTE: ALL DIMENSIONS APPROXIMATE

ELECTRICAL JUNCTION BOX (SUPPLIED WITH 6\"/>

LOCATION OF DRAIN TUBE FOR REMOTE REF. ONLY (SUPPLIED WITH 1/2\"/>

REFRIGERATION LINE CONNECTION.

REMOTE FLOOR SINK & UTILITIES ACCESS AREA.

SELF-CONTAINED CASE SERVICE ACCESS AREA.

DRY CASE SERVICE ACCESS AREA.

Model Technical Specifications

Model	L"	L1"	L2"	System Circuit Volts			Phs	Freq	Amps ***	Watts	Wires	NEMA Plug	SST	BTUH	Est Wt
B32	N/A	34.50	3.13	Remote(Type I)	Circuit #1	110-120	1	60	1.49	143	2+G	Leads Multiple	20.00	5900	800
				Self-Contained	Circuit #1	110-120	1	60	16.00	1,730	2+G	5-20P or L5-20P	N/A	N/A	
B42	N/A	45.50	3.13	Remote(Type I)	Circuit #1	110-120	1	60	2.13	197	2+G	Leads Multiple	20.00	6550	950
				Self-Contained	Circuit #1	110-120	1	60	15.49	1,523	2+G	5-20P or L5-20P	N/A	N/A	
B62	N/A	66.38	3.13	Remote(Type I)	Circuit #1	110-120	1	60	2.82	293	2+G	Leads Multiple	20.00	9500	1,250
				Self-Contained	Circuit #1	208-240	1	60	11.45	2,225	2+G	6-20P or L6-20P	N/A	N/A	
B82	N/A	88.38	3.13	Remote(Type I)	Circuit #1	110-120	1	60	3.67	371	2+G	Leads Multiple	20.00	12650	1,300
				Self-Contained	Circuit #1	120/230V	1	60	15.97	3,392	3+G	14-20P or L14-20P	N/A	N/A	

*** Does not include electric defrost on freezer models.

Regulatory Approvals:

All Models
 Accordance with AHRI Std 1200
 ETL Listed to UL 471
 ETL Listed to CAN/CSA 22.2 No. 120
 UL Sanitation to NSF Std 7



In Accordance with
AHRI Std 1200

DOE 2017
 Energy Efficiency
 Compliant

Important Notes:

- 1) ELECTRICAL NOTE: If GFCI is required, a GFCI breaker MUST be used in lieu of a GFCI receptacle
- 2) Performance issues (product temperatures, water on floor, etc.) caused by adverse conditions are not covered by warranty.
- 3) Keep unit at least 15' from exterior doors, overhead HVAC vents, or any air curtain disruption.
- 4) End panels must be tightly joined or kept at least 6" away from any structure to prevent condensation.
- 5) Do not expose unit to direct sunlight or any heat source (ovens, fryers, etc.).
- 6) Tile floors, low ceilings, or small rooms will increase noise level.

Submittal Sheet

12/20/2017

ITEM# 159 - INDUCTION RETHERMALIZER (4 EA REQ'D)

Vollrath 74110110

Mirage® Induction Soup Rethermalizer, 11 quart, LED push button controls, temperature control in °F or °C, (4) soup presets, stir indicator, locking controls function, includes: induction ready inset & inset cover, natural & black finish, 800W, 6.7 amps, NEMA 5-15P, 120v/60/1-ph, cULus, NSF, FCC, imported

ACCESSORIES

Mfr	Qty	Model	Spec
Vollrath	4		Requires use of included Vollrath induction-ready inset - failure to use these insets may damage the unit & will void the warranty
Vollrath	4	88204	Inset, 11 quart, induction ready, for Mirage induction rethermalizer, NSF
Vollrath	4	47490	Kool-Touch Hinged Cover, stainless with black phenolic knob, fits 78204 Inset & 77110 Double Boiler, imported

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1	120	60	1	Cord & Plug		5-15P	6.7	.8			



Outperform every day.™

Project:

Item Number:

Quantity:

MIRAGE® INDUCTION RETHERMALIZER



Mirage® Induction Rethermalizer

DESCRIPTION

Vollrath's Mirage® Induction Rethermalizers use innovative induction technology to run dry without a water bath, improve food quality and minimize food waste; while using a fraction of the energy.

Mirage® Induction Rethermalizers are shipped complete with an induction-ready inset and slotted hinged cover. The cover is not NSF.

PERFORMANCE CRITERIA

The Mirage® Induction Rethermalizer are designed to take a container of cooked food from a chilled state (below 40.0° F [4.4° C]) through the HACCP "danger zone" of 165° F (73.9° C) in less than 90 minutes. The performance standard is measured using the NSF mixture chilled to 35° F (1.7° C). The electric unit will raise the temperature of this product above 165° F (73.9° C) in less than 90 minutes. The temperature will be maintained above 150° F (65.6° C) when the food product and pan or inset are used with a standard pan or inset cover, and the food product is stirred regularly.

Agency Listings



This device complies with Part 18 FCC Rules.

Cover is not NSF.

Due to continued product improvement, please consult www.vollrath.com for current product specifications.

MODELS

- 7470110 7 Qt. Induction Rethermalizer, Natural (US/CAN)**
- 7470140 7 Qt. Induction Rethermalizer, Red (US/CAN)**
- 74110110 11 Qt. Induction Rethermalizer, Natural (US/CAN)**
- 74110140 11 Qt. Induction Rethermalizer, Red (US/CAN)**

FEATURES

- 800 watt 3D induction coil heats food evenly and efficiency.
- Dry use. Heat is transferred directly to the induction-ready inset, which eliminates the need to monitor and refill water levels.
- Three temperature sensors have direct contact with the inset to provide very accurate temperature control. Sensors help prevent food in near-empty insets from burning, which maintains food quality and reduces food waste.
- Sensors measure differences in food temperatures. This drives the Stir Indicator LED that informs operators the food product should be stirred.
- Advanced solid state controls with highly visible white LEDs include: temperature control in °F and °C; four presets - broth soups, crème soups, chili, mac and cheese; rethermalize mode; stirring indicator; and a locking function that prevents untrained operators from changing settings.
- Includes cover — item 47488 for 7 Qt. or 47490 for 11 Qt., and inset — item 88184 for 7 Qt. or item 88204 for 11 Qt. Covers and insets are also sold separately.
- Requires use of included Vollrath induction-ready inset.
- Meets NSF4 Performance Requirements for rethermalization and hot food holding equipment.
- 6' power cord plugs into any NEMA 5-15R 15 or 20 amp 120V receptacle.

IMPORTANT

- Failure to use Vollrath induction-ready insets may damage the unit and will void the warranty.
- All models require unrestricted intake and exhaust air ventilation for proper operation of the controls. The maximum intake temperature must not exceed 110°F (43°C). Temperatures are measured in ambient air while all appliances in the kitchen are in operation.
- Countertop models require a minimum clearance of 4 inches (10.2 cm) at the rear and 1 inch (2.5 cm) at the bottom.

WARRANTY: All models shown come with Vollrath's standard warranty against defects in materials and workmanship. For full warranty details, please refer to the Vollrath Equipment and Smallwares Catalog.

Approvals

Date

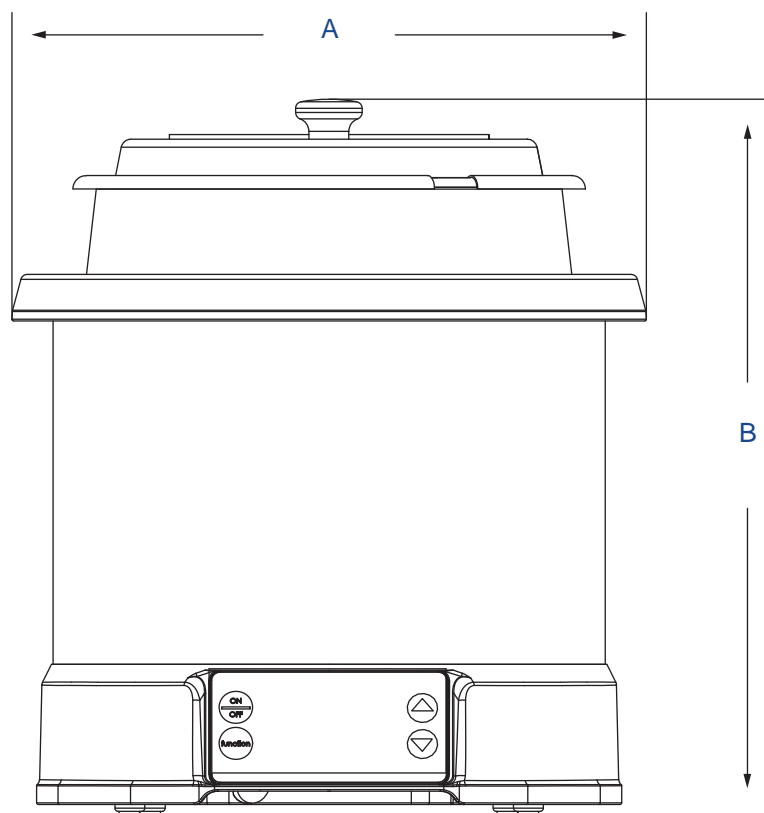


Outperform every day.™

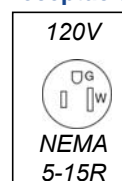
www.vollrath.com

The Vollrath Company, L.L.C.
1236 North 18th Street
Sheboygan, WI 53081-3201 U.S.A.
Customer Service: 800.628.0830
Canada Customer Service: 800.695.8560
Main Fax: 800.752.5620 or 920.459.6573

Technical Services: 800.628.0832
Technical Services Fax: 920.459.5462

MIRAGE® INDUCTION RETHERMALIZER**DIMENSIONS** (shown in inches (cm))**SPECIFICATIONS**

Item	Capacity QT (L)	Dimensions		Well Depth IN (CM)	Voltage	Watts	Amps	Plug	Shipping Dimensions IN (CM)	Shipping Weight LB (KG)
		(A) Width	(B) Height							
7470110	7 (6.6)	11 $\frac{7}{8}$ (30.3)	13 $\frac{1}{2}$ (34.2)	6 $\frac{7}{8}$ (17.6)	120V	800W	6.7A	NEMA 5-15P	14 $\frac{3}{4}$ x 14 $\frac{3}{4}$ v 15 (37.3 x 37.3 x 38.1)	11.4 (5.2)
7470140	7 (6.6)	11 $\frac{7}{8}$ (30.3)	13 $\frac{1}{2}$ (34.2)	6 $\frac{7}{8}$ (17.6)	120V	800W	6.7A	NEMA 5-15P	14 $\frac{3}{4}$ x 14 $\frac{3}{4}$ v 15 (37.3 x 37.3 x 38.1)	11.4 (5.2)
74110110	11 (10.4)	13 $\frac{7}{8}$ (35.3)	13 $\frac{1}{2}$ (34.2)	6 $\frac{7}{8}$ (17.6)	120V	800W	6.7A	NEMA 5-15P	14 $\frac{3}{4}$ x 14 $\frac{3}{4}$ v 15 (37.3 x 37.3 x 38.1)	13.4 (6.1)
74110140	11 (10.4)	13 $\frac{7}{8}$ (35.3)	13 $\frac{1}{2}$ (34.2)	6 $\frac{7}{8}$ (17.6)	120V	800W	6.7A	NEMA 5-15P	14 $\frac{3}{4}$ x 14 $\frac{3}{4}$ v 15 (37.3 x 37.3 x 38.1)	13.4 (6.1)

Receptacle

Outperform every day.™

www.vollrath.com

The Vollrath Company, L.L.C.
 1236 North 18th Street
 Sheboygan, WI 53081-3201 U.S.A.
 Customer Service: 800.628.0830
 Canada Customer Service: 800.695.8560
 Main Fax: 800.752.5620 or 920.459.6573

Technical Services: 800.628.0832
 Technical Services Fax: 920.459.5462

Submittal Sheet

12/20/2017

ITEM# 160 - MEGA TOP SANDWICH / SALAD PREPARATION REFRIGERATOR (3 EA REQ'D)

Continental Refrigerator SW72-30M-FB

Mighty Top Sandwich Unit, Front Breather, 72" wide, 20.6 cu ft capacity, three-section, (30) 1/6 size x 4" deep pans with 10" cutting board, (3) field rehingable doors, stainless steel top, front and end panels, aluminum interior, electronic controller w/digital display, 3-5/8" casters, rear mounted self-contained refrigeration, 1/4 hp, cETLus, NSF, Made in USA

ACCESSORIES

Mfr	Qty	Model	Spec
Continental Refrigerator	3		Standard warranty (for the United States & Canada Only): 3 year parts and labor; 5 year compressor
Continental Refrigerator	3		115v/60/1-ph, 7.6 amps, cord, NEMA 5-15P, standard
Continental Refrigerator	3		(00FL) Stainless steel flat cover - without hinges
Continental Refrigerator	3		10" cutting board, rear mounted (NOTE: Must use stainless steel flat cover)
Continental Refrigerator	3		NOTE: Overshelves not available with rear mounted cutting board option
Continental Refrigerator	3		Stainless steel interior

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1									1/4		
2	115	60	1	Cord & Plug		5-15P	7.6				

SANDWICH UNIT REFRIGERATOR

Model: SW72-30M-FB

72" Mighty Top Sandwich Unit Refrigerator with Solid Doors - 30 Pans Front Breathing

Stainless steel front and top, aluminum end panels, case back and interior.
Certified under NSF-7 to maintain temperatures in 86°F ambient and designed to maintain NSF-7 temperatures in 100°F ambient.



Options and Accessories

(upcharge and lead times may apply)

Stainless steel exterior and interior - SS models	Expansion valve system
Stainless steel end panels - SA models	Rear-mounted cutting board
Glass doors in lieu of solid doors - GD models	Flat insulated night covers
Stainless steel finished back in lieu of aluminum	Remote models
Drawers in lieu of doors	Door locks
Overshelves (single or double)	Adjustable legs
Stainless steel shelves	Digital thermometer
Additional epoxy-coated steel shelves	Crumb catcher
Automatic, electric condensate evaporator	

Consult factory for other model configurations, options and accessories.

Continental
 Refrigerator

Toll-Free: 800-523-7138
 Phone: 215-244-1400
 Fax: 215-244-9579

539 Dunksferry Road
 Bensalem, PA 19020
www.continentalrefrigerator.com

Project Name:

Model Specified:

Location:

Item No:

Quantity:

AIA #:

SIS #:

Standard Model Features

REFRIGERATION SYSTEM

Performance-rated refrigeration system
 Environmentally-safe R-134a refrigerant
 Unique air flow distribution allows pan product to maintain 33° - 41°F
 Automatic, energy saving, non-electric condensate evaporator
 Non-corrosive, plasticized fin evaporator coil
 Easily serviceable, back mounted compressor

CABINET ARCHITECTURE

2" non-CFC polyurethane foam insulation
 Spring loaded, self closing doors
 Magnetic snap-in door gaskets
 Heavy-duty, epoxy-coated steel shelves
 10" deep, full length nylon cutting board
 Insulated lids
 3 5/8" casters
 Completely enclosed, vented and removable case back

MODEL FEATURES

(30) 1/6 size non-recessed pans, 4" deep
 Interior hanging thermometer
 Field rehingeable doors

Front breathers are a unique, field assembled, bottom mounted ventilation system designed to allow cabinets to be flush against a wall or built into a counter to conserve space.

APPROVAL:

Model Specifications

DIMENSIONAL DATA

Net Capacity (cu. ft.)	20.6 (583 cu l)
1/6 Size Pans (4" deep)	30
Width, Overall (in.)	72 (1829 mm)
Depth, Overall (in.) (incl. handles & bumpers)	35 (889 mm)
Depth, Body Only (less doors) (in.)	27 1/2 (699 mm)
Depth, Cutting Board (in.)	10 (254 mm)
Height, Overall (in.) (incl. 3 5/8" casters)	40 7/8 (1038 mm)
Shelf Area (sq. ft.)	10.2 (.9 sq m)
No. of Shelves	3
No. of Doors	3
Interior Depth (in.)	19 3/8 (492 mm)
Interior Height (in.)	26 1/4 (667 mm)
Interior Width (in.)	68 (1727 mm)

REFRIGERANT DATA

Condensing Unit Size (H.P.)	1/4
Capacity (BTU/Hr)*	1940

ELECTRICAL DATA

Voltage (int'l)	115/60/1 (220/50/1)
Fans	4
Total Amps (int'l)	7.6 (4.7)
10 ft. Cord/Plug [attached] (int'l)	Yes (No)

SHIPPING DATA

Weight (lbs.)	420 (191 kg)
Height - Crated (in.)	43 1/4 (1099 mm)
Width - Crated (in.)	80 1/4 (2038 mm)
Depth - Crated (in.)	46 (1168 mm)

* Rating @ +25°F evaporator, 90°F ambient

Figures in parentheses reflect metric equivalents rounded to the nearest whole unit.



Equipped with one NEMA-5-15P Plug
(varies by country)

Continental
Refrigerator

Toll-Free: 800-523-7138
Phone: 215-244-1400
Fax: 215-244-9579

539 Dunkserry Road
Bensalem, PA 19020
www.continentalrefrigerator.com

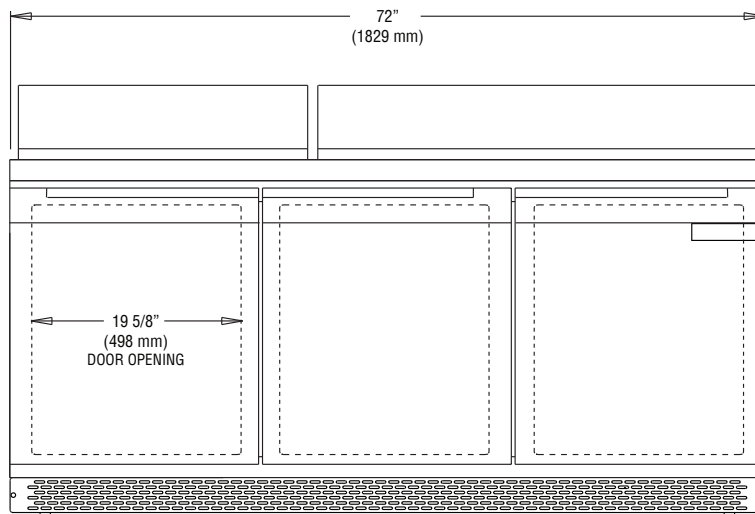
Due to our continued efforts in developing innovative products, specifications subject to change without notice.



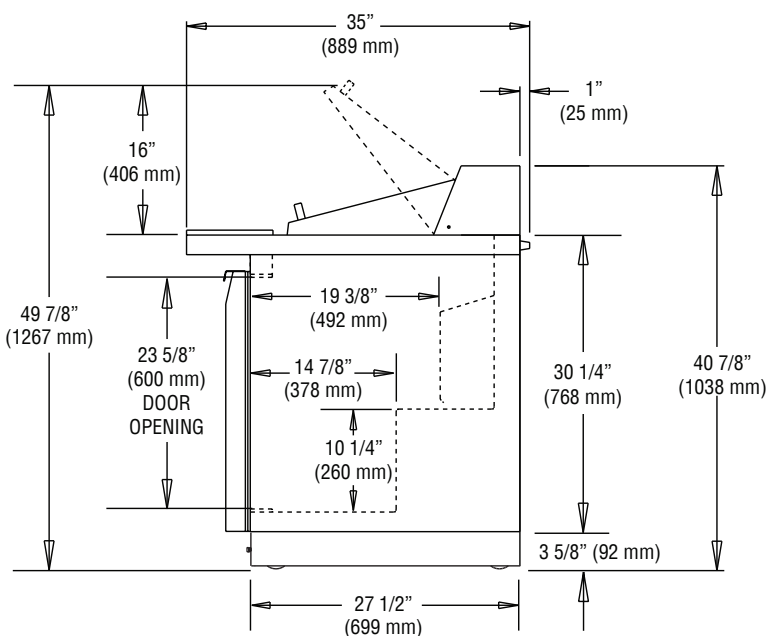
MADE IN THE U.S.A.

© Copyright 2014. Continental Refrigerator.
A Division of National Refrigeration & Air Conditioning Products, Inc.

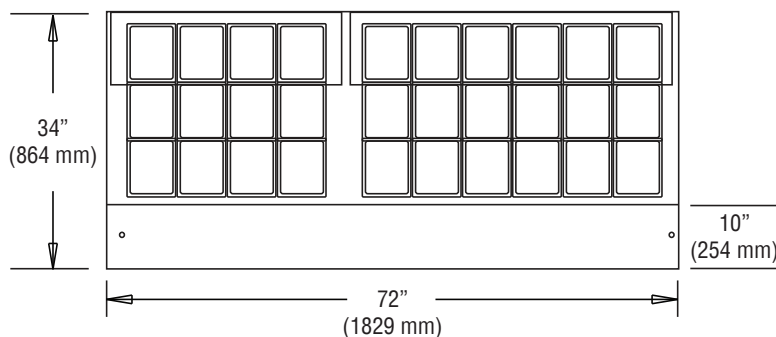
Model Plan Views



FRONT VIEW



SIDE VIEW



PAN TOP CONFIGURATION

Submittal Sheet

12/20/2017

ITEM# 161.1 - SNEEZE GUARD (1 EA REQ'D)

Versa-Gard VG3.3-SK

VG Series. Adjustable self service food protector with straight glass and top shelf. Adjustable in 7 different self-service positions. 1" OD Solid Supports. End glass panels are 1/4" clear tempered. All glass meets ANSI Z97.1 specifications for safety performance and ASTM C1048-04 specifications for heat treated glass. All hardware supplied in a brushed stainless steel finish. All glass with ground and polished edges. Conceal mount hardware.

The spec sheet for this item can be viewed on item 113.1)

ACCESSORIES

Mfr	Qty	Model	Spec
LED LIGHT			

Submittal Sheet

12/20/2017

ITEM# 161.2 - VERTICAL SNEEZE GUARD (1 EA REQ'D)

Versa-Gard VP24.3

VG Series. Full service food protector with 24" tall vertical glass. 1" OD Solid Supports. End glass panels are 1/4" clear tempered. All glass meets ANSI Z97.1 specifications for safety performance and ASTM C1048-04 specifications for heat treated glass. All hardware supplied in a brushed stainless steel finish. All glass with ground and polished edges. Conceal mount hardware.



VP24.3

Protected by US Patent 7,040,723

Other Patents Pending

Full Service Vertical Protector

- Cafeteria Counters
- Cooking Stations
- Carving Stations

FINISH:

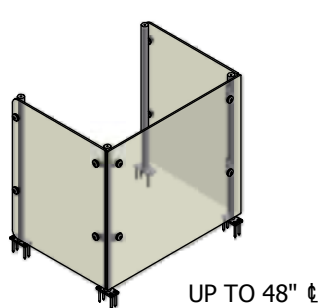
- ☐ Brushed Stainless Steel
☐ Clear Anodized Aluminum
☐ Powder Coat:
☐ Black ☐ Silver
 RAL # _____

GLASS:

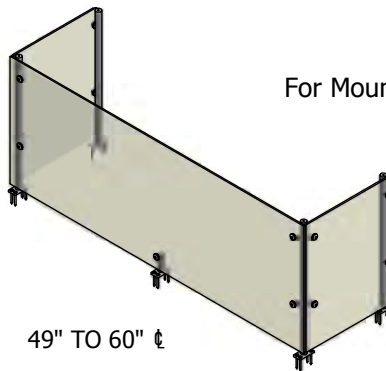
- ☐ 1/4" Clr Temp - Std
☐ Frosted

OPTIONS(*):

- ☐ End Panel - LT
☐ End Panel - RT
☐ Light Fixture
☐ Warmer
☐ Shelf Kit

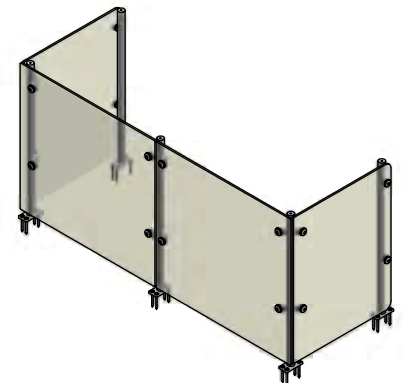


UP TO 48" t



49" TO 60" t

(*) Not all options available on all models
 Contact factory for specific information
 For Mounting Options see Mounting Hardware Guide



OVER 60" t

NSF/ANSI 2 - 2010 Standards Requirements:

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5.35.11 Food Shields for use on cooking and/or carving station operations

5.35.11.1 Shields for use on a cooking and/or carving station shall include a vertical barrier to a minimum height of 60 inches above the finished floor.

5.35.11.2 Maximum vertical distance from the bottom edge of the shield and counter top shall be 6 inches

5.35.11.3 Minimum horizontal distance between the front inside edge of displayed food and front (customer side) face of shield shall be 3/4 of the vertical distance (.75 x 6" = 4") of 5.35.11.2

5.35.12 Food Shields for use on cafeteria counters

5.35.12.1 The sum of a shield's protected horizontal plane (X) and its protected vertical plane (Y) shall be greater than or equal to 32 inches. When (X) = 0, (Y) shall be a minimum of 60 inches from finished floor

5.35.12.2 Maximum distance from the bottom edge of the front vertical glass and counter top shall be 1.5 inches

5.35.12.3 Maximum distance between the vertical glass and horizontal glass is 3/4 inch

5.35.12.4 Minimum horizontal distance between the front inside edge of displayed food and the bottom leading edge of the shield s 1.5 inches

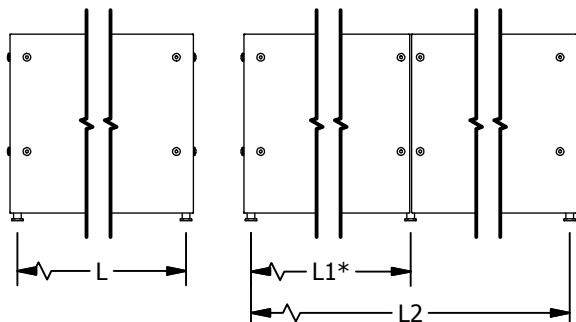
5.35.6 A vertical barrier (end shield) shall be provided at each end of a foodshield. The vertical barrier shall be a minimum of 18 inches deep (front to back) beginning at the bottom leading edge of the foodshield. The minimum height of the vertical barrier shall be equal to the overall height of the foodshield.

The maximum distance from the bottom edge of the vertical barrier and counter top shall be 1.5 inches.

5.35.6.1 A foodshield intended to be installed a maximum of 3" (76mm) from a building wall perpendicular to the foodshield is exempt from the requirements of 5.35.6 provided that the height of the building wall is not lower than the overall height of the foodshield.

(2) End Panels per unit unless otherwise specified. End panels are 1/4" clear tempered glass unless otherwise specified.

-Centerline Dimensions -
 L / L1 - 60" Max (1/4" Glass)



(* - Middle support is centered unless L1 dimension is specified)



Submittal Sheet

12/20/2017

ITEM# 161.3 - VERTICAL SNEEZE GUARD (1 EA REQ'D)

Versa-Gard VP24.3

VG Series. Full service food protector with 24" tall vertical glass. 1" OD Solid Supports. End glass panels are 1/4" clear tempered. All glass meets ANSI Z97.1 specifications for safety performance and ASTM C1048-04 specifications for heat treated glass. All hardware supplied in a brushed stainless steel finish. All glass with ground and polished edges. Conceal mount hardware.

The spec sheet for this item can be viewed on item 161.2)

Submittal Sheet

12/20/2017

ITEM# 161.4 - SNEEZE GUARD (1 EA REQ'D)

Versa-Gard VG3.3-SK

VG Series. Adjustable self service food protector with straight glass and top shelf. Adjustable in 7 different self-service positions. 1" OD Solid Supports. End glass panels are 1/4" clear tempered. All glass meets ANSI Z97.1 specifications for safety performance and ASTM C1048-04 specifications for heat treated glass. All hardware supplied in a brushed stainless steel finish. All glass with ground and polished edges. Conceal mount hardware.

The spec sheet for this item can be viewed on item 113.1)

ACCESSORIES

Mfr	Qty	Model	Spec
LED LIGHT			

Submittal Sheet

12/20/2017

ITEM# 161.5 - SNEEZE GUARD (1 EA REQ'D)

Versa-Gard VG3.3-SK

VG Series. Adjustable self service food protector with straight glass and top shelf. Adjustable in 7 different self-service positions. 1" OD Solid Supports. End glass panels are 1/4" clear tempered. All glass meets ANSI Z97.1 specifications for safety performance and ASTM C1048-04 specifications for heat treated glass. All hardware supplied in a brushed stainless steel finish. All glass with ground and polished edges. Conceal mount hardware.

The spec sheet for this item can be viewed on item 113.1)

ACCESSORIES

Mfr	Qty	Model	Spec
LED LIGHT			

Submittal Sheet

12/20/2017

ITEM# 170 - LCD SCREEN (6 REQ'D)

Provided by Operations CONTACT OPERATIONS

Submittal Sheet

12/20/2017

ITEM# 171 - OSM SCREEN (6 REQ'D)

Provided by Operations CONTACT OPERATIONS

Submittal Sheet

12/20/2017

ITEM# 172 - ICE & WATER DISPENSER (1 EA REQ'D)

Hoshizaki DCM-270BAH

Ice Maker/Water Dispenser, Cubelet-Style, air-cooled, self-contained condenser, production capacity up to 282 lb/24 hours at 70°/50° (215 lb AHRI certified at 90°/70°), 10 lb built-in storage capacity, counter model, push button operation, stainless steel bin & exterior, protected with H-GUARD Plus Antimicrobial Agent, R-404A refrigerant, 4" legs, 115v/60/1-ph, 8.5 amps, NEMA 5-15P (optional stand sold separately), NSF, UL

ACCESSORIES

Mfr	Qty	Model	Spec
Hoshizaki	1		Warranty: 3-Year parts & labor on entire machine
Hoshizaki	1		Warranty: 5-Year parts on compressor, air-cooled condenser
Hoshizaki	1	LP-4 LEG	Leg Package, (4) x 4" stainless steel legs
Hoshizaki	1	H9320-51	Water Filtration System, single configuration, 18.4" H (manifold & cartridge)

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1	115	60	1	Cord & Plug		5-15P	8.5				

WATER

	HOT SIZE	HOT AFF	HOT GPH	COLD SIZE	COLD AFF	FILTERED SIZE	FILTERED AFF	CONDENSER INLET SIZE	CONDENSER OUTLET SIZE
1				1/2"					

WASTE

	INDIRECT SIZE	DIRECT SIZE
1	3/4"	

PLUMBING 1 REMARKS

Ice maker drain



DCM-270BAH

SANITARY CUBELET ICE MACHINE/DISPENSER



DCM-270BAH
08/14/17
Item # 13116

W x D x H
16⁹/₁₆" x 24¹/₈" x 31¹¹/₁₆"

SD-270
16¹/₂" x 24" x 35³/₁₆"


DCM-270BAH
Air-Cooled
Shown with optional
SD-270 Stand


*SD-270 door is reversible



Item #: _____
Project: _____
Qty: _____
AIA#: _____

Features

- ▶ Durable stainless steel exterior
- ▶ Advanced CleanCycle24™ design 
- ▶ Stainless steel auger with greaseless bearing

- Up to 282 lbs. of ice production per 24 hours
- Built-in storage capacity of 0.3ft³/10 lbs.*
- CleanCycle12 - Every 12 hours, unit performs 20 minute purge to rid itself of impurities
- 2 second flush cycle every hour
- Easy to chew, cubelet ice
- Flush cycle removes sediment for cleaner ice
- Protected by H-GUARD Plus Antimicrobial Agent 
- Dispenses ice and water
- 6 ft. cord with a NEMA 5-15 plug
- R-404A Refrigerant

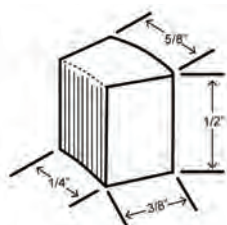
Warranty:

3 Year Parts & Labor on entire machine.
5 Year Parts on Compressor; air-cooled condenser coil.
Valid in United States, Canada, Puerto Rico and U.S. Territories. Contact factory for warranty in other countries.

*Rated in accordance with AHRI Standard 820(I-P). Capacity based on 100% of total volume x 30 lb/ft³ average density of ice.

Condenser	Model	ICE PRODUCTION			WATER USAGE		ELECTRICAL				Heat Rejection BTU/hr.	Shipping Weight	ENERGY STAR®
		Air / Water Temp Lbs. per 24 hours 70°/ 50°F 90°/ 70°F	Type of Ice (Hardness Rating)	Potable Gal. per 100 lbs. 90°/ 70°F	Condenser Gal. per 100 lbs. 90°/ 70°F	kWh Used per 100 lbs. 90°/ 70°F	Max. Fuse Size or HACR Circuit Breaker	Amperage	Voltage				
Air-Cooled	DCM-270BAH	282	215	Cubelet (90)	12.0	N/A	7.6	15A	8.5A	115V/60/1	3,532	170 lbs.	

Cubelet Dimensions*



* approximate size in inches, image not to scale

Operating Limits

- Ambient Temp Range 45 - 100°F
- Water Temp Range 45 - 90°F
- Water Pressure 10 - 113 PSIG
- Voltage Range 104 - 127V

Service

- Allow 6" (15cm) clearance at rear and left side, 10" (25cm) at right side, and 20" (51cm) at top for proper air circulation and ease of maintenance/ service should they be required.

Not intended for outdoor use - avoid placement in direct sunlight.

Plumbing

- Ice maker Water Supply Line: Minimum 1/4" Nominal ID Copper Water Tubing or Equivalent
- Ice maker Drain Line: Minimum 3/4" Nominal ID Hard Pipe or Equivalent



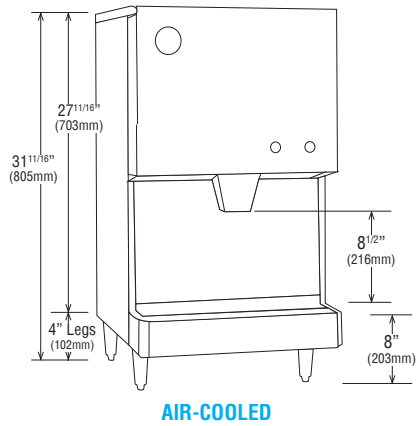
DCM-270BAH

SANITARY CUBELET ICE MACHINE/DISPENSER

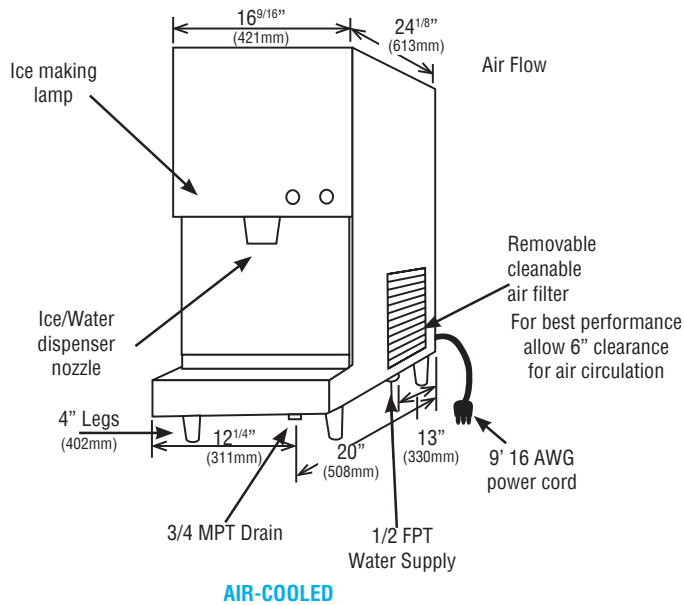


DCM-270BAH
08/14/17
Item # 13116

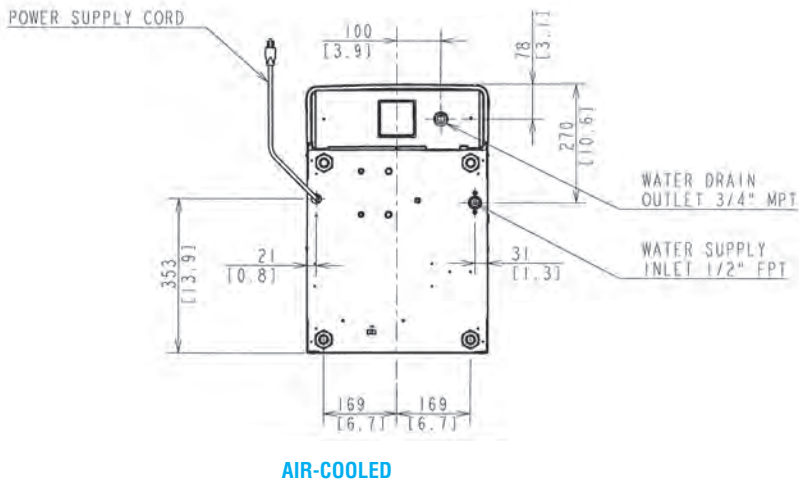
FRONT VIEW



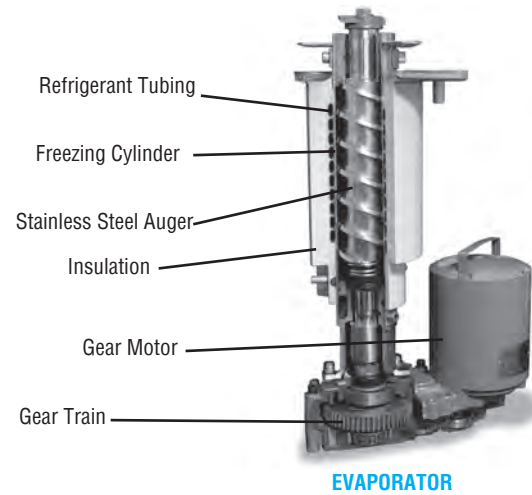
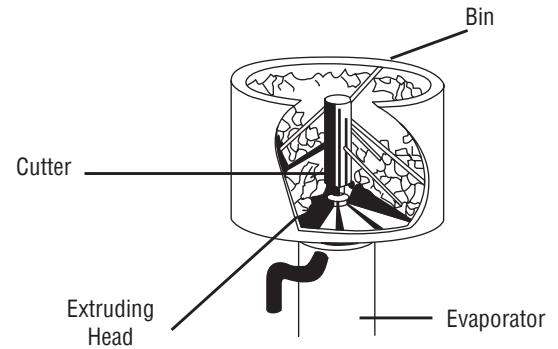
SIDE VIEW



REAR VIEW



inch
[mm]



Submittal Sheet

12/20/2017

ITEM# 173 - MULTI BEVERAGE DISPENSER (1 REQ'D)

Provided by Vendor CONTACT VENDOR

Submittal Sheet

12/20/2017

ITEM# 180 - DROP-IN REFRIGERATED MERCHANDISER (1 EA REQ'D)

RPI Industries VICD2-27-R-SQ-SC-INS

Vienna Cold Display Case, drop-in or slide-in, 31-1/2"W, self-contained refrigeration, full service, programmable digital refrigeration controller, top canopy LED light, (2) adjustable glass shelves with LED lights, squared tilt-out insulated glass front, top & side panels, stainless steel exterior, hinged rear see-thru access doors, 1/3 hp, cETLus, ETL-Sanitation, NSF

ACCESSORIES

Mfr	Qty	Model	Spec
RPI Industries	1		1 year limited warranty standard
RPI Industries	1		Self-contained refrigeration, standard
RPI Industries	1		5 year compressor warranty
RPI Industries	1		115v/60/1-ph, 5.7 amps, NEMA 5-15P, 8 ft cord
RPI Industries	1		Slide-in with a base, standard
RPI Industries	1		Casters

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1									1/3		
2	115	60	1	Cord & Plug		5-15P	5.7				

WATER

	HOT SIZE	HOT AFF	HOT GPH	COLD SIZE	COLD AFF	FILTERED SIZE	FILTERED AFF	CONDENSER INLET SIZE	CONDENSER OUTLET SIZE
1									

WASTE

	INDIRECT SIZE	DIRECT SIZE
1	1"	

VIENNA COLD DISPLAY

PROJECT: _____

ITEM: _____

QUANTITY: _____

MODEL # VICD-SQ INS SQUARED GLASS

SPECIFICATIONS

The Vienna Series VICD-SQ INS Slide-in or Drop-in is a full-service refrigerated display merchandiser, featuring a squared glass profile with insulated glass front, top and side panels. Unit is available in choice of two heights with hinged rear see-through access doors. When being used as a "slide-in" please advise if counter height is 34" or 36". Optional 6" or 8" stainless steel adjustable legs or casters are available for slide-in style models.



SLIDE-IN UNIT SHOWN WITH OPTIONAL LEGS & REAR AIR VENTILATION KIT

Available lengths: ☐ 31 1/2" ☐ 44 3/8" ☐ 57 1/8"

Available depths: ☐ 27 3/8"

Available (above counter) heights: ☐ 21 1/4" ☐ 28" ☐ 34 5/8"



STANDARD FEATURES

- Slanted Glass Profile
- 304 Stainless Steel Exterior
- Insulated Glass Top and Side Panels
- Hinged Rear See-Through Access Doors
- Tilt-Out Front Glass
- Energy Efficient LED Lighting
- Easy Removable Deck Pans for Cleaning
- Programmable Digital Refrigeration Controller
- Self-Contained Refrigeration with Integrated Compressor Housing
- Rear Air Ventilation Kit
- Fan Assisted Cooling System
- Lift-Up Evaporator
- ETL Listed in Accordance with UL 471 and NSF 7 Standards
- Environmentally Safe Refrigerant
- Floor Drain Required

OPTIONAL FEATURES

- ☐ Drop-In Style (Consult Factory for Additional Information)
- ☐ Remote Refrigeration
- ☐ Integrations Modular Counter (Consult Factory)
- ☐ Adjustable Legs & Casters (Slide-In Style Units)
 - ☐ 6" Legs ☐ 8" Legs ☐ 6" Casters
- ☐ 5 Year Compressor Warranty



Conforms to UL Standard 471, and NSF Standard 7; Certified To CSA Standard C22.2 No. 120

MODEL	L	D	H	HP	VOLT	AMPS	PLUG	WT	REFRIG.	DROP IN C/O SIZE	SLIDE IN C/O SIZE
VICD2-20-R-SQ-SC INS	31 1/2"	27 3/8"	21 1/4"	1/4	115	4.8	5-15P	462	134A	29 1/4 x 26 3/8	29 1/4 x VARIES
VICD3-20-R-SQ-SC INS	44 3/8"	27 3/8"	21 1/4"	1/3	115	5.7	5-15P	506	134A	42 1/8 x 26 3/8	42 1/8 x VARIES
VICD4-20-R-SQ-SC INS	57 1/8"	27 3/8"	21 1/4"	1/3	115	5.9	5-15P	572	134A	54 7/8 x 26 3/8	54 7/8 x VARIES
VICD2-27-R-SQ-SC INS	31 1/2"	27 3/8"	28"	1/3	115	5.7	5-15P	484	134A	29 1/4 x 26 3/8	29 1/4 x VARIES
VICD3-27-R-SQ-SC INS	44 3/8"	27 3/8"	28"	1/3	115	6.0	5-15P	528	134A	42 1/8 x 26 3/8	42 1/8 x VARIES
VICD4-27-R-SQ-SC INS	57 1/8"	27 3/8"	28"	3/8	115	7.8	5-15P	594	134A	54 7/8 x 26 3/8	54 7/8 x VARIES
VICD2-34-R-SQ-SC INS	31 1/2"	27 3/8"	34 5/8"	3/8	115	7.3	5-15P	528	134A	29 1/4 x 26 3/8	29 1/4 x VARIES
VICD3-34-R-SQ-SC INS	44 3/8"	27 3/8"	34 5/8"	3/8	115	7.8	5-15P	572	134A	42 1/8 x 26 3/8	42 1/8 x VARIES
VICD4-34-R-SQ-SC INS	57 1/8"	27 3/8"	34 5/8"	1/2	115	9.4	5-15P	638	134A	54 7/8 x 26 3/8	54 7/8 x VARIES

CALL TOLL FREE: 800-525-3692 (609-714-2330)

FAX: 609-714-2331 www.rpiindustries.com

220 ROUTE 70, MEDFORD, NJ 08055



INDUSTRIES, INC.

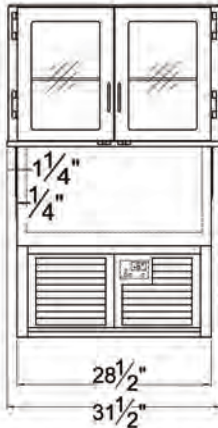
v1.13

VIENNA COLD DISPLAY

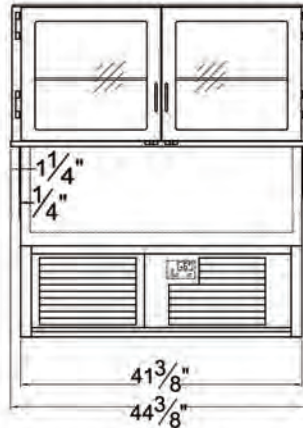
PROJECT:

TOLL FREE: 800-525-3692

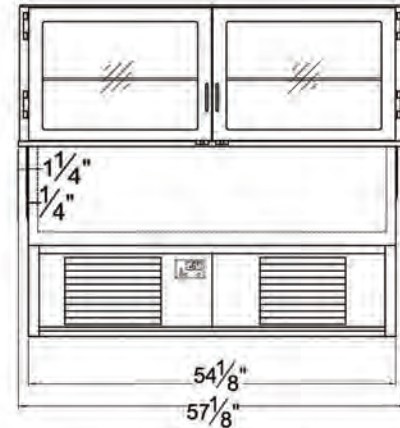
MODEL # VICD-SQ INS SQUARED GLASS



VICD2(A)-R-SQ-SC INS



VICD3(A)-R-SQ-SC INS

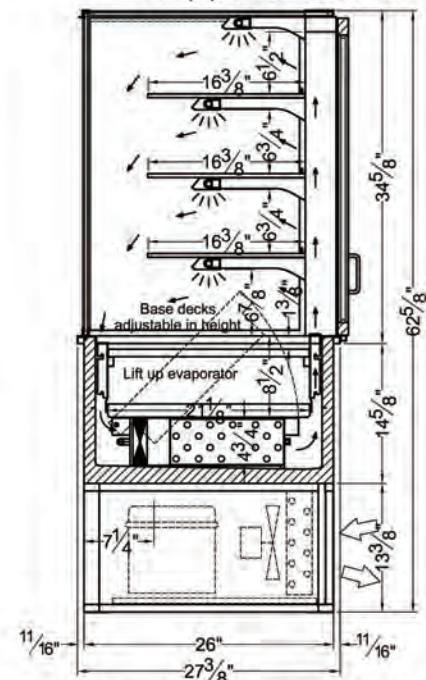
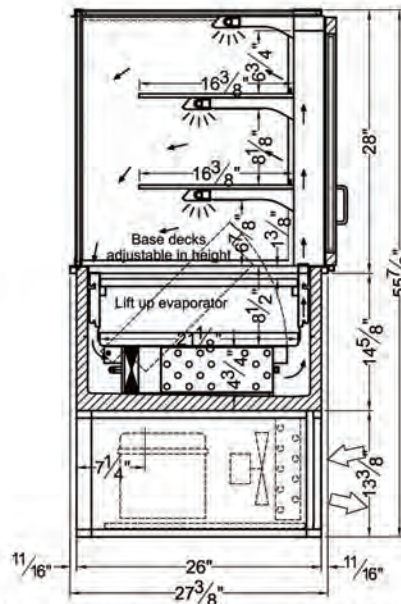
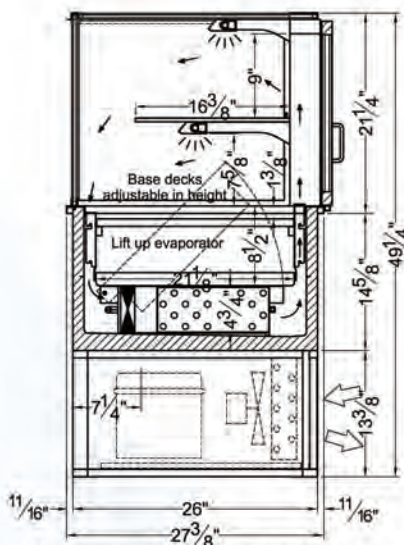


VICD4(A)-R-SQ-SC INS

VICD(A)-20-R-SQ-SC INS

VICD(A)-27-R-SQ-SC INS

VICD(A)-34-R-SQ-SC INS

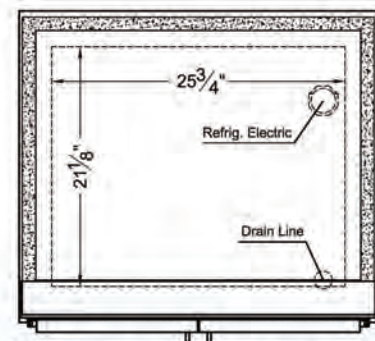


UNITS SHOWN WITH "REAR AIR BREATHING" OPTION

LARGEST DIMENSION REPRESENTS OUTSIDE FLANGE

1. A 1" diameter drain is provided. The drain **MUST** be connected to a floor drain or storage container **AT TIME OF INSTALLATION**.
2. Front and Rear ventilation louvers, each at least 25" W x 20" H, **MUST** be provided in the cabinet or counter and located so to provide full ventilation for the condensing unit.
3. The VICD-SQ INS merchandiser is designed for use in locations where temperatures and humidity do not exceed 75 degrees and 55% R.H. Locate away from direct sunlight, rapid air currents and extreme temperature changes. Exposure to air currents from ceiling fans, air conditioners, ovens, etc. will disrupt the cases air current and refrigeration zone within. Any adverse field conditions stated above will void warranty.

RPI in line with it's policy to continually improve it's product reserves the right to change materials and specifications without notice.



CALL TOLL FREE: 800-525-3692 (609-714-2330)

FAX: 609-714-2331 www.rpiindustries.com

220 ROUTE 70, MEDFORD, NJ 08055



Electrical & Plumbing locations

RPI INDUSTRIES, INC.

v1.13

Submittal Sheet

12/20/2017

ITEM# 181 - DROP-IN SINK (1 EA REQ'D)

Eagle Group SR10-14-9.5-1

Self-Rimming Drop-In Sink, one compartment, 10" wide x 14" front-to-back x 9-1/2" deep bowl, 4" O.C. deck mount faucet with gooseneck spout (302004), includes basket drain, 18/304 stainless steel construction, NSF

ACCESSORIES

Mfr	Qty	Model	Spec
Eagle Group	1		Faucet hole punched on 4" centers, standard
Eagle Group	1	313306	T&S Faucet, deck mount, 4" O.C., 8" swing spout, low lead

WATER

	HOT SIZE	HOT AFF	HOT GPH	COLD SIZE	COLD AFF	FILTERED SIZE	FILTERED AFF	CONDENSER INLET SIZE	CONDENSER OUTLET SIZE
1	1/2"			1/2"					

WASTE

	INDIRECT SIZE	DIRECT SIZE
1		



Profit from the Eagle Advantage®

Specification Sheet

Short Form Specifications

Eagle Countertop Self Rimming Drop-In Sink, model _____ . Sinks are type 304 stainless steel, deep-drawn and self rimming. Faucet holes are punched on 4" centers. Positive holddown clamping tabs for top mount. Faucet and drain included.



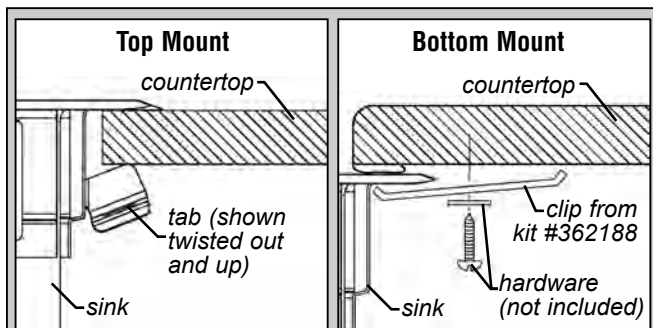
SRU14-10-5-1



SR10-14-9.5-2



SR10-14-9.5-3



For Top Mount: Positive holddown clamping twist-tabs designed for up to 1" (25mm)-thick countertops. FOR COUNTERTOPS THICKER THAN 1", CONTACT FACTORY.

For Bottom Mount: Kit sold separately—see back page.

EAGLE GROUP

100 Industrial Boulevard, Clayton, DE 19938-8903 USA

Phone: 302-653-3000 • Fax: 302-653-2065

www.eaglegrp.com

Foodservice Division: Phone 800-441-8440

MHC/Retail Display Divisions: Phone 800-637-5100

For custom configuration or fabrication needs, contact our **SpecFAB®** Division.

Phone: 302-653-3000 • Fax: 302-653-2065 • e-mail: quotes@eaglegrp.com

Item No.: _____
Project No.: _____
S.I.S. No.: _____

Countertop Drop-In Sinks with Self Rim Design*

MODELS:

- | | | |
|---|---|---|
| <input type="checkbox"/> SR10-14-5-1 | <input type="checkbox"/> SR18-24-13.5-1 | <input type="checkbox"/> SR16-19-13.5-2 |
| <input type="checkbox"/> SR10-14-9.5-1 | <input type="checkbox"/> SR19-16-8-1 | <input type="checkbox"/> SR18-24-13.5-2 |
| <input type="checkbox"/> SR12-14-9.5-1 | <input type="checkbox"/> SR19-16-13.5-1 | <input type="checkbox"/> SR22-22-13.5-2 |
| <input type="checkbox"/> SR14-10-5-1 | <input type="checkbox"/> SR20-12-6.5-1 | <input type="checkbox"/> SR24-24-13.5-2 |
| <input type="checkbox"/> SRU14-10-5-1 | <input type="checkbox"/> SR22-22-13.5-1 | <input type="checkbox"/> SR10-14-9.5-3 |
| <input type="checkbox"/> SR14-10-9.5-1 | <input type="checkbox"/> SR24-18-13.5-1 | <input type="checkbox"/> SR12-14-9.5-3 |
| <input type="checkbox"/> SR14-12-9.5-1 | <input type="checkbox"/> SR24-24-13.5-1 | <input type="checkbox"/> SR14-16-9.5-3 |
| <input type="checkbox"/> SR14-16-9.5-1 | <input type="checkbox"/> SR10-14-9.5-2 | <input type="checkbox"/> SR16-19-8-3 |
| <input type="checkbox"/> SR16-14-9.5-1 | <input type="checkbox"/> SR12-14-9.5-2 | <input type="checkbox"/> SR16-19-13.5-3 |
| <input type="checkbox"/> SR16-19-8-1 | <input type="checkbox"/> SR14-16-9.5-2 | <input type="checkbox"/> SR18-24-13.5-3 |
| <input type="checkbox"/> SR16-19-13.5-1 | <input type="checkbox"/> SR16-19-8-2 | |

Design and Construction Features

- Sinks can be mounted onto top or bottom of countertop. For bottom mount, order kit #362188 (see back page).
- Heavy gauge type 304 series stainless steel coved bowls with large radius.
- All sinks feature 3½" (89mm)-diameter drain hole in the center of the bowl.
- Crumb cup strainer assembly features 4½" (114mm)-diameter top flange and 1½" (38mm) NPS outlet.
- All sinks feature deck-mounted faucet on 4" (102mm)** centers; one-compartment sinks with 10" x 14" (254 x 356) and 14" x 16" (356 x 406mm) bowls include faucet with gooseneck spout.
- Self rimming.
- Deep-drawn.
- 18 or 20 gauge*** industrial grade construction and quality.

* Not intended for NSF installation into stainless steel worksurface. Please consult factory if need arises.

** To order sinks with faucet holes punched on 8" (203mm) centers, add suffix "-8CL". Example: SR10-14-9.5-2-8CL

*** Varies per model sink. Refer to charts on back page.

Options / Accessories

- ☐ Faucets (see back page)
- ☐ Electronic-eye faucets^Δ (add suffix "-FE")
- ☐ P-trap (#300789)

^Δ Electronic-Eye Faucets are available for One-Compartment Sinks only.

Certifications / Approvals



AutoQuotes





Profit from the Eagle Advantage®



NOTE: width = front-to-back, length = side-to-side

 Item No.: _____
 Project No.: _____
 S.I.S. No.: _____

One-Compartment Sinks — Furnished with a #302004 faucet with gooseneck spout, except where noted.

model #	inside bowl dimensions width x length x depth in. mm		overall dimensions width x length in. mm		cutout for top mount width x length in. mm		cutout for bottom mount width x length in. mm		weight lbs. kg	18 or 20 gauge
SR10-14-5-1	14" x 10" x 5"	356 x 254 x 127	19" x 12 1/2"	483 x 324	17 1/2" x 11 1/4"	448 x 286	14 1/8" x 10 1/8"	376 x 275	10 4.5	20
SR10-14-9.5-1	14" x 10" x 9 1/2"	356 x 254 x 241	18 1/2" x 12 1/2"	480 x 324	17 1/2" x 11 1/4"	445 x 286	14 1/8" x 10 1/8"	376 x 275	12 5.4	18
SR12-14-9.5-1	14" x 12" x 9 1/2"	356 x 305 x 241	19" x 14 1/2"	483 x 375	17 1/2" x 13 1/4"	448 x 337	14 1/8" x 12 1/8"	321 x 314	14 6.4	20
SR14-10-5-1	10" x 14" x 5"	254 x 356 x 127	15" x 16 1/2"	381 x 426	13 1/2" x 15 1/4"	346 x 387	10 1/8" x 14 1/8"	275 x 376	10 4.5	20
SRU14-10-5-1	10" x 14" x 5"	254 x 356 x 127	15" x 16 1/2"	381 x 426	13 1/2" x 15 1/4"	346 x 387	n/a	n/a	12 5.4	20
SR14-10-9.5-1	10" x 14" x 9 1/2"	254 x 356 x 241	15" x 16 1/2"	381 x 422	13 1/2" x 15 1/4"	346 x 384	10 1/8" x 14 1/8"	275 x 376	12 5.4	18
SR14-12-9.5-1	12" x 14" x 9 1/2"	305 x 356 x 241	17" x 16 1/2"	432 x 426	15 1/2" x 15 1/4"	397 x 387	12 1/8" x 14 1/8"	314 x 365	14 6.4	20
SR14-16-9.5-1	16" x 14" x 9 1/2"	406 x 356 x 241	21" x 16 1/2"	533 x 425	19 1/2" x 15 1/4"	499 x 387	16 1/8" x 14 1/8"	422 x 372	23 10.4	20
SR16-14-9.5-1	14" x 16" x 9 1/2"	356 x 406 x 241	19" x 18 1/2"	483 x 476	17 1/2" x 17 1/4"	448 x 438	14 1/8" x 16 1/8"	372 x 422	23 10.4	20
SR16-19-8-1	20" x 16" x 8"	508 x 406 x 203	24 1/2" x 18 1/2"	629 x 470	23 3/4" x 17"	594 x 432	20 1/8" x 16 1/8"	524 x 422	26 11.8	18
SR16-19-13.5-1	20" x 16" x 13 1/2"	508 x 406 x 343	24 1/2" x 18 1/2"	629 x 470	23 3/4" x 17"	594 x 432	20 1/8" x 16 1/8"	524 x 422	28 12.7	18
SR18-24-13.5-1	24" x 18" x 13 1/2"	610 x 457 x 343	28 3/4" x 20 1/2"	730 x 521	27 3/4" x 19"	695 x 483	24 1/8" x 18 1/8"	626 x 473	32 14.5	18
SR19-16-8-1*	16" x 20" x 8"	406 x 508 x 203	20 1/2" x 22 1/2"	527 x 572	19 1/2" x 21"	492 x 533	16 1/8" x 20 1/8"	422 x 524	24 10.9	18
SR19-16-13.5-1*	16" x 20" x 13 1/2"	406 x 508 x 343	20 1/2" x 22 1/2"	527 x 572	19 1/2" x 21"	492 x 533	16 1/8" x 20 1/8"	422 x 524	25 11.3	18
SR20-12-6.5-1	12" x 20" x 6 1/2"	305 x 508 x 165	17" x 22 1/4"	432 x 578	15 1/2" x 21 1/4"	397 x 540	12 1/8" x 20 1/8"	310 x 511	28 12.7	20
SR22-22-13.5-1*	22" x 22" x 13 1/2"	559 x 559 x 343	27" x 24 1/2"	686 x 629	25 1/2" x 23 1/4"	651 x 591	see template **	see template **	34 15.4	18
SR24-18-13.5-1*	18" x 24" x 13 1/2"	457 x 610 x 343	22 1/2" x 26 1/2"	578 x 673	21 1/2" x 25"	543 x 635	18 1/8" x 24 1/8"	473 x 626	32 14.5	18
SR24-24-13.5-1*	24" x 24" x 13 1/2"	610 x 610 x 343	28 1/2" x 26 1/2"	730 x 673	27 1/2" x 25"	695 x 635	24 1/8" x 24 1/8"	627 x 627	36 16.3	18

* #SRU14-10-5-1 features an upturn on sides and rear; *These sinks utilize a #300490 faucet with 12" (305mm) swivel spout; ** Template included with sink.

Two-Compartment Sinks — Furnished with a #300490 faucet with 12" (203mm) spout, except where noted.

model #	inside bowl dimensions width x length x depth in. mm		overall dimensions width x length in. mm		cutout for top mount width x length in. mm		cutout for bottom mount width x length in. mm		weight lbs. kg	18 or 20 gauge
SR10-14-9.5-2*	14" x 10" x 9 1/2"	356 x 254 x 241	18 1/2" x 24 1/2"	480 x 629	17 1/2" x 23 1/4"	445 x 591	14 1/8" x 23"	376 x 584	25 11.3	18
SR12-14-9.5-2	14" x 12" x 9 1/2"	356 x 305 x 241	19" x 28 1/2"	483 x 730	17 1/2" x 27 1/4"	448 x 692	14 1/8" x 26 1/8"	365 x 676	27 12.2	20
SR14-16-9.5-2	16" x 14" x 9 1/2"	406 x 356 x 241	21" x 32 1/2"	525 x 832	19 1/2" x 31 1/4"	499 x 794	16 1/8" x 30 1/8"	422 x 778	42 19.1	20
SR16-19-8-2	20" x 16" x 8"	508 x 406 x 203	24 1/2" x 36 1/4"	527 x 921	23 3/4" x 34 1/4"	594 x 883	20 1/8" x 34 1/8"	524 x 870	48 21.8	18
SR16-19-13.5-2	20" x 16" x 13 1/2"	508 x 406 x 343	24 1/2" x 36 1/4"	527 x 921	23 3/4" x 34 1/4"	594 x 883	20 1/8" x 34 1/8"	524 x 870	52 23.6	18
SR18-24-13.5-2	24" x 18" x 13 1/2"	610 x 457 x 343	28 3/4" x 40 1/2"	730 x 1022	27 3/4" x 38 1/4"	695 x 984	24 1/8" x 38 1/8"	626 x 978	56 24.9	18
SR22-22-13.5-2	22" x 22" x 13 1/2"	559 x 559 x 343	27" x 48 1/4"	686 x 1238	25 1/2" x 47 1/4"	651 x 1200	see template **	see template **	57 25.9	18
SR24-24-13.5-2	24" x 24" x 13 1/2"	610 x 610 x 343	28 3/4" x 52 1/2"	730 x 1324	27 3/4" x 50 1/2"	695 x 1286	24 1/8" x 50 1/8"	630 x 1276	64 29.0	18

* Model #SR10-14-9.5-2 utilizes a #301248 faucet with 8" (203mm) swivel spout; ** Template included with sink.

Three-Compartment Sinks — Furnished with a #300490 faucet with 12" (305mm) spout, except where noted.

model #	inside bowl dimensions width x length x depth in. mm		overall dimensions width x length in. mm		cutout for top mount width x length in. mm		cutout for bottom mount width x length in. mm		weight lbs. kg	18 or 20 gauge
SR10-14-9.5-3	14" x 10" x 9 1/2"	356 x 254 x 241	18 1/2" x 36 1/2"	480 x 933	17 1/2" x 35 1/4"	445 x 895	14 1/8" x 35"	376 x 889	37 16.8	18
SR12-14-9.5-3	14" x 12" x 9 1/2"	356 x 305 x 241	19" x 42 1/2"	483 x 1086	17 1/2" x 41 1/4"	448 x 1031	14 1/8" x 40 1/8"	331 x 1032	39 17.6	20
SR14-16-9.5-3	16" x 14" x 9 1/2"	406 x 356 x 241	21" x 48 1/4"	533 x 1238	19 1/2" x 47 1/4"	498 x 1200	16 1/8" x 46 1/8"	422 x 1184	66 29.9	20
SR16-19-8-3	20" x 16" x 8"	508 x 406 x 203	24 1/2" x 54"	629 x 1372	23 3/4" x 52 1/2"	594 x 1334	20 1/8" x 52 1/8"	524 x 1327	72 32.7	18
SR16-19-13.5-3	20" x 16" x 13 1/2"	508 x 406 x 343	24 1/2" x 54"	629 x 1372	23 3/4" x 52 1/2"	594 x 1334	20 1/8" x 52 1/8"	524 x 1327	77 34.9	18
SR18-24-13.5-3*	24" x 18" x 13 1/2"	610 x 457 x 343	28 3/4" x 60"	730 x 1524	27 3/4" x 58 1/2"	695 x 1486	24 1/8" x 58 1/8"	626 x 1480	82 37.2	18

* These sinks utilize a #301440 faucet with 14" (356mm) swivel spout.

Optional Deck Mount Faucets
description

gooseneck faucet, 4" (102mm) center, for single bowls	#313306 T&S faucet
8" (203mm) spout, 4" (102mm) center, for single and double bowls	
12" (305mm) spout, 4" (102mm) center, for triple bowls	
14" (356mm) spout, 8" (203mm) center, for triple bowls	
8" (203mm) spout, 4" (102mm) center, for single and double bowls, w/spray arm	
8" (203mm) spout, 8" (203mm) center, for single and double bowls, w/spray arm	
12" (305mm) spout, 8" (203mm) center, for triple bowls, w/spray arm	
14" (356mm) spout, 8" (203mm) center, for triple bowls, w/spray arm	

* Faucets with spray arm require special faucet holes.

Standard
model #

302004
301248
300490
301440
—
—
—
—

T&S
model #

313308
313306
313303
313307
377430
303560*
303561*
303562*

Bottom-Mount Kit

 One kit per one-compartment sink,
 two kits per two-compartment sink,
 three kits per three-compartment sink.

description	model #
8 undermount clips per kit	362188



EAGLE GROUP • 100 Industrial Boulevard, Clayton, DE 19938-8903 USA

Phone: 302-653-3000 • Fax: 302-653-2065 • www.eaglegrp.com

Foodservice Division: Phone 800-441-8440 • MHC/Retail Display Divisions: Phone 800-637-5100

 Spec sheets available for viewing, printing or downloading from our online literature library at www.eaglegrp.com

Although every attempt has been made to ensure the accuracy of the information provided, we cannot be held responsible for typographical or printing errors. Information and specifications are subject to change without notice. Please confirm at time of order.

Printed in U.S.A.

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Rev. 08/17

Submittal Sheet

12/20/2017

ITEM# 182 - MEGA TOP SANDWICH / SALAD PREPARATION REFRIGERATOR (1 EA REQ'D)

Continental Refrigerator DL27-12M-FB

Designer Line Mighty Top Sandwich Unit, Front Breather, 27" wide, one-section, (12) 1/6 size x 4" deep pans with 10" cutting board, (1) field rehingable door, stainless steel top, front, sides & interior, electronic controller w/digital display, 3-5/8" casters, rear mounted self-contained refrigeration, 1/5 hp

ACCESSORIES

Mfr	Qty	Model	Spec
Continental Refrigerator	1		Standard warranty (for the United States & Canada Only): 3 year parts and labor; 5 year compressor
Continental Refrigerator	1		115v/60/1-ph, 6.3 amps, cord, NEMA 5-15P, standard
Continental Refrigerator	1		(00HFL) Stainless steel flat cover - with hinges
Continental Refrigerator	1		10" cutting board, rear mounted (NOTE: Must use stainless steel flat cover)
Continental Refrigerator	1		NOTE: Overshelves not available with rear mounted cutting board option

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1									1/5		
2	115	60	1	Cord & Plug		5-15P	6.3				

Continental

Designer-line
REFRIGERATORS

Refrigerator

**SANDWICH UNIT
MIGHTY TOP
FRONT BREATHER**

Standard Features

Utilizing Environmentally Safe, CFC-free R-134a Refrigerant



DL60-24M-FB

Models Available

- DL27-12M-FB •DL60-24M-FB
- DL48-12M-FB •DL72-18M-FB
- DL48-18M-FB •DL72-27M-FB
- DL60-12M-FB •DL72-30M-FB
- DL60-18M-FB

- Unique Field Assembled, Bottom Mounted Ventilation System Designed To Allow Cabinets To Be Flush Against A Wall Or Built Into A Counter To Conserve Space
- 12" Deep, Full Length Nylon Cutting Board
- Unique Air Flow Distribution Allows Pan Product To Maintain 33°-41°F Being In Compliance With and Certified Under The New '98 NSF Standard For Preparation Units
- Modern, State-of-the Art Styling
- Performance Rated Refrigeration System Utilizing Environmentally Safe R-134a Refrigerant
- Easily Serviceable Back Mounted Compressor
- 2" Non-CFC Polyurethane Foam Insulation
- Spring Loaded, Self Closing Door
- Magnetic Snap-In Gasket
- 3½" Casters
- Heavy-Duty, Epoxy-Coated Steel Shelves
- Cabinet Construction Consisting of Stainless Steel Exterior and Interior
- Completely Enclosed, Vented & Removable Case Back
- Automatic, Energy Saving, Non-Electric Condensate Disposal
- 1/6 Size Pans, 4" Deep
- 10 ft Cord and Plug Attached

REFRIGERATION SYSTEM

The self-contained refrigeration system is rear mounted, concealed behind a removable louvered cover. Full-length front air grille allows for even air circulation to condensing unit. A "Performance Rated", air-cooled, hermetically sealed, capillary type refrigeration system is installed in each model. Plasticized finned coil and air circulating fans are contained within an easily accessible rear mounted housing. Our unique airflow design allows the cabinet to be enclosed on both sides or to be mounted flush against a wall. Our refrigeration system, fully charged with R-134a refrigerant, is designed to maintain 38° - 40° Fahrenheit while operating with an unrestricted air supply in an ambient temperature of 100° Fahrenheit. All condensate water is directed to a non-electric condensate vaporizer located in the compressor compartment, thus no plumbing is required. A strict quality assurance team inspects all materials and components to certify that each model conforms to the most exacting standards. All models are performance tested for a minimum of 16 hours prior to crating.

CABINET CONSTRUCTION

All materials are of top quality and are assembled under rigid supervision conforming to strict quality assurance requirements. Case is of all metal welded construction and is internally supported and braced for rigid unit construction. Exterior cabinet back and bottom are heavy gauge galvanized steel. Worktop is constructed of heavy gauge polished stainless steel for durability.

Cabinet design eliminates overlapping panels with raw edges. Interior corners are rounded with a ¼" radius for cleaning ease. All cabinet joints and seams are vapor-tight sealed. An easily removable anti-sweat door heater, concealed by a non-metallic, non-conductive, high impact thermal breaker strip, eliminates condensation build-up on case front.

INSULATION

All cabinet walls, top, and bottom have high density, foamed-in-place, non-CFC polyurethane insulation.

SHELVING

Shelves are designed for heavy-duty use with .306" diameter frame and brace members and .140" diameter fill wires spaced ¾" apart. Shelves are welded steel and epoxy-coated for a durable, long, rust-free service life.

DOOR CONSTRUCTION

Door shells are constructed of heavy-gauge stainless steel and are internally braced and urethane-foam-insulated for rigidity. Door corners are of welded construction and polished. Replaceable snap-in door gaskets are self adjusting, heavy-duty, magnetic type. Door handles and hinges are chrome-plated and non-corrosive. Hinges are spring loaded, heavy duty, self-closing.

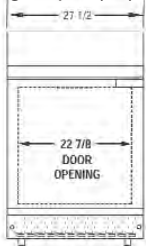




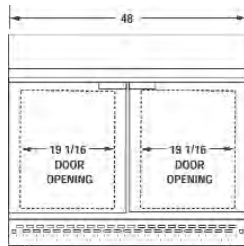
CHARACTERISTICS

DIMENSIONAL DATA

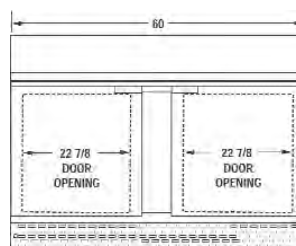
	MODEL DL27-12M-FB	MODEL DL48-12M-FB	MODEL DL48-18M-FB	MODEL DL60-12M-FB	MODEL DL60-18M-FB	MODEL DL60-24M-FB	MODEL DL72-18M-FB	MODEL DL72-27M-FB	MODEL DL72-30M-FB
Net Capacity (cu. ft.)	7.4	13.4	13.4	17.0	17.0	17.0	20.6	20.6	20.6
1/6 Size Pans (4" Deep)	12	12	18	12	18	24	18	27	30
Width, Overall (in.)	27 1/2	48	48	60	60	60	72	72	72
Depth, Overall (Incl. Hdl.) (in.)	34	34	34	34	34	34	34	34	34
Depth, Body only (Less Door(s)) (in.)	27 1/2	27 1/2	27 1/2	27 1/2	27 1/2	27 1/2	27 1/2	27 1/2	27 1/2
Depth, Cutting Board	10	10	10	10	10	10	10	10	10
Height (Incl. 3 5/8" Casters)	40 5/8	40 5/8	40 5/8	40 5/8	40 5/8	40 5/8	40 5/8	40 5/8	40 5/8
Shelf Area (sq.ft.)	3.5	6.8	6.8	8.1	8.1	8.1	10.2	10.2	10.2
Shelves	1	2	2	2	2	2	3	3	3
Doors	1	2	2	2	2	2	3	3	3
Condensing Unit Size (H.P.)	1/5	1/5	1/5	1/4	1/4	1/4	1/4	1/4	1/4
Refrigerant	R134a	R134a	R134a	R134a	R134a	R134a	R134a	R134a	R134a
Cabinets Electric	115/60/1	115/60/1	115/60/1	115/60/1	115/60/1	115/60/1	115/60/1	115/60/1	115/60/1
Amps	6.2	7.1	7.1	8.2	8.2	8.2	9.0	9.0	9.0
Fans	2	3	3	3	3	3	4	4	4
Interior Depth (in.)	20	20	20	20	20	20	20	20	20
Interior Height (in.)	26 1/4	26 1/4	26 1/4	26 1/4	26 1/4	26 1/4	26 1/4	26 1/4	26 1/4
Interior Width (in.)	24 1/2	44	44	56	56	56	68	68	68
Shipping Weight (lbs.)	188	282	285	319	322	330	398	414	420
Shipping Height (in.)	43 1/4	43 1/4	43 1/4	43 1/4	43 1/4	43 1/4	43 1/4	43 1/4	43 1/4
Shipping Length (in.)	35 3/4	64	64	68 1/4	68 1/4	68 1/4	80 1/4	80 1/4	80 1/4
Shipping Depth (in.)	46	46	46	46	46	46	46	46	46



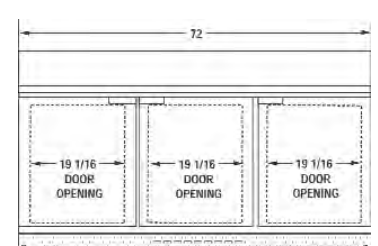
DL27-12M-FB Front View



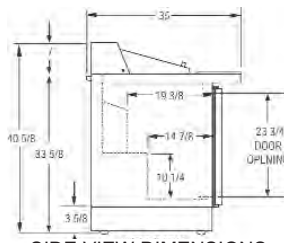
DL48-12M, 18M-FB Front View



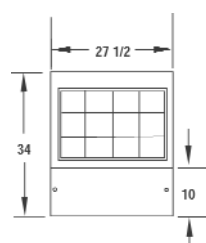
DL60-12M, 18M, 24M-FB Front View



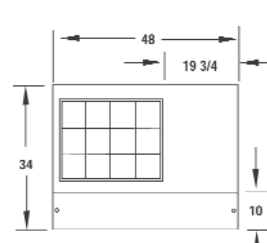
DL72-18M, 27M, 30M-FB Front View



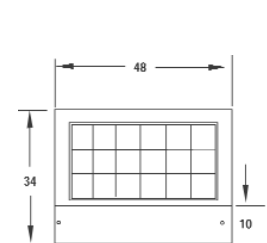
SIDE VIEW DIMENSIONS



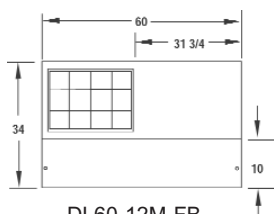
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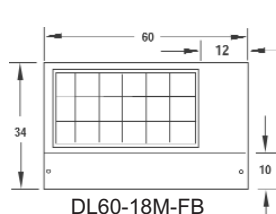
DL48-12M-FB



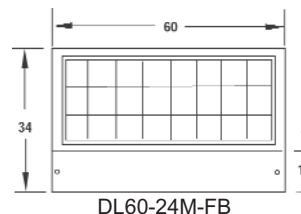
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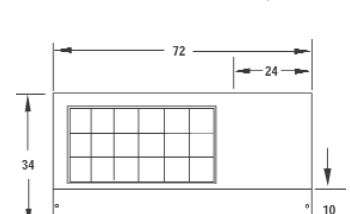
DL60-12M-FB



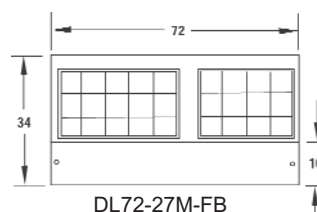
DL60-18M-FB



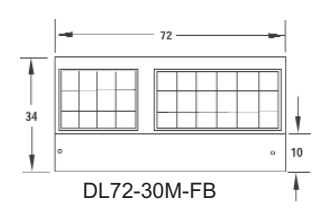
DL60-24M-FB



DL72-18M-FB



DL72-27M-FB



DL72-30M-FB

DLREF305

Continental

Refrigerator

A Division of National Refrigeration & A/C Products, Inc.
 539 Dunksferry Road Bensalem, PA 19020
 (800) 523-7138 Fax: (215) 244-9579
www.continentalrefrigerator.com

Submittal Sheet

12/20/2017

ITEM# 183 - REFRIGERATED WORK TOP (2 EA REQ'D)

Continental Refrigerator SW60-GD-FB

Work Top Display Refrigerator, Front Breather, 60" wide, 17.0 cu ft capacity, two-section, stainless steel flat top, (2) glass door, LED interior lighting, stainless steel front and end panels, aluminum interior, electronic controller w/digital display, 3-5/8" casters, rear mounted self-contained refrigeration, 1/4 hp, cETLus, NSF, Made in USA

ACCESSORIES

Mfr	Qty	Model	Spec
Continental Refrigerator	2		Standard warranty (for the United States & Canada Only): 3 year parts and labor; 5 year compressor
Continental Refrigerator	2		115v/60/1-ph, 7.4 amps, cord, NEMA 5-15P, standard

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1									1/4		
2	115	60	1	Cord & Plug		5-15P	7.4				

WORKTOP REFRIGERATOR

Model: SW60-GD-FB

60" Worktop Display Refrigerator with Hinged Glass Doors Front Breathing

Stainless steel front and top, aluminum end panels, case back and interior.

Designed to maintain NSF-7 temperatures in 100°F ambient.



Options and Accessories

(upcharge and lead times may apply)

Stainless steel exterior and interior	Solid doors
Stainless back in lieu of aluminum	Backsplash - BS models
Overshelves (single or double)	Expansion valve system
Additional epoxy-coated steel shelves	Remote models
Stainless steel shelves	Door locks
Automatic electric condensate evaporator	Digital thermometer
Stainless steel roll-out drawers in lieu of doors - D models	Special electrical requirements (consult factory)

Consult factory for other model configurations, options and accessories.

Continental
Refrigerator

Toll-Free: 800-523-7138
Phone: 215-244-1400
Fax: 215-244-9579

539 Dunksferry Road
Bensalem, PA 19020
www.continentalrefrigerator.com

Project Name:

Model Specified:

Location:

Item No:

Quantity:

AIA #:

SIS #:

Standard Model Features

REFRIGERATION SYSTEM

Performance-rated refrigeration system
Environmentally-safe R-134a refrigerant
Automatic, energy saving, non-electric condensate evaporator
Non-corrosive, plasticized fin evaporator coil
Easily serviceable, back mounted compressor

CABINET ARCHITECTURE

2" non-CFC polyurethane foam insulation
Double pane, low-e, tempered hinged glass doors
Magnetic snap-in door gaskets
Heavy-duty, epoxy-coated steel shelves
Completely enclosed, vented and removable case back
3 5/8" casters

MODEL FEATURES

Interior hanging thermometer
LED interior lighting
Field rehingeable doors

Front breathers are a unique, field assembled, bottom mounted ventilation system designed to allow cabinets to be flush against a wall or built into a counter to conserve space.

APPROVAL:

Model Specifications

DIMENSIONAL DATA

Net Capacity (cu. ft.)	17.0 (481 cu l)
Width, Overall (in.)	60 (1524 mm)
Depth, Overall (in.) (incl. handles & bumpers)	31 7/16 (799 mm)
Depth, Body Only (less doors) (in.)	27 1/2 (699 mm)
Height, Overall (in.) (incl. 3 5/8" casters)	33 7/8 (860 mm)
Shelf Area (sq. ft.)	8.1 (.8 sq m)
No. of Shelves	2
No. of Doors	2
Interior Depth (in.)	See Drawing
Interior Height (in.)	26 1/4 (667 mm)
Interior Width (in.)	56 (1422 mm)

REFRIGERANT DATA

Condensing Unit Size (H.P.)	1/4
Capacity (BTU/Hr)*	1940

ELECTRICAL DATA

Voltage (int'l)	115/60/1 (220/50/1)
Fans	3
Total Amps (int'l)	7.4 (4.0)
10 ft. Cord/Plug [attached] (int'l)	Yes (No)

SHIPPING DATA

Weight (lbs.)	300 (136 kg)
Height - Crated (in.)	43 1/4 (1099 mm)
Width - Crated (in.)	68 1/4 (1734 mm)
Depth - Crated (in.)	37 1/4 (946 mm)

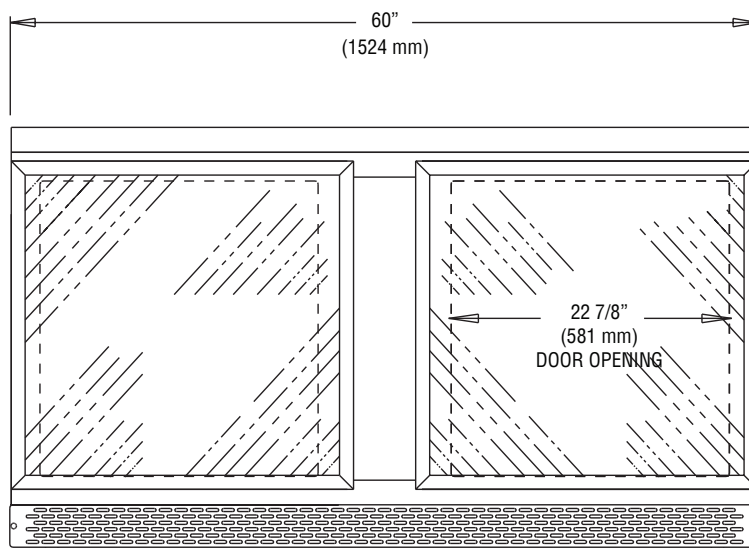
* Rating @ +25°F evaporator, 90°F ambient

Figures in parentheses reflect metric equivalents rounded to the nearest whole unit.

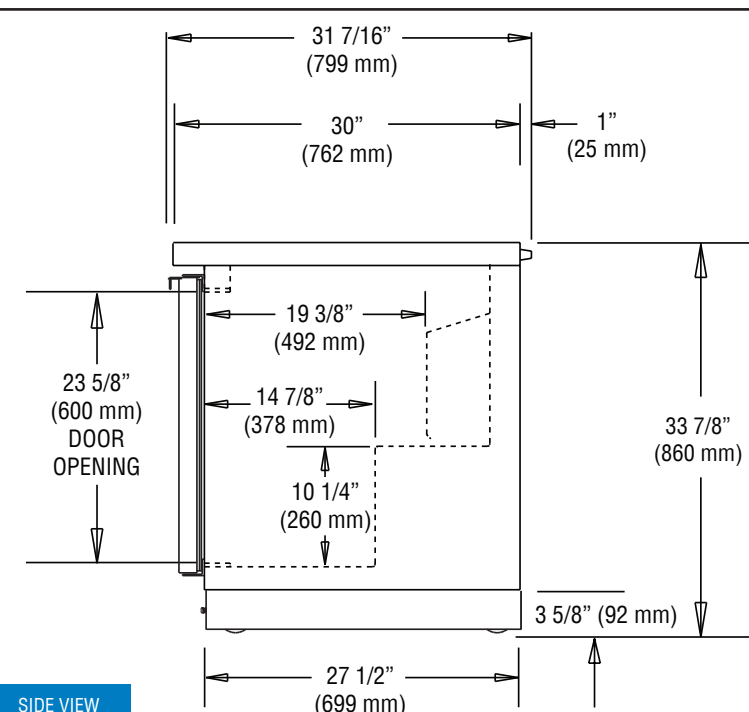


Equipped with one NEMA-5-15P Plug
(varies by country)

Model Plan Views



FRONT VIEW



SIDE VIEW

Continental
Refrigerator

Toll-Free: 800-523-7138
Phone: 215-244-1400
Fax: 215-244-9579

539 Dunkserry Road
Bensalem, PA 19020
www.continentalrefrigerator.com

Due to our continued efforts in developing innovative products, specifications subject to change without notice.



MADE IN THE U.S.A.

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Submittal Sheet

12/20/2017

ITEM# 184 - FOOD SLICER, ELECTRIC (2 EA REQ'D)

Globe 3600N

Globe Premium Slicer, 13" dia. steel alloy knife blade, manual, gear-driven knife system, start/stop touchpad controls, 2° angled drip groove on slicer table, knife ring guard with removable deflector, knife cover interlock and dual gear slice-thickness adjustment, 45° carriage angle, 12" food chute carriage, stainless steel construction, 1/2HP, 115v/60/1-ph, 7.0amps, NEMA 5-15P, cETLus, NSF/ANSI 8-2010, Made in USA

The spec sheet for this item can be viewed on item 17)

ACCESSORIES

Mfr	Qty	Model	Spec
Globe	2		1-year labor warranty from date of original installation (not to exceed 18 months from factory shipment)
Globe	2		2-year parts warranty (excludes wear/expendable parts)
Globe	2		15-year drive gears warranty (see Warranty sheet for complete details)

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1	115	60	1	Cord & Plug		5-15P	7.0		1/2		

Submittal Sheet

12/20/2017

ITEM# 185 - SPEEDELIGHT MICROWAVE CONVECTION OVEN (2 EA REQ'D)

Electrolux 603869

(HSP2RPRS) Speedelight Microwave Convection Oven, electric, manual adjustable top ribbed contact plate, 3-cooking technologies, digital display, (8) programs (4 pre-loaded), USB & wi-fi connections, dark grey, includes: glass saver (653527), brush (653623), spatula (653625), stainless steel feet (653791), spacer ventilation kit (653794) & detergent (653796), 5.0 kW, 208v/60/1-ph, cETLus, ETL-Sanitation

ACCESSORIES

Mfr	Qty	Model	Spec
Electrolux	2		<p>The following are included in the purchase of Electrolux Professional - SPEEDELIGHT units.</p> <p>1.) Start-up performed by a Factory Authorized Agent</p> <p>2.) Platinum Warranty: 2 years parts & 1 year labor (Warranty activated upon completion of mandatory Factory Authorized Agent start-up)</p> <p>3.) Performance Check: 12th month performance maintenance check</p>

Please contact Electrolux to schedule all of the above 1-800-449-4200

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1	208	60	1	Cord & Plug		6-30P	26	5.0			



Electrolux

Cooking Sandwich Press Speedelight with adjustable tube, ribbed removable teflon upper plate

ITEM #

MODEL #

NAME #

SIS #

AIA #



Cooking Sandwich Press

Speedelight with adjustable tube, ribbed
removable teflon upper plate

603869 (HSPP2RPRS)

Speedelight with manual
adjustable top ribbed
contact plate, dark grey

Short Form Specification

Item No.

Speedelight High Speed Cooking Platform - Fast, Friendly, Easy and Smart. Lid and top plate constructed in 304 AISI stainless steel and with external high-grade composite material paneling and handle. Possibility to manually adjust the maximum movement of the upper plate. Ribbed top contact plate 8 7/16" x 8 7/16" (215 x 215 mm) in aluminum with non-stick coating. Can accept food products from 25/64" to 2 61/64" (10 to 75 mm) thick. Smooth 5/32" (4 mm) thick quartz glass bottom cooking surface 10" x 10" (250 x 250 mm). Two (2) probes independently control the temperature of the top and bottom plates from 212 to 536°F (100 to 250 °C). Automatic lid holding and lifting of the lid at the end of the cooking cycle via mechanical spring. Electronic control with digital 4.3" LED display, countdown display and buzzer at the end of the cycle. Green technology - The exclusive Energy Saving Mode works when the lid is closed to activate the stand-by mode; Speedelight consumes 60% less energy.



APPROVAL:

Main Features

- It combines 3 cooking technologies: contact, infrared radiation and microwaves to provide perfectly cooked food, heated to the core.
- Adjusting upper plate to heat food up to a minimum height.
- The Energy Saving Mode automatically switches to stand-by after an amount of time settled by the operator (from 1 to 60 minutes).
- Delivered with USB port and wi-fi connection to optimize workflows allowing local and remote interaction (temperatures, countdowns, warnings).
- Electronic control with digital 4.3" LED display with adjustable brightness.
- Countdown display and buzzer with adjustable volume at the end of the cycle.
- 8 programs selectable on the display. The 8 programs can be adjusted by the user. The programmable parameters are:
 - top plate temperature
 - bottom plate temperature
 - total duration of each cycle
 - duration and distribution of microwaves within each cycle.
- 4 pre-loaded Programs (editable):
 - P1 = 30 sec. (20 sec. MW)
 - P2 = 40 sec. (30 sec. MW)
 - P3 = 50 sec. (40 sec. MW)
 - P4 = 60 sec.
 The remaining four are not pre-loaded and should be programmed by Users according to their specific menus.
- Automatic mechanical lid holding and opening system controlled.
- Ergonomic handle for easy movement of the lid.
- ETL safety approved, complies with UL 923 and CAN/CSA 22.2 standards.
- ETL sanitation approved, complies with NSF/ANSI 4 standard.
- IPX4 water resistance certification.

Construction

- Two (2) temperature probes for an independent control of the top and bottom plate temperature.
- Aluminum ribbed top contact plate 8 7/16" x 8 7/16" (215 x 215 mm) treated with a special non-stick coating.
- Smooth 5/32" (4 mm) thick quartz glass bottom cooking surface 9 13/16" x 9 13/16" (250 x 250 mm).
- Independent temperature setting of the top and bottom plates from 212 to 536°F (100 to 250 °C).
- Automatic lifting of the lid at the end of the cooking cycle via mechanical spring.
- Lid, back cover and bottom all in AISI 304 S/S.
- Lid covers, handle and side panels in high-grade reinforced composite material.
- 800W heating element on the top plate.
- 800W electrical armored heating elements on the



Electrolux

Speedelight with adjustable tube, ribbed removable teflon upper plate

Cooking Sandwich Press

Electrolux Professional, Inc.

www.electroluxusa.com/professional

10200 David Taylor Drive, Charlotte, NC 28262 • Telephone Number: 866-449-4200 • Fax Number: 704-547-7401



Electrolux

Cooking Sandwich Press SpeedDelight with adjustable tube, ribbed removable teflon upper plate

bottom plate.

- 2 x 1050W magnetrons for microwave.
- Front air inlet and back outlet for efficient cooling ventilation allows easy air filters removal and side by side installation.
- Included accessories: brush, spatula, scraper, 2 3/4" (75 mm) high stainless steel feet and de-greaser cleaning agent.

Included Accessories

- 1 of Glass saver for SpeedDelight PNC 653527
- 1 of Cleaning brush for SpeedDelight PNC 653623
- 1 of 4x1qt "GREASE EXPRESS" detergent bottles for High Speed Sandwich Press PNC 653624
- 1 of Spatula for SpeedDelight PNC 653625
- 1 of SpeedDelight Spacer Stop Kit for Rear Ventilation PNC 653794

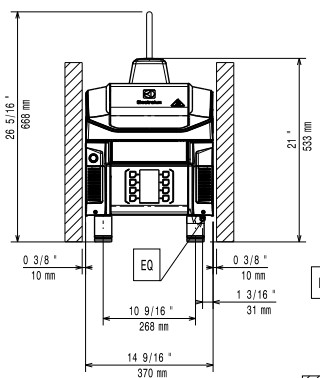
Optional Accessories

- Glass saver for SpeedDelight PNC 653527 ☐
- Cleaning brush for SpeedDelight PNC 653623 ☐
- 4x1qt "GREASE EXPRESS" detergent bottles for High Speed Sandwich Press ☐
- Spatula for SpeedDelight PNC 653625 ☐
- Special scraper for HSG Panini PNC 653690 ☐
- 16 ounce Spray Bottle for detergent for High Speed Sandwich Press PNC 653695 ☐
- Removable ribbed teflon plate for SpeedDelight PNC 653787 ☐
- Four (4) Rubber Feet 1 1/32" (26mm) PNC 653792 ☐
- Four (4) Rubber Feet 1 37/64" (40mm) PNC 653793 ☐
- SpeedDelight Spacer Stop Kit for Rear Ventilation PNC 653794 ☐

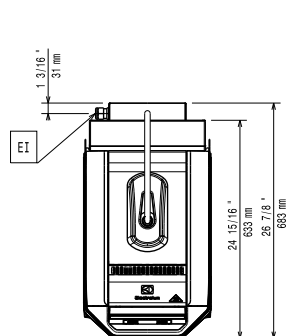

Electrolux

Cooking Sandwich Press SpeedDelight with adjustable tube, ribbed removable teflon upper plate

Front



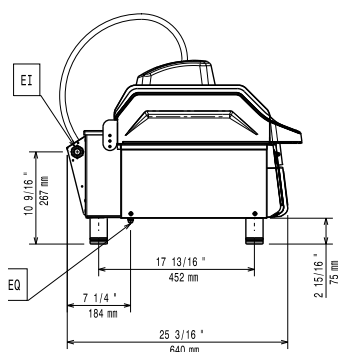
Top



EI = Electrical connection

EO = Electrical Outlet

Side



Electric

Supply voltage:

603869 (HSPP2RPRS) 208 V/1 ph/60 Hz

Amps:

26 A

Electrical power, max:

5 kW

Total Watts:

5 kW

Plug type:

NEMA 6 -30

 Minimum Circuit Ampacity
(MCA):

30A

Installation:

Clearance: 7 1/2" (190mm) from rear vertical panel

Key Information:

External dimensions, Width:	14 3/16" (361 mm)
External dimensions, Depth:	26 9/16" (675 mm)
External dimensions, Height:	24 13/16" (630 mm)
Net weight:	79 lbs (36 kg)
Shipping width:	17 3/4" (450 mm)
Shipping depth:	30 11/16" (780 mm)
Shipping height:	26 3/4" (680 mm)
Shipping weight:	119 lbs (54 kg)
Shipping volume:	8.43 ft ³ (0.24 m ³)

 Cooking Sandwich Press
SpeedDelight with adjustable tube, ribbed removable teflon upper plate

 The company reserves the right to make modifications to the products
without prior notice. All information correct at time of printing.

2017.03.15

Page: 357

Submittal Sheet

12/20/2017

ITEM# 186 - DROP-IN SINK (1 EA REQ'D)

Eagle Group SR14-16-9.5-1

Self-Rimming Drop-In Sink, one compartment, 14" wide x 16" front-to-back x 9-1/2" deep bowl, 4" O.C. deck mount faucet with gooseneck spout (302004), includes basket drain, 20/304 stainless steel construction, NSF

The spec sheet for this item can be viewed on item 181)

ACCESSORIES

Mfr	Qty	Model	Spec
Eagle Group	1		Faucet hole punched on 4" centers, standard
Eagle Group	1	313306	T&S Faucet, deck mount, 4" O.C., 8" swing spout, low lead

WATER

	HOT SIZE	HOT AFF	HOT GPH	COLD SIZE	COLD AFF	FILTERED SIZE	FILTERED AFF	CONDENSER INLET SIZE	CONDENSER OUTLET SIZE
1	1/2"			1/2"					

WASTE

	INDIRECT SIZE	DIRECT SIZE
1		

Submittal Sheet

12/20/2017

ITEM# 187.1 - SNEEZE GUARD (1 EA REQ'D)

Versa-Gard VP1.3-SKV

VG Series. Full service food protector with vertical glass. Two-tier with intermediate and top shelves. 1" OD Solid Supports. End glass panels are 1/4" clear tempered. All glass meets ANSI Z97.1 specifications for safety performance and ASTM C1048-04 specifications for heat treated glass. All hardware supplied in a brushed stainless steel finish. All glass with ground and polished edges. Conceal mount hardware.

ACCESSORIES

Mfr	Qty	Model	Spec
LED LIGHT			



VP1.3-SKV

Protected by US Patent 7,040,723
Other Patents Pending

Full Service Protector with Intermediate Shelf

FINISH:

- ☐ Brushed Stainless Steel
☐ Clear Anodized Aluminum
☐ Powder Coat:
☐ Black ☐ Silver

RAL # _____

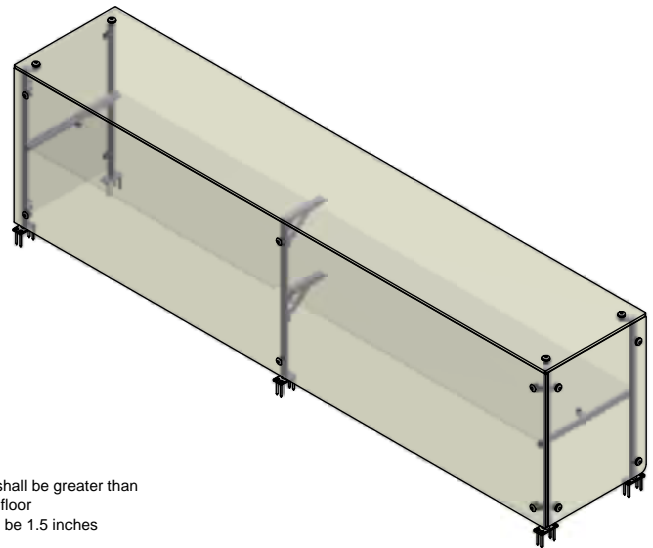
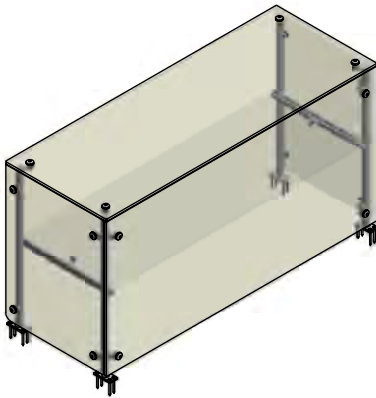
GLASS (Clear Tempered):

- ☐ 1/4" Front - Std ☐ 3/8" Top - Std
☐ 3/8" Front ☐ 1/2" Top
☐ 1/2" Front
☐ Frosted

OPTIONS(*):

- ☐ End Panel - RT
☐ End Panel - LT
☐ Light Fixture
☐ Warmer
☐ Shelf Kit

(*) Not all options available on all models
 Contact factory for specific information
 For Mounting Options see Mounting Specifications



NSF/ANSI 2 - 2010 Standards Requirements:

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5.35.12 Food Shields for use on cafeteria counters

5.35.12.1 The sum of a shield's protected horizontal plane (X) and its protected vertical plane (Y) shall be greater than or equal to 32 inches. When (X) = 0, (Y) shall be a minimum of 60 inches from finished floor

5.35.12.2 Maximum distance from the bottom edge of the front vertical glass and counter top shall be 1.5 inches

5.35.12.3 Maximum distance between the vertical glass and horizontal glass is 3/4 inch

5.35.12.4 Minimum horizontal distance between the front inside edge of displayed food and the bottom leading edge of the shield s 1.5 inches

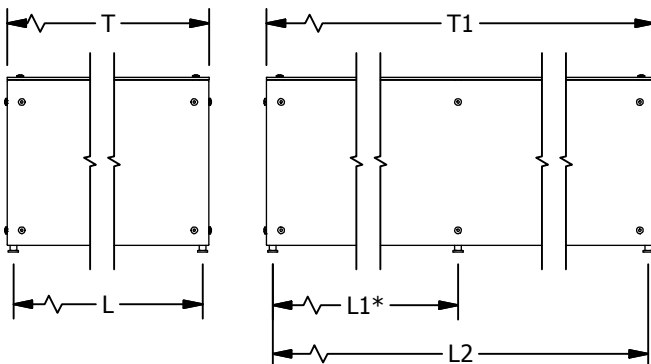
5.35.6 A vertical barrier (end shield) shall be provided at each end of a foodshield. The vertical barrier shall be a minimum of 18 inches deep (front to back) beginning at the bottom leading edge of the foodshield.

The minimum height of the vertical barrier shall be equal to the overall height of the foodshield.

The maximum distance from the bottom edge of the vertical barrier and counter top shall be 1.5 inches.

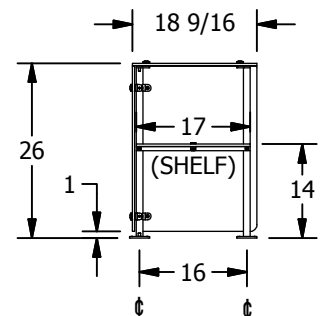
5.35.6.1 A foodshield intended to be installed a maximum of 3" (76mm) from a building wall perpendicular to the foodshield is exempt from the requirements of 5.35.6 provided that the height of the building wall is not lower than the overall height of the foodshield.

(2) End Panels per unit unless otherwise specified. End panels are 1/4" clear tempered glass unless otherwise specified.



(* - Middle support is centered unless L1 dimension is specified)

L / L1 - 48" Max (1/4" Glass)
 - 60" Max (3/8" Glass)
 - 66" Max (1/2" Glass)
 T
 T1 - 60" Max (3/8" Glass)
 - 96" Max in a Single Section



Submittal Sheet

12/20/2017

ITEM# 187.2 - SNEEZE GUARD (1 EA REQ'D)

Versa-Gard VG3.3-SK

VG Series. Adjustable self service food protector with straight glass and top shelf. Adjustable in 7 different self-service positions. 1" OD Solid Supports. End glass panels are 1/4" clear tempered. All glass meets ANSI Z97.1 specifications for safety performance and ASTM C1048-04 specifications for heat treated glass. All hardware supplied in a brushed stainless steel finish. All glass with ground and polished edges. Conceal mount hardware.

The spec sheet for this item can be viewed on item 113.1)

ACCESSORIES

Mfr	Qty	Model	Spec
LED LIGHT			

Submittal Sheet

12/20/2017

ITEM# 187.3 - SNEEZE GUARD (1 EA REQ'D)

Versa-Gard VP1.3-SKV

VG Series. Full service food protector with vertical glass. Two-tier with intermediate and top shelves. 1" OD Solid Supports. End glass panels are 1/4" clear tempered. All glass meets ANSI Z97.1 specifications for safety performance and ASTM C1048-04 specifications for heat treated glass. All hardware supplied in a brushed stainless steel finish. All glass with ground and polished edges. Conceal mount hardware.

The spec sheet for this item can be viewed on item 187.1)

ACCESSORIES

Mfr	Qty	Model	Spec
LED LIGHT			

Submittal Sheet

12/20/2017

ITEM# 190 - STONE HEARTH OVEN, GAS (1 EA REQ'D)

Wood Stone WS-MS-6-RFG-IR

Mt. Baker Stone Hearth Oven, radiant gas flame in dome and infrared burner under hearth, 62" diameter hearth, (22) 8", (13) 10", (10) 12" or (8) 16" pizza capacity, monolithic cast-ceramic floor and dome create "deep heat sink", angle iron stand, 10" OD flue collar, ETL-Sanitation, 188,000 BTU

ACCESSORIES

Mfr	Qty	Model	Spec
Wood Stone	1		Natural gas
Wood Stone	1		120v/50/60/1-ph, 1.1 amps, direct wire
Wood Stone	1	LEFT-SIDE-FLAME	Flame located LEFT side of chamber, adds 2 weeks to standard lead time
Wood Stone	1	SG-BDL-O-WS-47-C	Hood for Mt. Baker & Mt. Adams oven, Curved Face, pre-piped for Ansul, requires 685 CFM, 0.8" S.P. (ALL HOODS ARE pre-piped for Ansul; includes duct and plenum nozzles, fusible link holder with 450 degree fusible link, ready for connection to Customer supplied Ansul 102 system (NOTE: ANSUL SYSTEM BY OTHERS)), 430 stainless steel finish, Type 1 Hood, ETL Listed to UL 710
Wood Stone	1	RP-002-800-RES	Interlock Relay, to connect fan to oven, GAS ONLY
Wood Stone	1	O-6-DFEA-F	Doorway Facade Extension, arched, flat 6'
Wood Stone	1	O-6-SPE-F	Service Panel Extension, to match flat doorway facade extension, stainless steel
Dormont	1	16100BPCF48	Dormont Blue Hose™ Moveable Gas Connector Hose Assembly, 1" inside dia., 48" long, covered with stainless steel braid, coated with blue antimicrobial PVC, 1 Safety Quik® QDV, 1 elbow, 334,000 BTU/hr minimum flow capacity, limited lifetime warranty

CURVED, AIR COOLED VIEWING WINDOW**ELECTRICAL**

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1	120	60	1	Direct			1.1				

GAS

	SIZE	MBTU	KW
1	3/4"	188	

STEAM

	INLET SIZE	RETURN SIZE	LB/HR	PSIG (min)	PSIG (max)
1					

Wood Stone



WS-MS-6 model with optional Stainless Steel Mantle shown.

HEARTH CAPACITY

8" pizzas:	18–22
10" pizzas:	14–16
12" pizzas:	10–12
16" pizzas:	6–8

Assuming 5-minute cook times, the approximate maximum hourly production capacity can be calculated by multiplying the above numbers by 12. Cook times will also vary depending on "style" of pizza.

GUIDE TO MODEL NUMBERS

	Radiant Flame	Underfloor IR Burner	Wood Required	Combination	Natural Gas BTU/hr	Liquid Propane BTU/hr
WS-MS-6-RFG	X				-NG 105,000	-LP 94,000
WS-MS-6-RFG-W	X			X	-NG 105,000	-LP 94,000
WS-MS-6-RFG-IR	X	X			-NG 188,000	-LP 159,000
WS-MS-6-RFG-IR-W	X	X		X	-NG 188,000	-LP 159,000
WS-MS-6-W-IR		X	X		-NG 83,000	-LP 65,000
WS-MS-6-W			X			

MT. BAKER 6' STONE HEARTH OVEN



Job Name

Model WS-MS-6

Item#

The Mt. Baker 6' oven features a door opening 36 inches wide x 10 inches high. The oven floor diameter is 62 inches, resulting in a 22-square-foot cooking surface. A tensioned steel exoskeleton surrounding the hearth and dome perimeter ensures structural integrity and longevity. Wrapped in spun ceramic fiber insulation and requiring only a 1-inch side clearance to combustibles, the monolithic 4-inch thick cast-ceramic hearth and monolithic 4-inch thick dome rest on an open black painted steel stand. The oven body is finished with galvanized steel and a stainless steel service panel is provided. The oven arrives completely assembled, ETL Listed, ready to install and is made in the USA. Information about custom finishes, tools and accessories can be found online at: woodstone-corp.com.

FUEL CONFIGURATIONS

GAS-FIRED ONLY: Configured to burn either natural gas (NG) or liquid propane (LP).*

❑ RADIANT FLAME (RFG): Heated by an easily adjustable radiant flame (105,000 BTU/hr max. NG) located in the rear of the cooking chamber. User control ensures the ability to balance the oven's radiated top heat with the heat being conducted and radiated from the floor.

❑ RADIANT FLAME + UNDERFLOOR IR (RFG-IR): In addition to the radiant flame, a 83,000 BTU/hr (NG) thermostatically controlled infrared burner is mounted under the oven deck to ensure high production capacity with no heat recovery issues.

❑ WOOD-FIRED (W): Wood-fired only.

❑ WOOD WITH GAS ASSIST (W-IR): This wood-fired model is assisted by the additional BTU/hr of an Underfloor IR burner. **Note:** A wood fire is required with this configuration.

❑ COMBINATION (-W): Allows optional wood burning for ovens with gas burner configurations.* **Note:** Adding wood to an oven with an RFG burner will reduce available hearth capacity.

*Gas type must be specified at time of order.



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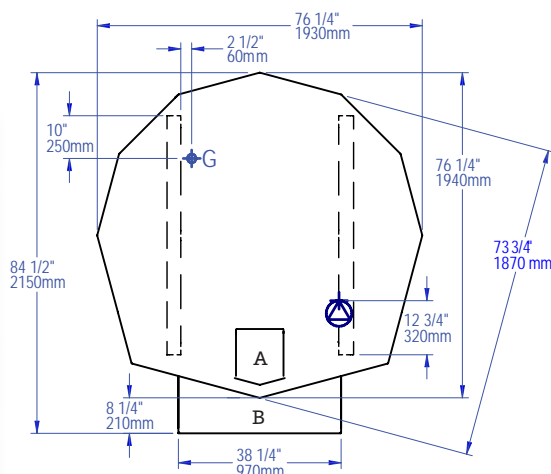




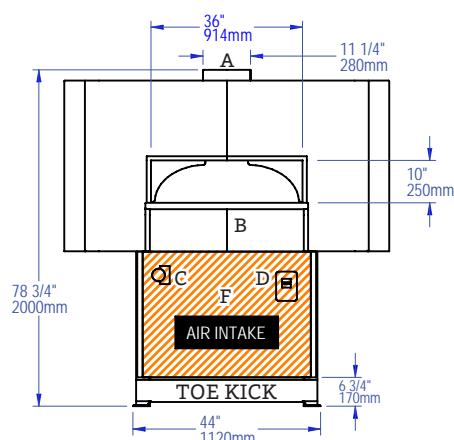
MT. BAKER 6'

STONE HEARTH OVEN • WS-MS-6

PLAN VIEW



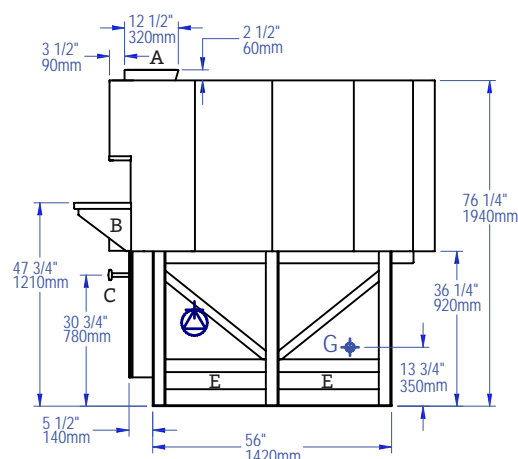
FRONT VIEW



FACADE INFORMATION

- All facades or enclosures are by others.
- All MS ovens require a 1" side clearance and 14" top clearance to combustible construction. Any construction 6" to either side of the oven doorway and above must be non-combustible.
- Any facade or enclosure below the mantle of Gas-Fired or Combination ovens must allow for:
 - Unobstructed access for removal of service/intake panel.
 - Easy access to all controls.
 - Sufficient combustion air for gas burners; see Installation and Operation Manual for details.

SIDE VIEW



A	Flue Collar
B	Mantle
C	Flame Height Control Knob
D	Digital Controller
E	Forklift Here
	Electrical Connection
F	Service Panel or Optional Storage Box
	Gas Connection
	Must Be Left Removable for Service
	AIR INTAKE: Do Not Facade or Cover Over

UTILITIES SPECIFICATIONS

GAS

¾ inch gas inlet (FNPT)

BTU/hr Requirements

See table on previous page

ELECTRICAL

Gas-Fired Only and Combination

120 VAC, 1.1 A, 50/60 Hz

Connection made beneath oven as shown.

Wood-Fired Only

120 VAC, 2 A, 50/60 Hz

Connection made to readout box.

VENTING INFORMATION

The Mt. Baker can be direct connected to a power-ventilated, grease-rated chimney or can be vented with a Listed Type 1 exhaust hood, or one constructed in accordance with NFPA 96 and all relevant local and national codes. The oven must be vented in accordance with all relevant local and national codes, and in a manner acceptable to the authority having jurisdiction.



Note: A 10" ID flue adapter is included with ovens ordered without a hood to facilitate connection to a round duct (adds 3" to height).

Ship Weight: 4,600 lbs / 2,087 kg



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OVEN-MOUNTED EXHAUST HOODS

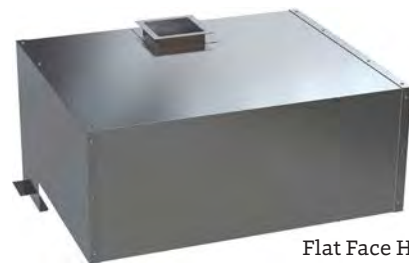
The SG-BDL-O-WS is an ETL Listed (to the UL710 Standard) Type 1 Oven-Mounted Exhaust Hood manufactured by Gaylord Industries specifically for Wood Stone ovens. The eyebrow-type hood mounts directly on top of the oven. It is designed to capture all the exhaust from the oven flue collar and draw warm air away from the front of the oven. The hood comes complete with a pre-drilled mounting flange and all the hardware necessary for mounting.

Hoods are available in flat front or curved face design. Solid brass trim is available on either design. All hoods are pre-piped for ANSUL R-102 fire suppression.

The hood is constructed of 18-gauge stainless steel and is equipped with baffle-type filters for removal of grease from the exhaust stream. The Wood Stone SG-BDL-O-WS is listed by Intertek and NSF. Its construction meets the requirements of NFPA-96 as well as those of all national mechanical codes. Spark arrestor filters are available as an option and must be used in all solid fuel installations.

The hood can be used in conjunction with one of Wood Stone's variable-speed exhaust fans (see previous page) to create an effective and responsive exhaust system. All duct work beyond the ventilator duct take-off collar is to be provided and installed by others in accordance with applicable codes.

Wood Stone



Flat Face Hood



Curved Face Hood

AVAILABLE OPTIONS

SPARK ARRESTOR FILTERS

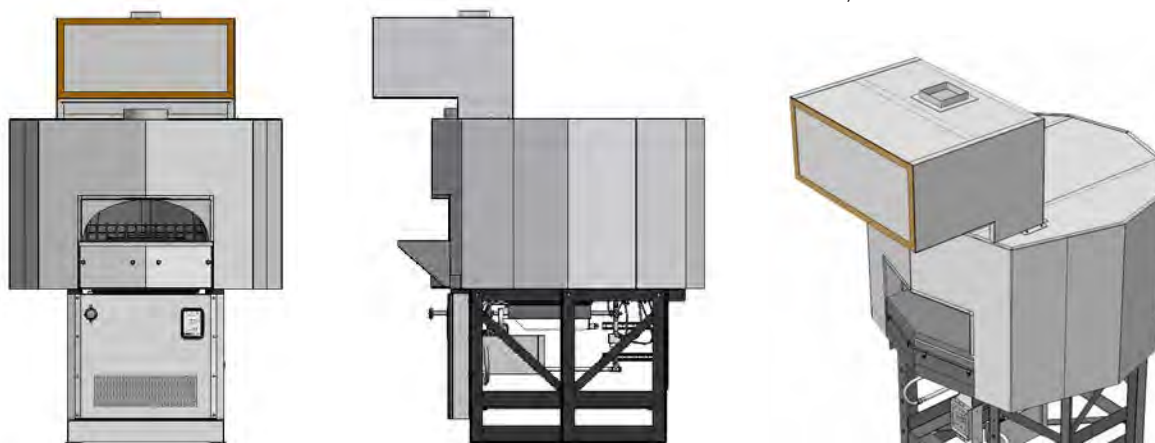
Hood filters required for solid fuel applications.

AUTOSTART

The Gaylord Autostart System is designed to automatically start the exhaust fan if cooking starts without the exhaust Fan switch being turned ON. The Autostart utilizes a hood-mounted thermostat and accompanying controller. This system is meant to be installed in conjunction with your conventional fan ON/OFF switch (by others).

BALANCING DAMPER

Manually set balancing dampers, used for balancing in multi-hood, shared duct installations.



Exhaust Hood mounted on a Mountain Series oven. Shown with brass trim.



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OVEN-MOUNTED EXHAUST HOODS



See below for exact dimensions and installation specifications of Gaylord Industries hoods for Bistro Line, Mountain Series and Fire Deck Series oven models. For details on Energex Exhaust Fans for Wood Stone Exhaust Hoods, see page 119.

		Oven Model Number									
		WS-BL-3030	WS-BL-4343/ 4355/ 4836	WS-MS-4	WS-MS-5	WS-MS-6	WS-MS-7	WS-FD-6045	WS-FD-8645	WS-FD-9660/ 11260	WS-FD-9690/ 11275/ 11290
DEPTH	Hood Width	29.5"	42.5"	30"	47"	47"	54"	50"	72"	72"	72"
	Hood Height	29"	27"	24"	24"	24"	24"	24"	24"	24"	24"
	Flat Face	29"	33"	33"	38"	38"	33"	33"	33"	33"	33"
	Curved Face	33"	37"	37"	42"	42"	42"	37"	37"	37"	37"
Required CFM		440	625	450	685	685	700	730	1050	1050	1050
Duct Size		6 x 6"	7 x 7"	6 x 6"	7.5 x 7.5"	7.5 x 7.5"	7.5 x 7.5"	7.5 x 7.5"	9 x 9"	9 x 9"	9 x 9"
Min. Overhang		8"	8"	8"	8"	8"	8"	8"	8"	8"	8"
Static Pressure		0.80"	0.80"	0.80"	0.80"	0.80"	0.80"	0.80"	0.80"	0.80"	0.80"
Weight in lbs.		125	175	125	175	175	225	225	350	350	350



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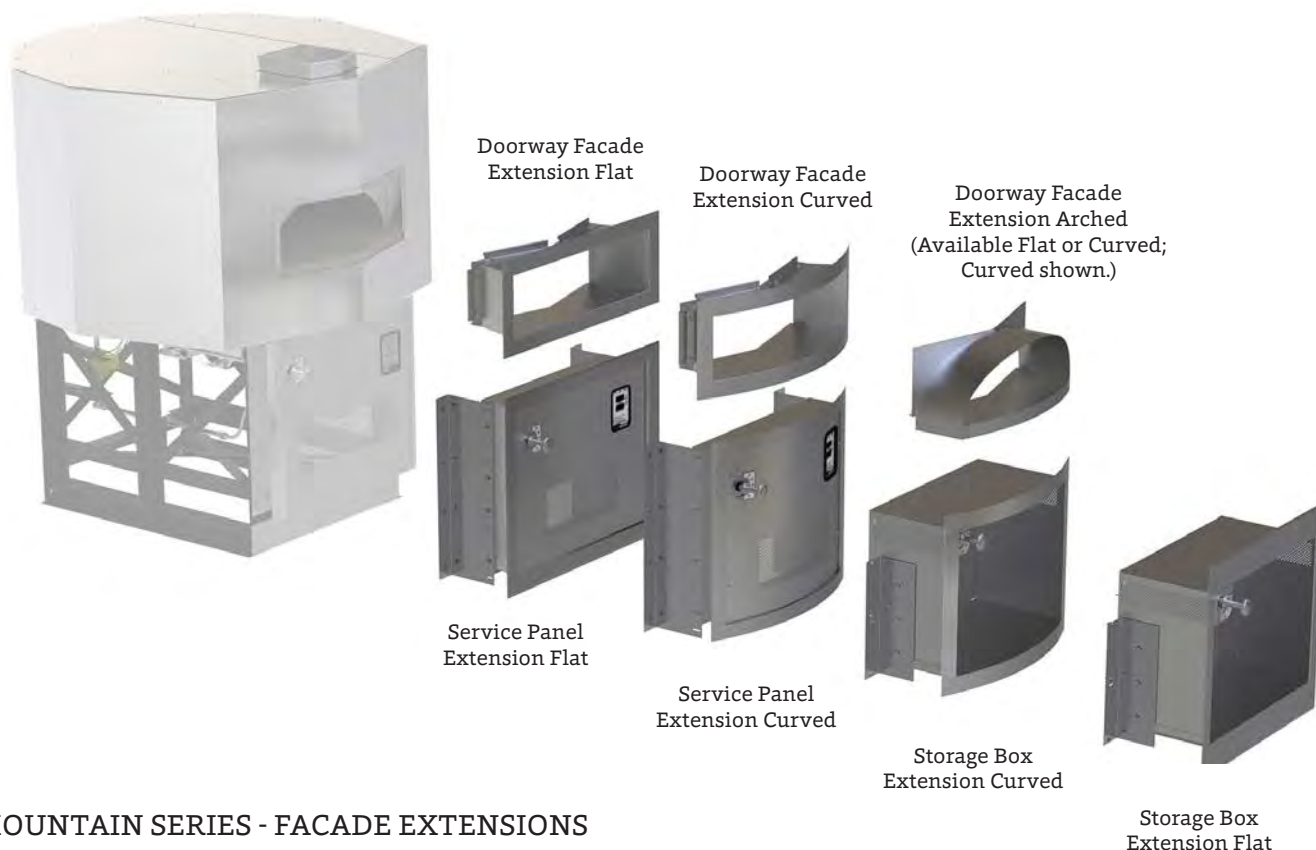
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MOUNTAIN SERIES FACADE EXTENSIONS

Wood Stone



MOUNTAIN SERIES - FACADE EXTENSIONS

Wood Stone offers a number of doorway, service panel and storage box options to help make oven installation into a facade wall seamless and attractive. Coordinated extensions bring the doorway of the oven into alignment with a panel or storage box below the oven. Both must be ordered at the same time to ensure proper alignment.

The face of an extension can be flat or curved. Curved extensions are available in either small or large radius dimensions (see exceptions on next page). Whatever your facade design, there's an option that's right for you.

Additionally, there's an arched doorway extension which mirrors the traditional stone hearth oven design.

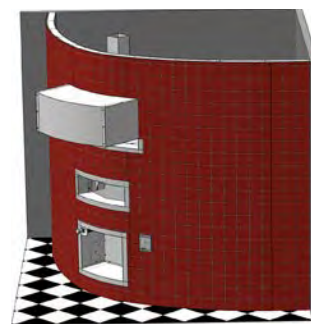
The side walls of all rectangular doorway extensions flare out slightly to enhance accessibility into the oven, and create a distinctive and beautiful look.

Lower extension options include the Service Panel Extension and the 15" deep Storage Box Extension, which offers additional storage for ovens with an Underfloor IR burner.

For ovens without an IR burner, Stand-Mounted Storage Boxes are an option. See the previous page for Mountain Series Stand-Mounted Storage Boxes.

For additional details on incorporating your oven into a facade, see the Facade Tutorials section of the Wood Stone website.

Doorway Facade and Storage Box
Large Radius Curved Extensions
and Curved Face Hood shown.



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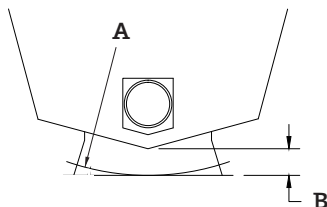
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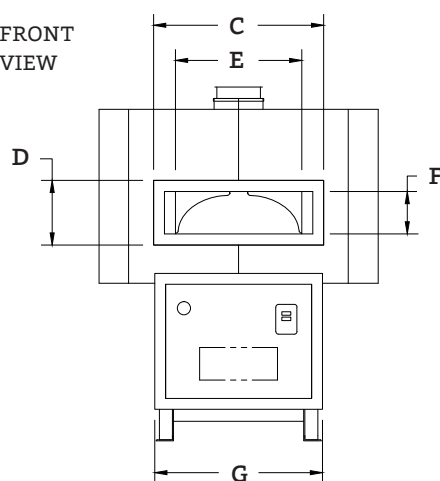
MOUNTAIN SERIES FACADE EXTENSIONS



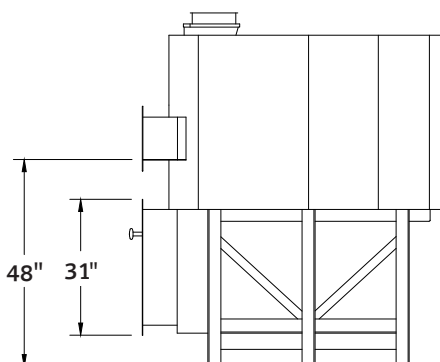
PLAN
VIEW



FRONT
VIEW



SIDE
VIEW



Doorway Facade and
Storage Box Flat
Extensions and
Flat Face Hood shown.



- The addition of granite on the mantle increases dimension (F) by .75" below the doorway.
- Curved Face Extensions are available in large or small radius styles, except for the WS-MS-4, which only has a small radius option.
- WS-MS-4 models with Underfloor IR burners do not have a Storage Box Extension option.
- Double Door and Viewing Window options (not available on WS-MS-4 models) affect some dimensions. Call for details.

					Upper Extension				Lower Extension	
			Radius of Curved Extension	Oven Face to Extension Face	Doorway Frame ¹ Width (C) x Height (D)		Doorway Opening Width (E) x Height (F)		Width of Service Panel or Box Frame	
Extensions			A	B	C	D	E	F	G	
WS-MS-4	Flat	Doorway / Service Panel ²	-	6.5"	28"	15"	19.5"	10"	33.5"	
		Doorway Arched		6"	-	9.5"				
	Small Radius	Doorway / Service Panel ²	34.5"	10"	28.5"	15"		10"		
WS-MS-5	Flat	Doorway / Service Panel or Box	-	6"	39"	15"	29"	10"	38.5"	
		Doorway Arched		5.5"	-	-				
	Small Radius	Doorway / Service Panel or Box	39"	7.5"	39"	15"			35"	
		Doorway Arched		7"	-	-				
	Large Radius	Doorway / Service Panel or Box	57"	6"	37.5"	15"			35.5"	
		Doorway Arched		5.5"	-	-				
WS-MS-6	Flat	Doorway / Service Panel or Box	-	6"	45.5"	15"	35"	9-1/2"	45"	
		Doorway Arched		5.5"	-	-				
	Small Radius	Doorway / Service Panel or Box	44.5"	7.5"	45"	15"			41.5"	
		Doorway Arched		7"	-	-				
	Large Radius	Doorway / Service Panel or Box	65.5"	6"	43.5"	15"				
		Doorway Arched		5.5"	-	-				
WS-MS-7	Flat	Doorway / Service Panel or Box	-	6"	52"	17"	41"	11.5"	47.5"	
		Doorway Arched		5.5"	-	-		12"		
	Small Radius	Doorway / Service Panel / Box	52"	8.5"	52"	17"		11.5"	47"	
		Doorway Arched		8"	-	-				
	Large Radius	Doorway / Service Panel or Box	75.5"	6"	50"	17"			47.5"	
		Doorway Arched		5.5"	-	-				

Dimension tolerance $\pm 1/2"$

¹ Doorway Facade Extension Arched does not have a frame.

² WS-MS-4 Models without Underfloor IR burners do have a Storage Box Extension option.

For Commercial Applications

Job Name _____
 Job Location _____
 Engineer _____
 Approval _____

Contractor _____
 Approval _____
 Contractor's P.O. No. _____
 Representative _____
 SKU _____

Safety Quik® Quick-Disconnect Valve Kits and Assemblies

Sizes: ½" to 1" (15 to 25mm)

Safety Quik Quick-Disconnect Valve Kits and Assemblies feature a quick-disconnect protection valve that combines one-handed quick-disconnect functionality with a unique safety feature that protects you and your business from a potential disaster. Safety Quik prevents users from accidentally turning on the gas while the appliance is not connected to the supply line. It also prevents the hose from being disconnected whenever the gas is flowing.

Features

Safety Quik® Quick-Disconnect Valve

Quick-Disconnect.....	Flat face push-to-connect; brass body
Protection Valve.....	Full port brass ball valve
Thermal Shut-off.....	Shuts off gas flow within a temperature range of 250°F - 300°F (121°C - 149°C)

Specifications

The Dormont Blue Hose™

Tubing	Annealed, 304 stainless steel
Braiding	Multi-strand, stainless steel wire
Coating	Blue antimicrobial PVC, melts at 350°F (177°C), coating will not hold a flame
End Fittings.....	Carbon steel; zinc trivalent chromate
Stress Guard®.....	360° rotational end fitting at both ends

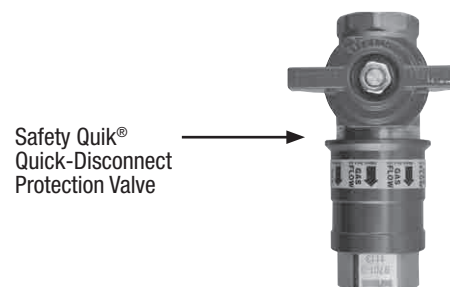
Additional Components

Restraining Device	PVC-coated, steel multi-strand cable and mounting hardware
Elbow	Malleable iron

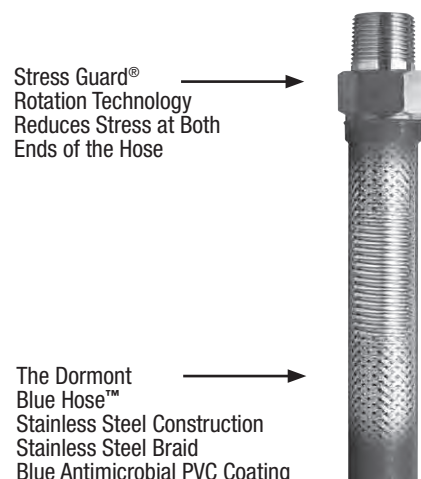
Approvals & Certifications

NSF/ANSI 169 – Special purpose food equipment and devices
 ANSI Z21.69/CSA 6.16 – Connectors for moveable gas appliances
 ANSI Z21.15/CSA 9.1 – Manually operated gas valves for appliances, appliance connector
 ANSI Z21.90/CSA 6.24 – Gas convenience outlets
 Meets Requirements of ANSI Z223.1/NFPA 54 national fuel gas code
 Not for use in temperatures less than 32°F (0°C). For indoor use only.
 Max operating pressure 1/2 psi.
 Refer to the catalog for additional approvals and certifications or go to www.dormont.com.

A restraining device is required for all moveable gas equipment.



Safety Quik®
Quick-Disconnect
Protection Valve



Stress Guard®
Rotation Technology
Reduces Stress at Both
Ends of the Hose

The Dormont
Blue Hose™
Stainless Steel Construction
Stainless Steel Braid
Blue Antimicrobial PVC Coating

(Cutaway shown)

Stress Guard®
Rotation Technology
Reduces Stress at Both
Ends of the Hose

Safety System

The Dormont Safety System™ is the first and only complete gas equipment connection system specifically engineered for the commercial kitchen. The Safety System consists of the famous Dormont Blue Hose and a variety of accessories designed for improved safety and performance in commercial kitchens. Because they are manufactured in the USA under an ISO qualified production process and to multiple design certifications, you can Connect with Confidence with the Dormont Safety System.

Dormont®

Safety Quik® Quick-Disconnect Valve Deluxe Kit Assembly

Ordering Information

		LENGTH				
Configuration	Size I.D.	24" (607mm)	36" (914mm)	48" (1,219mm)	60" (1,524mm)	72" (1,829mm)
Deluxe Kit*	½" (13mm)	1650KITCF24	1650KITCF36	1650KITCF48	1650KITCF60	1650KITCF72
Hose Assembly		1650BPCF24	1650BPCF36	1650BPCF48	1650BPCF60	1650BPCF72
Deluxe Kit*	¾" (19mm)	1675KITCF24	1675KITCF36	1675KITCF48	1675KITCF60	1675KITCF72
Hose Assembly		1675BPCF24	1675BPCF36	1675BPCF48	1675BPCF60	1675BPCF72
Deluxe Kit*	1" (25mm)	16100KITCF24	16100KITCF36	16100KITCF48	16100KITCF60	16100KITCF72
Hose Assembly**		16100BPCF24	16100BPCF36	16100BPCF48	16100BPCF60	16100BPCF72

BTU/hr Flow Capacity Natural Gas (Flow rating BTU/hr 0.64 SP. GR. @ 0.5 inch WC pressure drop)

		LENGTH				
Model	Size I.D.	24" (607mm)	36" (914mm)	48" (1,219mm)	60" (1,524mm)	72" (1,829mm)
1650BPCF	½" (13mm)	87,000	77,000	68,000	60,000	55,000
1675BPCF	¾" (19mm)	232,000	218,000	180,000	158,000	139,000
16100BPCF	1" (25mm)	414,000	379,000	334,000	294,000	279,000

***Deluxe Kits include:** The Dormont Blue Hose, Safety Quik, Restraining Device and 2 Street Elbows

****Hose Assembly includes:** The Dormont Blue Hose, Safety Quik QD and Street Elbow

Typical Installation



The Dormont Blue Hose™

The Dormont Blue Hose is a commercial, moveable-grade gas connector designed for use with moveable equipment.

Moveable equipment is defined in ANSI Standard Z21.69/CSA 6.16 as gas utilization equipment that may be mounted on casters or otherwise be subject to movement.



Safety Quik

- Prevents user from turning on gas while appliance is disconnected
- Thermal shutoff within a temperature range of 250°F - 300°F (121°C - 140°C)



Restraining Device

- ANSI Z21.69 Standard section 1.7.4 states: Connectors when used on caster-mounted equipment shall be installed with a restraining device, which prevents transmission of the strain to the connector



We guarantee our commercial gas connectors for the life of the original appliance to which it is connected.

Dormont®

A Watts Water Technologies Company

ES-D-SafetyQuik 1404



**ISO 9001-2008
CERTIFIED**

USA: Export, PA • Tel. (724) 733-4800 • Fax: (724) 733-4808 • www.dormont.com

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Submittal Sheet

12/20/2017

ITEM# 190.1 - FIRE SUPPRESSION SYSTEM (1 EA REQ'D)

Ansul R-102

Wet chemical type fire suppression system. Installation in accord with N.F.P.A. 17A code requirements. Suppression system to be pre-piped at factory and hooked up in field by a local licensed agency. Local agency to perform certifications tests as required by local authorities. Furnish manual strike mechanism in accessible location. Furnish unit complete with all tanks, piping, relays, cable, fusible links, nozzles, etc. as required for a complete system.

Submittal Sheet

12/20/2017

ITEM# 191 - CUTTING BOARD (1 REQ'D)

Provided by Operations CONTACT OPERATIONS

Submittal Sheet

12/20/2017

ITEM# 192 - HEATED SHELF FOOD WARMER (2 EA REQ'D)

Hatco GRSBF-36-I

Glo-Ray® Built In Heated Shelf with Flush Top, 37-1/2" x 21" surface area, hardcoat aluminum top, control thermostat, illuminated on/off switch & mounting bracket, NSF, cUL, UL, UL EPH Classified, ANSI/NSF 4, CSA

The spec sheet for this item can be viewed on item 112)

ACCESSORIES

Mfr	Qty	Model	Spec
Hatco	1		NOTE: Sale of this product must comply with Hatco's Minimum Resale Price Policy; consult order acknowledgement for details
Hatco	1		NOTE: Includes 24/7 parts & service assistance, call 800-558-0607
Hatco	2		1-Yr Warranty on Blanket Heating Elements against burnout, standard
Hatco	2		120v/60/1-ph, 780W, 6.5 amps, NEMA 5-15P
Hatco	2		NOTE: Recommended for use in metallic countertop, verify that the material is suitable for temperatures up to 200 degree F
Hatco	2		Thermostat control with lighted rocker switch (Available at time of purchase only), standard

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1	120	60	1	Cord & Plug		5-15P	6.5	.78			

Submittal Sheet

12/20/2017

ITEM# 193 - HOT / COLD FOOD WELL UNIT, DROP-IN, ELECTRIC (1 EA REQ'D)

Delfield N8630

Drop-In Hot/Cold Food Well, 30-3/4", 2-pan size for 12" x 20" pans, 8" deep single tank with drain, remote control panel with single temperature control & three-way toggle switch, stainless steel top & well, galvanized steel exterior housing, self-contained refrigeration, 1/4 HP, (29-3/4" x 25" cutout required), cUL, UL, NSF

ACCESSORIES

Mfr	Qty	Model	Spec
Delfield	1		NOTE: Freight quotes are only valid from Delfield
Delfield	1		120v/60/1-ph, 25.0 amps, standard
Delfield	1		1 year parts & 90 day labor warranty, standard
Delfield	1	000-504-0030	Autofill assembly kit (shipped loose), for N8600 and N8800 series

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1									1/4		
2	120	60	1				25.0				

WATER

	HOT SIZE	HOT AFF	HOT GPH	COLD SIZE	COLD AFF	FILTERED SIZE	FILTERED AFF	CONDENSER INLET SIZE	CONDENSER OUTLET SIZE
1									

WASTE

	INDIRECT SIZE	DIRECT SIZE
1	1"	



N8600

Drop-In Self-Contained Hot & Cold Combination Pan

Project _____
 Item _____
 Quantity _____
 CSI Section 11400
 Approved _____
 Date _____

Models

- N8630 30" hot & cold combination pan drop-in
- N8643 43" hot & cold combination pan drop-in
- N8656 56" hot & cold combination pan drop-in
- N8669 69" hot & cold combination pan drop-in
- N8681 81" hot & cold combination pan drop-in



N8630

Standard Features

- NSF-4 and NSF-7 certified for hot and cold operation
- Stainless steel immersion heaters
- Remote control panel with 3-way hot/cold/off power switch and thermostat for hot operation
- Thermostat for cold operation located next to condensing unit
- Adjustable pan support for flush mounted hot operation or 2" recessed cold operation
- 1" stainless steel drain with screen
- Stainless steel louver provided
- High density environmentally friendly, Kyoto Protocol compliant, Non ODP (Ozone Depletion Potential), Non GWP (Global Warming Potential) polyurethane foam throughout
- Push-in flange gasket is standard
- Adaptor bars for 12"x20" pans provided
- Environmentally friendly HFC-404A refrigerant
- Standard 90 day labor and one year parts warranty
- Additional adaptor bars or plates

Options & Accessories

- Relocate compressor
- Remote refrigeration*
- Automatic water fill
- 220V/50C electrical*
- 3-phase electrical*
- Counter protectors
- Extended warranty

* Inclusion of this option will alter electrical specifications of the unit

Specifications

Top: Top is constructed of one-piece stainless steel.

Interior: Interior liner is constructed of stainless steel with a 1" (2.5cm) drain. Adjustable stainless steel pan rest for flush mount heating or 2" (5cm) recessed cooling to accommodate up to 6" (15cm) deep 12"x20" pans, supplied by others. Stainless steel immersion heater(s) installed in bottom for wet only heating operation.

Exterior: Exterior body is constructed of galvanized steel with high density environmentally friendly, Kyoto Protocol compliant, Non ODP (Ozone Depletion Potential), Non GWP (Global Warming Potential) polyurethane insulation throughout.

Refrigeration: Condensing unit is suspended on a galvanized steel frame. Environmentally friendly HFC-404A refrigerant is utilized. Temperature controlled by thermostat located next to condensing unit.

Operation: Remote control panel contains 3-way Hot/Cold/Off power switch and thermostat for heated operation. As a safety feature, the food well immersion heater includes a high limit safety switch. If the heater gets too hot the safety

switch will trip, turn the heater off and illuminate a control panel pilot light.

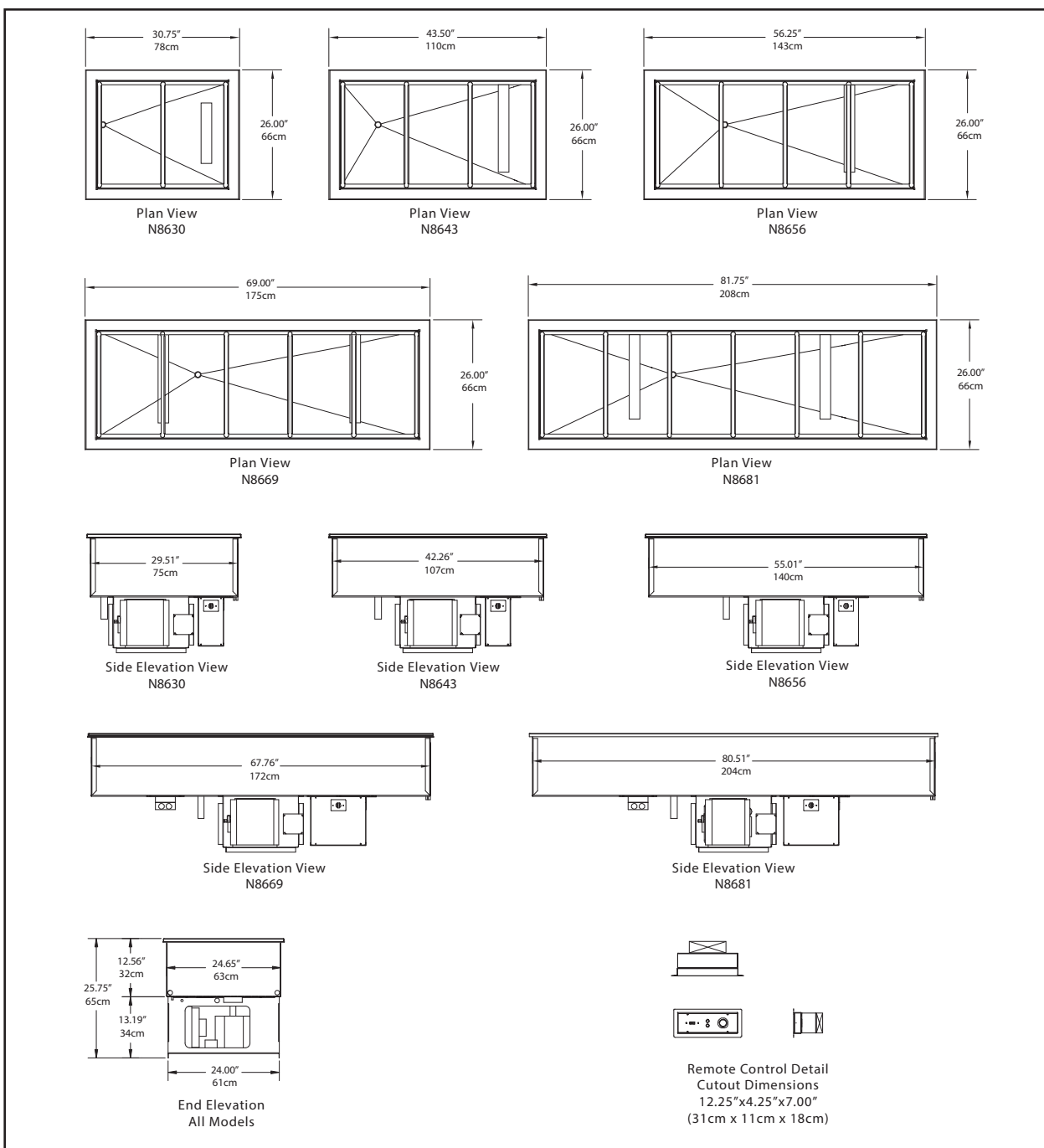
Electrical: All units must be hard wired at installation.





Drop-In Self-Contained Hot & Cold Combination Pan

N8600



Specifications

Model	Cutout Dimensions	Volts/Hertz/Phase	Amps	H.P.	Ship Weight
N8630	29.75" X 25.00" (76cmX64cm)	120/60/1	25.0	1/4	164lbs/74kg
N8643	42.50" X 25.00" (108cmX64cm)	120-240/60/1	21.0	1/4	198lbs/90kg
N8656	55.25" X 25.00" (140cmX64cm)	120-240/60/1	21.0	1/4	233lbs/106kg
N8669	68.00" X 25.00" (173cmX64cm)	120-240/60/1	42.0	1/4	266lbs/121kg
N8681	80.75" X 25.00" (205cmX64cm)	120-240/60/1	42.0	1/3	301lbs/137kg

Delfield reserves the right to make changes to the design or specifications without prior notice.

980 S. Isabella Rd.
Mt. Pleasant, Michigan 48858

Phone: 800-733-8948 or 989-773-7981
Fax: 800-669-0619
www.delfield.com

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Submittal Sheet

12/20/2017

ITEM# 194 - REFRIGERATED SELF-SERVICE UNDER COUNTER HEIGHT CASE (1 EA REQ'D)

Structural Concepts CO43R-UC

Oasis® Self-Service Refrigerated Under Counter Height Case, 47-1/4"W, 32-3/4"H, Breeze-E (Type II) with EnergyWise self-contained refrigeration system, Blue Fin coated coil, top light, one piece formed ABS plastic tub, black interior, (2) square full end panels, casters with levelers, front panel extends over end panels to blend with adjacent counters (supplied by others), counter surface (supplied by others) extends over top unit, cETLus, ETL-Sanitation

The spec sheet for this item can be viewed on item 111)

ACCESSORIES

Mfr	Qty	Model	Spec
Structural Concepts	1		NOTE: If GFCI is required, a GFCI breaker MUST be used in lieu of a GFCI receptacle
Structural Concepts	1		1 yr. parts & labor warranty, 5 yr. compressor warranty, standard
Structural Concepts	1		Breeze-E (Type II) with EnergyWise refrigeration - NSF Type II compliant, standard
Structural Concepts	1		110-120v/60/1ph, 11.70 amps, standard
Structural Concepts	1		6 ft straight blade power cord with NEMA 5-15P, standard
Structural Concepts	1		NOTE: Compressor air rear intake, front discharge at toe kick, unit MUST remain 4" from wall & front & rear panels cannot be blocked (Not applicable with remote refrigeration option)
Structural Concepts	1		Interior: Stainless steel, in lieu of standard black
Structural Concepts	1		Exterior: Stainless steel
Structural Concepts	1		Exterior back panel: Solid back panel - stainless steel
Structural Concepts	1		Left end panel: Square full with mirrored interior, standard
Structural Concepts	1		Right end panel: Square full with mirrored interior, standard
Structural Concepts	1		Night curtain, retractable, non-locking (not available with security cover)

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1	110-120	60	1	Cord & Plug			11.7				
2						5-15P					

Submittal Sheet

12/20/2017

ITEM# 195 - REACH-IN REFRIGERATOR (1 EA REQ'D)

Continental Refrigerator 2R

Refrigerator, reach-in, two-section, self-contained refrigeration, stainless steel front, aluminum interior & ends, standard depth, full-height solid doors, electronic controller w/ digital display, electric condensate evaporator, 5" casters, 1/3 hp, cETLus, NSF, Made in USA

The spec sheet for this item can be viewed on item 76)

ACCESSORIES

Mfr	Qty	Model	Spec
Continental Refrigerator	1		Standard warranty (for the United States & Canada Only): 3 year parts and labor; 5 year compressor
Continental Refrigerator	1		115v/60/1-ph, 6.5 amps, cord, NEMA 5-15P, standard
Continental Refrigerator	1		Left Door hinged on left & right door hinged on right, standard
Continental Refrigerator	1		5" Casters, standard

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1									1/3		
2	115	60	1	Cord & Plug		5-15P	6.5				

Submittal Sheet

12/20/2017

ITEM# 196 - PIZZA PREPARATION REFRIGERATOR (1 EA REQ'D)

Continental Refrigerator CPA93

Pizza Prep Table, 93" wide, three-section, 32.0 cu ft capacity, forced air, #300 stainless steel work top with 19" poly cutting board, (3) full & (1) half height field rehingable doors, stainless steel front and end panels, aluminum interior, electronic controller with digital display, 5" swivel casters, side-mounted refrigeration, 1/2 hp, cETLus, NSF, Made in USA

ACCESSORIES

Mfr	Qty	Model	Spec
Continental Refrigerator	1		Standard warranty (for the United States & Canada Only): 3 year parts and labor; 5 year compressor
Continental Refrigerator	1		115v/60/1-ph, 14.4 amps, cord, NEMA 5-15P, standard
Continental Refrigerator	1		Condensing unit on the right, standard
Continental Refrigerator	1		(00VL) Lid with vision panel
Continental Refrigerator	1		Stainless steel interior
Continental Refrigerator	1		5" Swivel Casters standard

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1									1/2		
2	115	60	1	Cord & Plug		5-15P	14.4				

PIZZA PREPARATION TABLE

Model: CPA93

93" Pizza Preparation Refrigerator with Solid Doors

Heavy gauge #300 Series stainless steel top, stainless steel front and end panels, galvanized steel rear and grill and aluminum interior.
Certified under NSF-7 to maintain temperatures in 86°F ambient and designed to maintain NSF-7 temperatures in 100°F ambient.



Options and Accessories

(upcharge and lead times may apply)

Stainless steel interior	Automatic, electric condensate evaporator
Stainless steel back	Stainless steel pan slides
Stainless steel shelves	Wire rod garnish rack
Add'l epoxy-coated steel shelves	Vision panel lid
Drawers in lieu of full doors	Door locks
Drawer in lieu of half door above the condensing unit*	Adjustable legs
Overshelves (single or double)	Front breathing
Condensing unit left or right	Special electrical requirements (consult factory)

*Drawer section above condensing unit holds (1) 12 x 20 x 6 pan

Continental
 Refrigerator

Toll-Free: 800-523-7138
 Phone: 215-244-1400
 Fax: 215-244-9579

539 Dunksferry Road
 Bensalem, PA 19020
www.continentalrefrigerator.com

Project Name:

Model Specified:

Location:

Item No:

Quantity:

AIA #:

SIS #:

Standard Model Features

REFRIGERATION SYSTEM

- Performance-rated refrigeration system
- Environmentally-safe R-134a refrigerant
- Unique forced air design utilizes fans (approx. every 12") across the entire back of unit for even distribution of cold
- Automatic, energy saving, non-electric condensate evaporator
- Non-corrosive, plasticized fin evaporator coil
- Easily serviceable, slide-out condensing unit

CABINET ARCHITECTURE

- 2" non-CFC polyurethane foam insulation
- Spring loaded, self closing doors
- Magnetic snap-in door gaskets
- Heavy-duty, epoxy-coated steel shelves
- 19" deep, full length nylon cutting board
- Refrigerated section with door above the condensing unit
- Insulated lids
- 5" casters

MODEL FEATURES

- Electronic controller w/digital display & hi-low alarm
- Ergonomically-friendly raised angle rail
- Expansion valve for quick recovery
- Built-in, off cycle defrost timer
- Field rehingeable doors

NOTE: CPA models come standard with a door over the condensing unit. A drawer over the condensing unit is an option.

APPROVAL:

Model Specifications

DIMENSIONAL DATA

Net Capacity (cu. ft.)	32 (906 cu l)
Width, Overall (in.)	93 (2362 mm)
Depth, Overall (in.) (incl. handles & bumpers)	36 7/8 (937 mm)
Height, Overall (in.) (incl. 5" casters)	39 7/16 (1002 mm)
Depth, Cutting Board (in.)	19 (483 mm)
Pan Capacity (pans supplied by others)	(12) 1/3
Shelf Area (sq. ft.)	14.2 (1.3 sq m)
No. of Shelves	3
No. of Full Doors	3
No. of Half Doors	1
Interior Depth (in.)	27 3/8 (695 mm)
Interior Height (in.)	26 (660 mm)
Interior Height (in.) (above condenser)	12 1/2 (318 mm)
Interior Width (in.)	89 (2261 mm)

REFRIGERANT DATA

Condensing Unit Size (H.P.)	1/2
Capacity (BTU/Hr)*	5260

ELECTRICAL DATA

Voltage (int'l)	115/60/1 (220/50/1)
Fans	6
Total Amps (int'l)	14.4 (9.1)
10 ft. Cord/Plug [attached] (int'l)	Yes (No)

SHIPPING DATA

Weight (lbs.)	605 (274 kg)
Height - Crated (in.)	43 3/4 (1111 mm)
Width - Crated (in.)	95 (2413 mm)
Depth - Crated (in.)	47 (1194 mm)

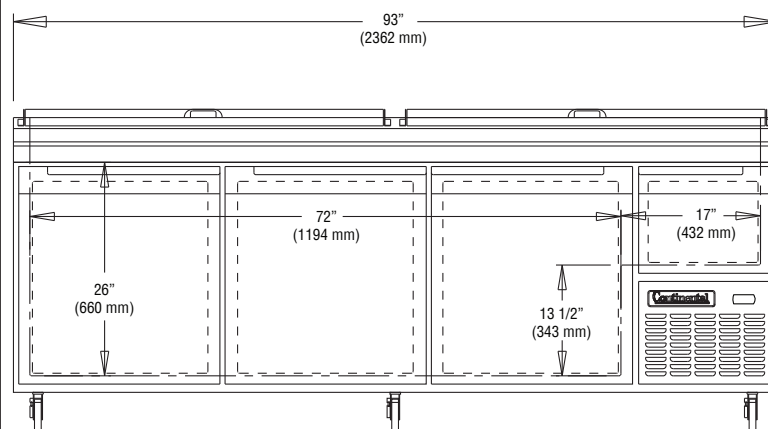
* Rating @ +25°F evaporator, 90°F ambient

Figures in parentheses reflect metric equivalents rounded to the nearest whole unit.

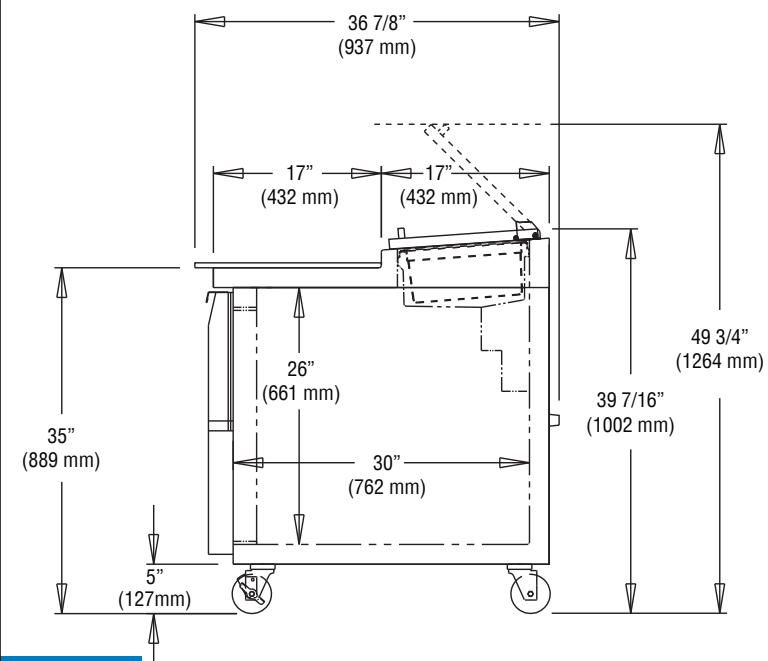


Equipped with one NEMA-5-15P Plug
(varies by country)

Model Plan Views



FRONT VIEW



SIDE VIEW

IMPORTANT NOTE: If the cabinet is located directly against a wall, a minimum clearance of 3" is required on sides, front and rear.

Continental®

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539 Dunksferry Road
Bensalem, PA 19020
www.continentalrefrigerator.com

Due to our continued efforts in developing innovative products, specifications subject to change without notice.



MADE IN THE U.S.A.

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Submittal Sheet

12/20/2017

ITEM# 197 - ROLL-IN REFRIGERATOR (1 EA REQ'D)

Continental Refrigerator DL1RI

Designer Line Refrigerator, roll-in, one-section, self-contained refrigeration, stainless steel front, aluminum interior & ends, standard depth cabinet, full-height solid door, electronic controller w/ digital display, removable stainless steel ramp, 1/3 hp

The spec sheet for this item can be viewed on item 67)

ACCESSORIES

Mfr	Qty	Model	Spec
Continental Refrigerator	1		Standard warranty (for the United States & Canada Only): 3 year parts and labor; 5 year compressor
Continental Refrigerator	1		115v/60/1-ph, 9.6 amps, cord & plug, standard
Continental Refrigerator	1		Door hinged on right, standard

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1									1/3		
2	115	60	1	Cord & Plug			9.6				

Submittal Sheet

12/20/2017

ITEM# 198 - WORK TABLE, STAINLESS STEEL TOP (1 EA REQ'D)

Eagle Group T2436SE

Spec-Master® Series Work Table, 36"W x 24"D, 14/300 series stainless steel top, rolled edge on front & back, adjustable 18/300 series stainless steel undershelf with marine edge, Uni-Lok® gusset system, (4) stainless steel legs & adjustable bullet feet, NSF

The spec sheet for this item can be viewed on item 15)

ACCESSORIES

Mfr	Qty	Model	Spec
Eagle Group	1	CA4-SB	Table Casters, set of (4), 4" diameter, (2) swivel & (2) swivel/brake, 115 lbs. capacity per caster, zinc with resilient tread, NSF

Submittal Sheet

12/20/2017

ITEM# 199 - HAND SINK (1 EA REQ'D)

Eagle Group HSA-10-F

Hand Sink, wall mount, 13-1/2" wide x 9-3/4" front-to-back x 6-3/4" deep bowl, 304 stainless steel construction, splash mount gooseneck faucet, basket drain, deep-drawn seamless design-positive drain, inverted "V" edge, NSF

The spec sheet for this item can be viewed on item 24)

ACCESSORIES

Mfr	Qty	Model	Spec
Eagle Group	1	303987	Gooseneck Faucet, standard, splash mount, 4" O.C., NSF
Eagle Group	1	307120	Wrist Handles, for 303987 faucet, NSF

WATER

	HOT SIZE	HOT AFF	HOT GPH	COLD SIZE	COLD AFF	FILTERED SIZE	FILTERED AFF	CONDENSER INLET SIZE	CONDENSER OUTLET SIZE
1									
2	1/2"			1/2"					

WASTE

	INDIRECT SIZE	DIRECT SIZE
1		1-1/2"
2		

Submittal Sheet

12/20/2017

ITEM# 200.1 - SNEEZE GUARD (1 EA REQ'D)

Versa-Gard VG3.3-SK

VG Series. Adjustable self service food protector with straight glass and top shelf. Adjustable in 7 different self-service positions. 1" OD Solid Supports. End glass panels are 1/4" clear tempered. All glass meets ANSI Z97.1 specifications for safety performance and ASTM C1048-04 specifications for heat treated glass. All hardware supplied in a brushed stainless steel finish. All glass with ground and polished edges. Conceal mount hardware.

The spec sheet for this item can be viewed on item 113.1)

ACCESSORIES

Mfr	Qty	Model	Spec
LED LIGHT			

Submittal Sheet

12/20/2017

ITEM# 200.2 - SNEEZE GUARD (1 EA REQ'D)

Versa-Gard VG3.3-SK

VG Series. Adjustable self service food protector with straight glass and top shelf. Adjustable in 7 different self-service positions. 1" OD Solid Supports. End glass panels are 1/4" clear tempered. All glass meets ANSI Z97.1 specifications for safety performance and ASTM C1048-04 specifications for heat treated glass. All hardware supplied in a brushed stainless steel finish. All glass with ground and polished edges. Conceal mount hardware.

The spec sheet for this item can be viewed on item 113.1)

ACCESSORIES

Mfr	Qty	Model	Spec
HEAT LAMP & LED LIGHT			

Submittal Sheet

12/20/2017

ITEM# 200.3 - SNEEZE GUARD (1 EA REQ'D)

Versa-Gard VG3.3-SK

VG Series. Adjustable self service food protector with straight glass and top shelf. Adjustable in 7 different self-service positions. 1" OD Solid Supports. End glass panels are 1/4" clear tempered. All glass meets ANSI Z97.1 specifications for safety performance and ASTM C1048-04 specifications for heat treated glass. All hardware supplied in a brushed stainless steel finish. All glass with ground and polished edges. Conceal mount hardware.

The spec sheet for this item can be viewed on item 113.1)

ACCESSORIES

Mfr	Qty	Model	Spec
HEAT LAMP & LED LIGHT			

Submittal Sheet

12/20/2017

ITEM# 200.4 - VERTICAL SNEEZE GUARD (1 EA REQ'D)

Versa-Gard VP24.3

VG Series. Full service food protector with 24" tall vertical glass. 1" OD Solid Supports. End glass panels are 1/4" clear tempered. All glass meets ANSI Z97.1 specifications for safety performance and ASTM C1048-04 specifications for heat treated glass. All hardware supplied in a brushed stainless steel finish. All glass with ground and polished edges. Conceal mount hardware.

The spec sheet for this item can be viewed on item 161.2)

Submittal Sheet

12/20/2017

ITEM# 210 - POS, SELF-CHECKOUT (4 REQ'D)

Provided by Operations CONTACT OPERATIONS

Submittal Sheet

12/20/2017

ITEM# 210.1 - POS, SELF-CHECKOUT (6 REQ'D)

Provided by Operations CONTACT OPERATIONS

Submittal Sheet

12/20/2017

ITEM# 211 - P.O.S. (1 REQ'D)

Provided by Operations CONTACT OPERATIONS

Submittal Sheet

12/20/2017

ITEM# 211.1 - P.O.S. (2 REQ'D)

Provided by Operations CONTACT OPERATIONS

Submittal Sheet

12/20/2017

ITEM# 212 - AIR CURTAIN (1 EA REQ'D)

Mars Air Systems STD278-2UA-SS

Standard Series 2 Air Curtain, for 78" wide door, Unheated, 115v/60/1-ph, Stainless Steel cabinet (Premium Finish)
(Contact factory for price)

ACCESSORIES

Mfr	Qty	Model	Spec
Mars Air Systems	1		5 year warranty, standard
Mars Air Systems	1		Options WITH control panel
Mars Air Systems	1	MCPA-2U	Motor Control Panel for two motors, 1/2 HP, Unheated, supplied with NEMA 1 Cabinet with HOA selector switch on the cover and are remote mounted
Mars Air Systems	1	-TD	Adjustable Time Delay Option - field adjustable, panel mounted
Mars Air Systems	1	-OB	Paint Panel to Match Unit - Obsidian Black
Mars Air Systems	1	J0004-TS	2-1/2" Clearance Mounting Bracket, per set TS
Mars Air Systems	1	J2178	Filter, Kit, Alum, Washable, STD2/PH, 78" Set of 2, (4) 37 3/8" x 11 1/2"

ELECTRICAL

	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1	115	60	1						(2) 1/2		



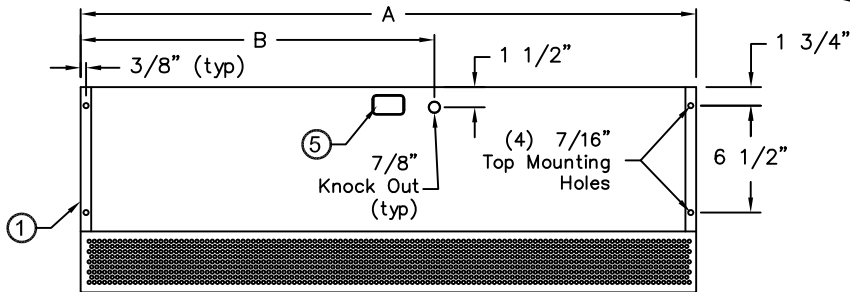
atmosphere is everything

14716 S. Broadway • Gardena, CA 90248 • USA
TEL: (310) 532-1555 • (800) 421-1266 • FAX: (310) 324-3030
Web Site: www.marsair.com • E-mail: info@marsair.com

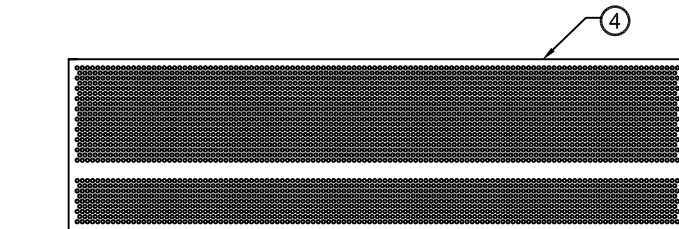
MODEL NO.	STD2 Series	DRAWING NO.	STD2U-F	DRAWN BY	BH	CHECKED BY		FILE NAME	
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Unheated Drawing

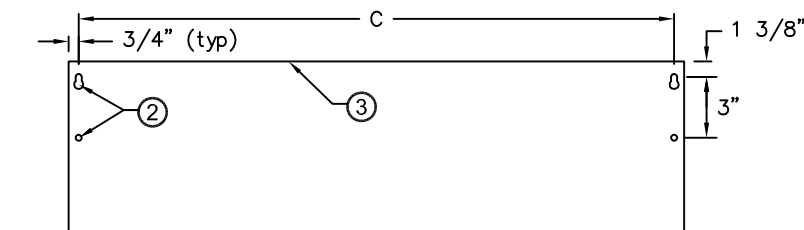
STD2 (Standard 2) Series



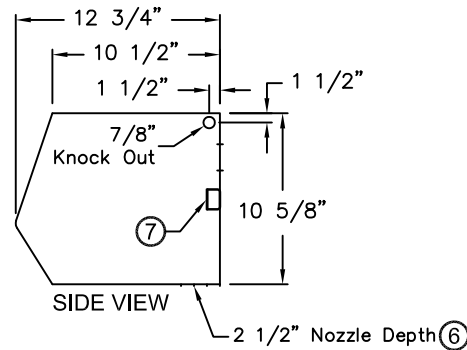
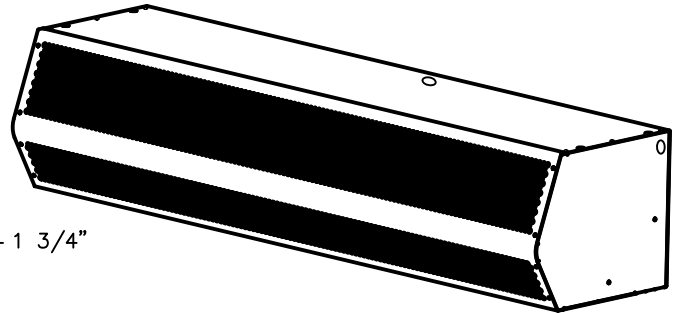
TOP VIEW



FRONT VIEW



REAR VIEW



SIDE VIEW



Note: Models STD260-2, STD264-2, STD278-2, STD296-3 & STD2108-2 are not AMCA Certified



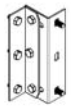
(8) Recommended Accessories



Control Panels



Door Limit Switches



Brackets

Notes:

- This product is designed to meet the National Electric Code (NEC), ETL Listed (UL 507 and CSA 22.2) and AMCA 211 Certified.
- (2) 1/2" key hole slots and (2) 7/16" mounting holes provided for wall mounting and (4) 7/16" mounting holes for overhead mounting provided, (2) on each end.
- All units have a self contained one piece cabinet, fire retardant and corrosion proof paint lock metal double protected with baked on Obsidian Black color, rust preventative electrostatic polyurethane powder coating.
- Cabinet has sufficient strength for fastening to wall on both ends without intermediate support.
- Internal J-Box(es) for electrical wiring: one motor-(1) 2"x 4"; two motors-(1) 4"x 4"; three motors-(2) 4"x 4".
- Unit is to be installed such that air flow is unobstructed. Air discharge nozzle containing adjustable air directional vanes with 40° sweep front to back.
- Circuit protection as per NEC by others.
- Optional motor control panel, door limit switch and mounting brackets are field installed and/or wired by others. The door limit switch is to be mounted such that the air curtain turns on as door begins to open. To prevent unit damage, the mounting brackets must be installed such that the bottom of the air curtain is not below the door header.

*- Use corresponding letters in "Electrical Data" columns to complete the model numbers.

MODEL NUMBER	OVERALL LENGTH A (in)	KNOCKOUT LOCATION B (in)	REAR MOUNTING CENTER C (in)
STD236-1U*-OB	36	25 1/2	34 1/2
STD242-1U*-OB	42	28 1/2	40 1/2
STD248-1U*-OB	48	31 1/2	46 1/2
STD260-2U*-OB	60	37 1/2	58 1/2
STD272-2U*-OB	72	40	70 1/2
STD284-2U*-OB	84	46	82 1/2
STD296-2U*-OB	96	52	94 1/2
STD2108-3U*-OB	108	58	106 1/2
STD2120-3U*-OB	120	64	118 1/2
STD2144-3U*-OB	144	76	142 1/2



atmosphere is everything

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STD2 (Standard 2) Series

Unheated

Model Lengths 36" – 144"

Unheated Data Sheet

Applications: Environmental Separation (up to 10') and Insect Control (up to 8')

STD2 (Standard) Series 2	Mechanical Data						AMCA Certified Lab Data				
Model Number	Nozzle Length (in)	Length (in)	Depth (in)	Height (in)	Motor (hp)	Weight (lbs)	Max Core Velocity at Nozzle (fpm)	Avg Velocity (fpm)	Volume (cfm)	Uniformity (%)	Power Rating (watts)
STD236-1U*-OB	36	36	13	11	1/2	60	5960	2206	1379	84	500
STD242-1U*-OB	42	42	13	11	1/2	65	4865	1945	1418	87	510
STD248-1U*-OB	48	48	13	11	1/2	70	4247	1730	1442	85	550
STD260-2U*-OB	60	60	13	11	Two 1/2	90	6737	2592	2700	93	940
STD272-2U*-OB	72	72	13	11	Two 1/2	120	5960	2206	2758	84	1000
STD284-2U*-OB	84	84	13	11	Two 1/2	125	4865	1945	2836	87	1020
STD296-2U*-OB	96	96	13	11	Two 1/2	135	4247	1730	2884	85	1100
STD2108-3U*-OB	108	108	13	11	Three 1/2	175	5960	2206	4137	84	1500
STD2120-3U*-OB	120	120	13	11	Three 1/2	185	4660	2084	4341	92	1570
STD2144-3U*-OB	144	144	13	11	Three 1/2	200	4247	1730	4326	85	1650

* - Use corresponding letters in "Electrical Data" columns to complete the model numbers.

Note: Data above for 1725 RPM at 60 Hz, 50 Hz is 1425 RPM with a 17% reduction in the performance data.

1. The AMCA Certified Ratings Seal applies to airflow rate, average outlet velocity, outlet velocity uniformity, velocity projection and power rating at free delivery only.
2. Rated data shown are only for base (unheated) units, as shown.

Features:

- ❖ 1/2 HP Continuous Duty TEAO Motors
- ❖ Sleek self-contained one piece heavy gauge corrosion proof paint lock metal design
- ❖ ETL Certified to conform to UL 507 (US) and CSA 22.2 (Canada) Standards
- ❖ AMCA Certified to AMCA 211 (see table above for models available)
- ❖ (4) 7/16" top and wall mounting holes provided, (2) on each end
- ❖ Cabinet has sufficient strength for fastening to wall on both ends without intermediate support
- ❖ Adjustable air directional vanes with 40° sweep front to back
- ❖ Standard color is Obsidian Black
- ❖ Rust preventative electrostatic polyurethane powder coating
- ❖ 5 year parts warranty
- ❖ Freight Included (FOB Continental USA)
- ❖ Proudly Made in the USA

Options and Accessories: (see Accessories Brochure)

- ❖ Motor Control Panels
- ❖ Wall and Overhead Bracket
- ❖ Multi-speed motors and controls
- ❖ Washdown units and accessories (NEMA 4 & 4X)
- ❖ Explosion Resistant units and accessories (Class I, Div. I, Group D)
- ❖ Custom colors and finishes (304SS, 316SS)

Sound Levels: (measured at 10' in an open field)

1 Motor Unit = 66 dBA, 2 Motor Unit = 68 dBA, 3 Motor Unit = 71 dBA & 4 Motor Unit = 73 dBA

Projection Velocity		
Model	Distance from nozzle (in)	Avg. Core Velocity (FPM)
STD236-1U*-OB	36"	1522
	48"	1312
	60"	1158



MARS Air Systems, LLC certifies that the Air Curtains shown on this data sheet are licensed to bear the AMCA seal. The rating shown are based on tests and procedures performed in accordance with AMCA Publication 211 and comply with the requirements of the AMCA Certified Ratings Program.

Note: Models STD260-2, STD264-2, STD278-2, STD296-3 & STD2108-2 are not AMCA Certified.

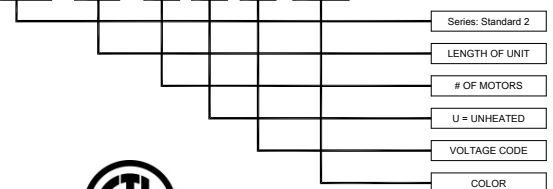
Electrical Data (FLA)	Unit Voltage (Voltage Code)						
	Single Phase			Three Phase			
	115v/10 (A)	208/230v/10 (D)	277v/10 (L)	208/230v/30 (G)	460v/30 (H)	575v/30 (I)	380v/30/50Hz (W)
STD236-1U*-OB	5.1	2.5	2.7	1.8/1.6	0.8	0.7	1.8
STD242-1U*-OB	5.1	2.5	2.7	1.8/1.6	0.8	0.7	1.8
STD248-1U*-OB	5.1	2.5	2.7	1.8/1.6	0.8	0.7	1.8
STD260-2U*-OB	10.2	5.0	5.4	3.6/3.2	1.6	1.4	3.6
STD272-2U*-OB	10.2	5.0	5.4	3.6/3.2	1.6	1.4	3.6
STD284-2U*-OB	10.2	5.0	5.4	3.6/3.2	1.6	1.4	3.6
STD296-2U*-OB	10.2	5.0	5.4	3.6/3.2	1.6	1.4	3.6
STD2108-3U*-OB	15.3	7.5	8.1	5.4/4.8	2.4	2.1	5.4
STD2120-3U*-OB	15.3	7.5	8.1	5.4/4.8	2.4	2.1	5.4
STD2144-3U*-OB	15.3	7.5	8.1	5.4/4.8	2.4	2.1	5.4

* - Use corresponding letters in "Electrical Data" columns to complete the model numbers.

Note: For Ampacity Multiply FLA X 1.25

EXAMPLE

STD2 72 -2 U H -OB



NOTE: MARS AIR SYSTEMS, LLC reserves the right to change specifications and product design without notice. Such revisions do not entitle the buyer to corresponding changes, improvements, additions or replacements for previously purchased equipment.

STD2U-B; August 09, 2016

State University of New York AGREEMENT

Contract No. _____

This Agreement made as of the _____ day of _____, 20____, for Contract Number _____ by and between STATE UNIVERSITY OF NEW YORK, a corporation organized and existing under the laws of the State of New York, with its principal office located at State University Plaza, Albany, New York 12246, on behalf of State University of New York at Purchase College located at 735 Anderson Hill Road, Purchase, New York 10577 hereinafter referred to as "University" and _____ having its principal office located at _____, hereinafter referred to as "Contractor".

Federal ID or
Social Security No. _____

The University and the Contractor agree as follows:

1. The Contractor shall (a) furnish and perform all work of every kind required, and all other things necessary to complete, in the most substantial and workmanlike manner, the construction of Project Number **SU-20002**, titled **HUB Café Renovation**, in strict accordance with the Contract Documents; (b) complete all work necessary for substantial completion within **95** days of contract award, or within the time to which such completion may have been extended in accordance with the Contract Documents; (c) in the event it fails to substantially complete all the work on time, the Contractor agrees to pay to the University liquidated damages in accordance with paragraph 1 of the Proposal for each calendar day of delay in substantially completing the work; and (d) do everything required by the contract; subject however to the terms, provisions and conditions listed hereinafter
2. The University shall pay and the Contractor shall accept for the performance of work of the above referenced Project, the total contract compensation of \$ _____, (in figures),
_____ (in word)s.

ARTICLE I

General Provisions

Section 1.01 Definitions

Where the following words and expressions are used in the Contract Documents it is understood that they have the meaning set forth as follows:

CONSULTANT	The Architect, Engineer, Landscape Architect, or Surveyor named in the Notice to Bidders or such other person or firm designated by the University to provide general administration of the Contract and inspection of the work.
BIDDING DOCUMENTS	Notices to Bidders, Information for Bidders, and Proposal
BONDS	Performance Bond and Labor and Material Bond
CONTRACT OR CONTRACT DOCUMENTS	The Agreement, Project Manual, Proposal, Bonds, Specifications, Contract Drawings, Addenda issued prior to the opening of bids and Change Orders issued after the award of the Contract.
UNIVERSITY	State University of New York
NOTICE OF AWARD	Letter of Intent
PROJECT	The facility or facilities to be constructed including all usual, appropriate and necessary attendant work shown on, described in or mentioned in the Contract.
SITE	The area within the Contract limit lines, as shown on the Drawings, and all other areas upon which the Contractor is to perform work.
WORK	The using, performing, installing, furnishing and supplying of all materials, equipment, labor and incidentals necessary or proper for or incidental to the successful completion of the Project and the carrying out of all duties and obligations imposed upon the Contractor by the Contract.
NOT IN CONTRACT, "N.I.C."	Indicates equipment furnished by the Owner and installed under another construction contract or by another contractor, or operations at the site not included as part of this Contract.

PROVIDE, PROVIDED

Mean that the Contractor shall furnish and install all materials and labor for the item so specified.

Section 1.02 Captions

The titles or captions of Articles and Sections of the Contract are intended for convenience and reference purposes only and in no way define, limit or describe the scope or intent thereof or of the Contract or in any way affect the Contract.

Section 1.03 Nomenclature

Materials, equipment or other work described in words which have a well-known, technical or trade meaning shall be interpreted as having such meaning in connection with the Contract.

Section 1.04 Contract Documents

- (1) This agreement
- (2) Exhibit A and A-1
- (3) Project Manual SU-200002 and all attachments included therein, specifications, and drawings .

The Contract, together with all exhibits thereto, constitutes the entire agreement between the parties hereto and no statement, promise, condition, understanding, inducement or representation, oral or written, expressed or implied, which is not contained herein shall be binding or valid and the Contract shall not be changed, modified, or altered in any manner except by an instrument in writing executed by the parties hereto.

Section 1.05 Successors and Assigns

To the extent allowed by the terms of "Exhibit A", the Contract shall bind the successors, assigns and representatives of the parties hereto. The University reserves the right to have the State University Construction Fund (Fund) act on its behalf at any time or duration of this Agreement. Such designation of the Fund to act on the behalf of the University shall be in writing and addressed to the Contractor and signed by the University.

Section 1.06 Accuracy and Completeness of Contract Documents

- (1) The Contract Documents are complementary and what is called for by any one shall be as binding as if called for by all. The intention of the Documents is to include all materials, plant, equipment, tools, skill and labor of every kind necessary for the proper execution of the work and also those things which may be reasonably inferable from the Contract Documents as being necessary to produce the intended results.
- (2) The Contract Documents contemplate a finished piece of work of such character and quality as is reasonably inferable from them. The Contractor acknowledges that the contract consideration includes sufficient money allowance to make its work complete and operational and in compliance with good practice and it agrees that inadvertent minor discrepancies or omissions or the failure to show details or to repeat on any part of the Contract Documents the figures or notes given on another shall not be the cause for additional charges or claims. In case of a conflict between any part or parts of the Contract Documents with any other part or parts thereof, as contrasted with an omission or failure to show details or to repeat on any part of the Contract Documents the figures or notes given on another part thereof, the following shall be given preference, in the order hereinafter set forth, to determine what work the Contractor is required to perform: (a) Addenda (later dates to take preference over earlier dates); (b) Amendments to Agreement; (c) Agreement; (d) Specifications; (e) Schedules; (f) Large scale detail Drawings (detail drawings having a scale of 3/4" and over); (g) Large scale plan and section Drawings (plan and section drawings having a scale equal to or larger than that used for the basic floor or site plan, as the case may be); (h) Small scale detail Drawings (detail drawings having a scale of less than 3/4"); and (i) Small scale plan and section Drawings (plan and section drawings having a scale less than that used for the basic floor or site plan, as the case may be). In the event of such a conflict between or among parts of the Contract Documents that are entitled to equal preference, the more expensive way of doing the work, the better quality or greater quantity of material shall govern unless the University otherwise directs.

Section 1.07 Organization of Contract Documents

The Specifications and Drawings are generally divided into trade sections for the purpose of ready references, but such division is arbitrary and such sections shall not be construed as the prescription by the Consultant or the University of the limits of the work of any subcontractor or as a determination of the class of labor or trade necessary for the fabrication, erection, installation or finishing of the work required. The Contractor will be permitted to allot the work of subcontractors at its own discretion regardless of the grouping of the Specifications and Drawings. It shall be the Contractor's responsibility to settle definitively with each subcontractor the portions of the work which the latter will be required to do. The University and the Consultant assume no responsibility whatever for any jurisdiction claimed by any of the trades involved in the work.

Section 1.08 Furnishing of Contract Documents

The Contractor shall be furnished, free of charge, with as many copies of the Specifications and Drawings as it may reasonably request, in the judgment of the University, within fifteen (15) working days after the Notice of Award. Any other copies of the Specifications and Drawings which the Contractor may desire can be obtained by it from the Consultant at the latter's cost of duplication thereof.

Section 1.09 Examination of Contract Documents and Site

By executing the Contract, the Contractor agrees: that it has carefully examined the Contract Documents together with the site of the proposed work as well as its surrounding territory; that it is fully informed regarding all the conditions affecting the work to be done and the labor and materials to be furnished for the completion of the Contract; and that its information has been acquired by personal investigation and research and not in the estimates and records of the University.

Section 1.10 Invalid Provisions

If any term or provision of the Contract Documents or the application thereof to any person, firm or corporation or circumstance shall, to any extent, be invalid or unenforceable, the remainder of the Contract Documents, or the application of such terms or provisions to persons, firms or corporations or circumstances other than those to which it is held invalid or unenforceable, shall not be affected thereby and each term or provision of the Contract Documents shall be valid and be enforced to the fullest extent permitted by law.

Section 1.11 No Collusion or Fraud

Reference "Exhibit A" which is attached to and made a part of this Agreement.

Section 1.12 Notices

Any notice to either party hereunder must be in writing signed by the party giving it and shall be served either personally, by facsimile or registered mail of the United State Post Office and individuals indicated below:

TO THE UNIVERSITY: Director of Procurement and Accounts Payable
State University of New York
Purchase College
735 Anderson Hill Road
Purchase, New York 10577

and a copy to: Vice Chancellor for Capital Facilities
State University of New York
State University Plaza
Albany, New York 12246

TO THE CONTRACTOR: At the address indicated on page 1 of this Agreement
Or to such other addressee as may be hereafter designated by notice. All notices become effective only when received by the addressee.

Section 1.13 Singular-Plural; Male-Female

As used in the Contract Documents, the singular of any word or designation, whenever necessary or appropriate, shall include the plural and vice versa, and the masculine gender shall include the female and neuter genders and vice versa.

ARTICLE II

Contract Administration and Conduct

Section 2.01 Consultant's Status

- (1) The Consultant, as the University's representative, shall provide general administration of the Contract and inspection of the work. The Consultant will not be responsible for construction means, methods, techniques, sequences or procedures, or for safety precautions and programs in connection with the work, and it will not be responsible for the Contractor's failure to carry out the work in accordance with the Contract Documents. The Consultant's duties, services and work shall in no way supersede or dilute the Contractor's obligation to perform the work in conformance with all Contract requirements, but it is empowered by the University to act on its behalf with respect to the proper execution of the work and to give instructions when necessary to require such corrective measures as may be necessary, in its professional opinion, to insure the proper execution of the Contract or to otherwise protect the University's interest.
- (2) The Consultant shall have the authority to stop the work or to require the prompt execution thereof whenever such action may be necessary, in its professional opinion, to insure the proper execution of the Contract or to otherwise protect the interests of the University.
- (3) Except as otherwise provided in the Contract, the Consultant shall determine the amount, quality, acceptability, fitness and progress of the work covered by the Contract and shall decide all questions of fact which may arise in relation to the interpretation of the plans and Specifications, the performance of the work and the fulfillment by the Contractor of the provisions of the Contract. The Consultant shall in the first instance be the interpreter of the provisions of the Contract and the judge of its performance and it shall use its power under the Contract to enforce its faithful performance.

Section 2.02 Finality of Decisions

- (1) Any decision or determination of the Consultant under the provisions of the Contract shall be final, conclusive and binding on the Contractor unless the Contractor shall, within ten (10) working days after such decision, make and deliver to the University a verified written statement of its contention that the decision of the Consultant is contrary to a provision of the Contract. The University shall thereupon determine the validity of the Contractor's contention. Pending decision by the University, the Contractor shall proceed in accordance with the Consultant's decision.
- (2) Wherever it is provided in the Contract Documents that an application must be made to the University and/or determination made by the University, the University's decision on such application and/or its determination under the Contract Documents shall be final, conclusive and binding upon the Contractor unless the same shall be determined by a court of competent jurisdiction to have been fraudulent, capricious, arbitrary or so grossly erroneous as necessarily to imply bad faith and unless the Contractor, within ten (10) working days after receiving notice of the University's decision or determination, files a written statement with the University and the Consultant that it reserves its rights in connection with the matters covered by said decision or determination.

Section 2.03 Claims and Disputes

- (1) If the Contractor claims (i) that any work it has been ordered to do is extra work or (ii) that it has performed or is going to perform extra work or

(iii) that any action or omission of the University or the Consultant is contrary to the terms and provisions of the Contract, it shall:

- a. Promptly comply with such order;
 - b. File with the University and the Consultant, within five (5) working days after being ordered to perform the work claimed by it to be extra work or within five (5) working days after commencing performance of the extra work, whichever date shall be the earlier, or within five (5) working days after the said action or omission on the part of the University or the Consultant occurred, a written notice of the basis of its claim and request a determination thereof;
 - c. File with the University and the Consultant, within thirty (30) calendar days after said alleged extra work was required to be performed or said alleged extra work was commenced, whichever date shall be the earlier, or said alleged action or omission by the University or the Consultant occurred, a verified detailed statement, with documentary evidence, of the items and basis of its claim;
 - d. Produce for the University's examination, upon notice from the University, all its books of account, bills, invoices, payrolls, subcontracts, time books, progress records, daily reports, bank deposit books, bank statements, checkbooks and canceled checks, showing all of its actions and transactions in connection with or relating to or arising by reason of its claim, and submit persons in its employment and in its subcontractors' employment for examination under oath by any person designated by the University to investigate any claims made against the University under the Contract, such examination to be made at the offices of the Contractor; and
 - e. Proceed diligently, pending and subsequent to the determination of the University with respect to any such disputed matter, with the performance of the Contract and in accordance with all instructions of the University and the Consultant.
- (2) The Contractor's failure to comply with any or all parts of subdivision b of paragraph (1) of this Section shall be deemed to be (i) a conclusive and binding determination on its part that said order, work, action or omission does not involve extra work and is not contrary to the terms and provisions of the Contract; and (ii) a waiver by the Contractor of all claims for additional compensation or damages as a result of said order, work, action or omission. The provisions of subdivision b of paragraph (1) of this Section are for the purpose of enabling the University to avoid waste of public funds by affording it promptly the opportunity to cancel or revise any order, change its plans, mitigate or remedy the effects of circumstances giving rise to a claim or take such other action as may seem desirable and to verify any claimed expenses or circumstances as they occur. Compliance with such provisions is essential whether or not the University is aware of the circumstances of any order or other circumstances which might constitute a basis for a claim and whether or not the University has indicated it will consider a claim in connection therewith.
- (3) No person has power to waive or modify any of the foregoing provisions and, in any action against the University to recover any sum in excess of the sum certified by the University to be due under or by reason of the Contract, the Contractor must allege in its complaint and prove at the trial compliance with the provisions of this Section.
- (4) Nothing in this Section shall in any way affect the University's right to obtain an examination before trial or a discovery and inspection in any action that might be instituted by or against the University or the Contractor.

Section 2.04 Omitted Work

The University reserves the right at any time during the progress of the work to delete, modify or change the work covered by the Contract, by a Change Order thereto providing for either a reduction or omission of any portion of the work, without constituting grounds for any claim by the Contractor for allowances for damages or for loss of anticipated profits and in such event a deduction shall be made from the Contract consideration, the amount of which is to be determined in accordance with the provisions of Section 4.02 of the Agreement.

Section 2.05 Extra Work

- (1) The University reserves the right at any time during the progress of the work to add, modify or change the work covered by the Contract by a Change Order thereto providing for extra work of either a qualitative or quantitative nature and in such event the Contract consideration shall be increased by an amount to be determined in accordance with the provisions of Section 4.02 of the Agreement and the completion date for all or any part of the work shall be extended for such period of time as may be determined by the University as necessary, because of the extra work, to complete the work or any part thereof.
- (2) Nothing in the Contract Documents shall excuse the Contractor from proceeding with the extra work as directed and, except as otherwise specifically provided for in a Change Order, the terms and conditions of the Contract Documents shall be fully applicable to all extra work.
- (3) The Contractor shall have no claim for extra work if the performance of such work, in the judgment of the Consultant, is made necessary or desirable because of any act or omission of the Contractor which is not in accordance with the Contract.
- (4) Notwithstanding the provisions of Section 2.02 of the Agreement and any other provisions of the Contract Documents to the contrary, the University, after conferring with the Consultant, shall have the right to overrule a determination or decision of the Consultant, that relates to whether certain work is included in the Contract Documents or is extra work, which he or she believes is incorrect; in the event an officer exercises such right, his or her determination or decision shall be final, conclusive and binding upon the Contractor and the University unless the same shall be determined by a court of competent jurisdiction to have been fraudulent, capricious, arbitrary or so grossly erroneous as necessarily to imply bad faith.

Section 2.06 Contractor to Give Personal Attention

- (1) The Contractor shall give its constant personal attention to all the work while it is in progress and shall place the working charge of a competent and reliable full-time superintendent acceptable to the Consultant and the University who shall have authority to act for the Contractor and who shall be accountable to the Consultant to the extent provided in the Contract. Unless the superintendent proves to be unsatisfactory to the Contractor and ceases to be in its employ, such superintendent shall not be changed without the written permission of the Consultant and the University.

- (2) When the Contractor and its superintendent are temporarily absent from the site of the work, the Contractor or its superintendent shall designate a responsible supervisory employee to receive such orders as the Consultant or its representative may give. At no time shall any work be conducted on the site in the absence of an individual present who has been so designated by the Contractor or its superintendent as having authority to receive and execute instructions given by the Consultant or its representative.

Section 2.07 Employment of Workers

The Contractor shall at all times employ competent and suitable workers and equipment which shall be sufficient to prosecute all the work to full completion in the manner and time specified. All workers engaged in specially or skilled work shall have had sufficient experience in such work to properly and satisfactorily perform the same. Should the Consultant deem any employee of the Contractor or any subcontractor incompetent, careless, insubordinate or otherwise objectionable or whose continued employment on the work is deemed by the Consultant to be contrary to the public interest, it shall so advise the Contractor and the latter shall dismiss or shall cause the subcontractor, if such employee is employed by the latter, to dismiss such employee and such employee shall not again be employed on the work to be performed under the Contract without obtaining the prior written approval of the Consultant.

Section 2.08 Detailed Drawings and Instructions

Upon timely notice by the Contractor that supplementary information is required, the Consultant shall furnish additional instructions, by means of Drawings or otherwise, necessary for the proper execution of the work. All such Drawings and instructions shall be consistent with the Contract Documents, true developments thereof and reasonably inferable therefrom. The work shall be executed in conformity therewith and the Contractor shall do no work without proper Drawings and/or instructions.

Section 2.09 Contract Documents to Be Kept at Site

The Contractor shall keep at the site of the work a copy of the Drawings and Specifications and shall at all times give the Consultant and the University access thereto.

Section 2.10 Permits and Building Codes

The Contractor shall obtain from the proper authorities all permits legally required to carry on its work, pay any and all taxes and fees legally required and shall be responsible for conducting its operations in accordance with the provisions of such permits. Except as otherwise expressly provided in the Contract Documents, all of the work covered by this Contract which is to be performed on property owned by the State University of New York is not subject to the building code of any city, county or other political subdivision of the State of New York. It is, however, subject to the provisions of the New York State Uniform Fire Prevention and Building Code and the applicable Federal and State health and labor laws and regulations. The building permit for the work shall be issued by the Campus Code Compliance Officer.

Section 2.11 Surveys

- (1) From the data shown on the Drawings and identified at the site by the Consultant, a licensed surveyor, to be designated and paid for by the University, shall establish one (1) fixed bench mark and one (1) fixed base line at the site. The Contractor shall work from the bench marks and base lines shown on the Drawings, identified at the site by the Consultant and established at the site by the aforesaid surveyor and shall establish such supplementary bench marks and base lines that are required in order for it to lay out the work. The Contractor shall be responsible for all measurements that may be required for execution of the work to the exact position and elevation as prescribed in the Specifications, shown on the Drawings, or as the same may be modified at the direction of the Consultant to meet changed conditions or as a result of modifications to the work covered by the Contract.
- (2) The Contractor shall furnish at its own expense such stakes and other required equipment, tools and materials, and all labor as may be required in laying out any part of the work. If, for any reason, monuments are disturbed, it shall be the responsibility of the Contractor to reestablish them, without cost to the University, as directed by the Consultant. The Consultant may require that construction work be suspended at any time when location and limit marks established by the Contractor are not reasonably adequate to permit checking completed work or the work in progress.
- (3) In all multiple-story construction, the Contractor shall establish and maintain line marks at each floor level and grade marks four (4) feet above the finished floor at each floor level.

Section 2.12 Site Conditions

- (1) The Contractor acknowledges that it has assumed the risk and that the Contract consideration includes such provision as it deems proper for all physical conditions and subsurface conditions as it could reasonably anticipate encountering from the provisions of the Contract Documents, borings, rock cores, topographical maps and such other information as the University or the Consultant made available to it prior to the University's receipt of bids or from its own inspection and examination of the site prior to the University's receipt of bids.
- (2) In the event that the Contractor encounters subsurface physical conditions or other latent physical conditions at the site differing substantially from those shown on or described or indicated in the Contract Documents and which could not have been reasonably anticipated from the aforesaid information made available by the University or the Consultant or from the Contractor's aforesaid inspection and examination of the site, it shall give immediate notice to the Consultant of such conditions before they are disturbed. The Consultant will thereupon promptly investigate the conditions and, if it finds that they do substantially differ from that which should have been reasonably anticipated by the Contractor, it shall make such changes in the Drawings and Specifications as may be necessary and a Change Order shall be issued, the amount of which shall be determined in accordance with the provisions of Section 4.02, to reflect any increase or decrease in the cost of, or the time required for, performance of the Contract as a result of any of the aforesaid changes made by the Consultant and/or as a result of such unanticipated subsurface conditions.

Section 2.13 Right to Change Location

When additional information regarding the subsurface conditions becomes available to the University as a result of the excavation work, further testing or otherwise, it may be found desirable to change the location, alignment, dimensions or grades to conform to such conditions. The University reserves the right to make such reasonable changes in the work as, in its opinion, may be considered necessary or desirable, such changes and any adjustments in the Contract consideration as a result thereof are to be made in accordance with the provisions of Sections 2.04, 2.05 and 4.02 of the Agreement.

Section 2.14 Unforeseen Difficulties

Except as otherwise expressly provided in Section 2.12 of the Agreement and in other Sections of the Contract Documents, the Contractor acknowledges that it has assumed the risk and that the Contract consideration includes such provisions as it deems proper for any unforeseen obstacles or difficulties which it may encounter in the performance of the work.

Section 2.15 Moving Materials and Equipment

Should it become necessary, in the judgment of the Consultant, at any time during the course of the work to move materials which are stored on the site and equipment which has been temporarily placed thereon, the Contractor upon request of the Consultant shall move them or cause them to be moved at its sole cost and expense; provided, however, if materials and equipment have been stored or placed by the Contractor at a location on the site expressly approved, in writing, by the consultant and the same are moved or caused to be moved by the Contractor at the Consultant's request, such removal shall be deemed extra work and the Contractor shall be compensated therefore in accordance with the provisions of Section 4.02 of the Agreement.

Section 2.16 Other Contracts

- (1) Prior to and during the progress of the work hereunder the University reserves the right to let other contracts relating to the Project or in connection with work on sites within the Contract limit lines or adjoining or adjacent to that on which the work covered by this Contract is to be performed. In the event such other contracts are let, or have previously been let, the Contractor and such other contractors shall coordinate their work with each other, arrange the sequence of their work to conform with the progressive operation of all the work covered by such contracts and afford each other reasonable opportunities for the introduction and storage of their materials, supplies and equipment and the execution of their work. If the Contractor or such other contractors contend that their work or the progress thereof is being interfered with by the acts or omissions of the other or others or that there is a failure to coordinate or properly arrange the sequence of the work on the part of the Contractor or such other contractors, they shall, within five (5) working days of the commencement of such interference or failure of coordination or failure to perform work in proper sequence, give written notification to the University and the Consultant of such contention. Upon receipt of such notification or on its own initiative, the Consultant shall investigate the situation and issue such instructions to the Contractor or such other contractors with respect thereto as it may deem proper. The Consultant shall determine the rights of the Contractor and of such other contractors and the sequence of work necessary to expedite the completion of all work covered by this Contract in relation to the work covered by said other contracts.
- (2) The Contractor agrees that it has and will make no claim for damages against the University by reason of any act or omission to act by any other contractor or party or in connection with the Consultant's or University's acts or omissions to act in connection with such other contractor, but the Contractor shall have a right to recover such damages from the other contractors under a provision similar to the following provision which has been or will be inserted in the Contract with such other contractors.
- (3) Should any other contractor, having or who shall hereafter have a contract with the University relating to the Project or in connection with the work on sites adjoining or adjacent to that on which the work covered by this Contract is to be performed, sustain any damage, during the progress of the work hereunder, through any act or omission of the Contractor, the Contractor agrees to reimburse such other contractor for all such damages and it further agrees to indemnify and save harmless the University and the State of New York from all claims for such damages.
- (4) If the proper and accurate performance of the work covered by the Contract depends upon the proper performance and execution of work not included herein or depends upon the work of any other contractor, the Contractor shall inspect and promptly report to the Consultant any defects in such work that render it unsuitable for proper execution and results. Its failure to so inspect and report shall constitute an acceptance of the other contractor's work as fit and proper for the execution of the work covered by the Contract, except as to latent defects which may be discovered thereafter.

Section 2.17 Inspection and Testing

- (1) All materials and workmanship shall be subject to inspection, examination and testing by the Consultant and the University at all times during the performance of the work and at all places where the work is carried on. Except as otherwise herein specified, the University shall pay for the cost of inspection, examination and testing by the Consultant or the University. If, however, the tests and any attendant re-inspection or re-examination prove that the materials and/or work tested do not meet the requirements of the Contract, then the entire cost of such tests is to be borne by the Contractor. The Consultant will have the right to reject defective material and workmanship furnished by the Contractor or require its correction. The Contractor, without charge therefore, shall satisfactorily and promptly correct all rejected work and replace all rejected material with proper material.
- (2) The Contractor shall promptly segregate and remove from the site of the work all rejected material and work. If the Contractor shall fail to proceed at once with the replacing of rejected material and/or correction of defective workmanship, the University may, by contract or otherwise, replace such material and/or correct such workmanship, and charge the costs thereof to the Contractor and/or it may cancel the Contract and terminate the Contractor's employment as provided in the Agreement.
- (3) The Contractor, without additional charge therefore, shall promptly furnish all reasonable facilities, labor and materials necessary for the safe and convenient inspection and testing that may be required by the Consultant or the University.
- (4) If the Contract Documents or the Consultant's instructions or the applicable laws, ordinances or regulations of any governmental authority require any part of the work covered by the Contract to be specially tested or inspected, the Contractor shall give the Consultant timely notice of its readiness for such testing or inspection or, if the same is to be performed by a governmental authority, of the date fixed therefore. If any

such work, without the written permission of the Consultant, should be covered up prior to such testing or inspection, the Contractor, at its sole cost and expense, must, if directed by the Consultant, uncover the same for testing or inspection and reconstruct the same after the tests or inspection are conducted. All certificates of inspection or testing, involving the Contractor's work, required to be obtained from governmental authorities are to be secured by the Contractor at its sole cost and expense.

- (5) Should it be considered necessary or advisable by the Consultant at any time before final acceptance of the entire work to make an examination of work already completed by removing or tearing out same, the Contractor, upon request, shall furnish all necessary facilities, labor and material to perform such examination. If the work subject to such examination is found to be defective or nonconforming in any manner due to the fault of the Contractor or any of its subcontractors, such uncovering or destruction and necessary reconstruction, even though such includes work not covered in the Contract, shall be at the expense of the Contractor. If, however, such work after testing and examination is found to be satisfactory, the University will pay the Contractor the cost of such uncovering or destruction and reconstruction, such cost to be determined as in the case of extra work as provided in Section 4.02.
- (6) Inspection of material and furnished articles to be incorporated in the work may be made at the place of production, manufacture or shipment unless otherwise stated herein. The inspection of material and workmanship for final acceptance as a whole or in part will be made at the site of the work.

Section 2.18 Subcontractors

- (1) Except for subcontractors designated by the University, or required to be named at any earlier date, pursuant to the provisions of the Information for Bidders, within thirty (30) calendar days after Notice of Award, the Contractor must submit a written statement to the Consultant giving the name and address of all proposed subcontractors. Said statement must contain a description of the portion of the work and materials which the proposed subcontractors are to perform and furnish and any other information tending to prove that the proposed subcontractors have the necessary facilities, skill, integrity, past experience and financial resources to perform the work in accordance with the terms and provisions of the Contract Documents.
- (2) If the Consultant finds that the proposed subcontractors are qualified, it will so notify the Contractor within ten (10) working days after receipt of the aforesaid information. If the determination is to the contrary, however, the Consultant within such period will notify the Contractor of such determination and the latter, unless it decides to do such work itself and is qualified, in the Consultant's opinion, to do such work, must, within ten (10) working days thereafter, submit similar information with respect to other proposed subcontractors.
- (3) The Consultant's approval of a subcontractor and/or the University's designation of a subcontractor pursuant to the provisions of the Contract Documents shall not relieve the Contractor of any of its responsibilities, duties and liabilities hereunder. The Contractor shall be solely responsible to the University for the acts or defaults of such subcontractors and of such subcontractors' officers, agents and employees, each of whom shall, for this purpose, be deemed to be the agent or employee of the Contractor to the extent of its subcontract.
- (4) The Contractor shall be fully responsible for the administration, integration, coordination, direction and supervision of all of its subcontractors and of all work and it shall check all space requirements of the work and coordinate and adjust the same so that conflicts in space do not occur in the work being performed by it with its own employees and with the work being performed by its subcontractors and so that all equipment, piping, wiring, etc., can be installed, where possible, in the spaces allowed for the same.
- (5) No subcontractor shall be permitted to work at the site until (a) it has furnished satisfactory evidence to the Consultant of the insurance required by law; (b) in the case of a Project involving a federal grant, it has furnished satisfactory evidence to the Consultant of the same type and amount of liability insurance as that required of the Contractor by Section 5.06 of the Agreement; and (c) except for subcontractors designated by the University pursuant to the provisions of the Information for bidders, it has been approved by the Consultant.
- (6) Within seven (7) working days after the Contractor receives payment from the University on account of a progress payment application for the percentage of the work done, it shall pay each of its subcontractors the sum contained in said payment for the percentage of said subcontractor's work, less the same amount retained therefrom by the University under the terms of the Contract Documents or in consequence of any legal proceedings or statutory liens, and less any amounts due the Contractor under the subcontract for work not performed or not properly or timely performed by the subcontractor. In the event any subcontractor is not paid by the Contractor, the former should immediately notify the University of such fact. Notwithstanding the foregoing, no retention or withholding of payment by the university shall affect the Contractor's obligation to pay all subcontractors, agents, employees or other parties for goods or services provided in connection with the work.
- (7) The Contractor shall execute with each of its subcontractors and shall require all subcontractors to execute with their sub-subcontractors a written agreement which shall bind the latter to the terms and provisions of this Contract insofar as such terms and provisions are applicable to the work to be performed by such subcontractors. The Contractor shall require all subcontractors and sub-subcontractors to promptly, upon request, file with the Consultant and the University a copy of such agreements, from which the price and terms of payment may be deleted.
- (8) If for sufficient reason, at any time during the progress of the work to be performed hereunder, the Consultant determines that any subcontractor or sub-subcontractor is incompetent, careless or uncooperative, the Consultant will notify the Contractor accordingly and immediate steps will be taken by the Contractor for cancellation of such subcontract or sub-subcontract. Such termination, however, shall not give rise to any claim by the Contractor or by such subcontractor or sub-subcontractor for loss of prospective profits on work unperformed and/or work unfurnished and a provision to that effect shall be contained in all subcontracts and sub-subcontracts.
- (9) No provisions of this Contract shall create or be construed as creating any contractual relation between the University and any subcontractor or sub-subcontractor or with any person, firm or corporation employed by, contracted with or whose services are utilized by the Contractor.

Section 2.19 Shop Drawings and Samples

- (1) The Contractor, in accordance with the approved Shop Drawing and Sample schedule and with such promptness and in such sequence as to cause no delay in the work, shall submit for the Consultant's approval all Shop Drawings and Samples called for under the Contract or requested by the Consultant.
- (2) Shop Drawings shall establish the actual detail of the work, indicate proper relation to adjoining work, amplify design details of mechanical and

electrical equipment in proper relation to physical spaces in the structure, and incorporate minor changes of design or construction to suit actual conditions.

- (3) All Shop Drawings and Samples shall be thoroughly checked by the Contractor for compliance with the Contract Documents before submitting them to the Consultant for approval and all Shop Drawings shall bear the Contractor's recommendation for approval certifying that they have been so checked. Any Shop Drawings submitted without this stamp of approval and certification, and Shop Drawings which, in the Consultant's opinion, are incomplete, contain numerous errors or have not been checked or only checked superficially, will be returned unchecked by the Consultant for resubmission by the Contractor. In checking Shop Drawings, the Contractor shall verify all dimensions and field conditions and shall check and coordinate the Shop Drawings of any section or trade with the requirements of all other sections or trades whose work is related thereto, as required for proper and complete installation of the work.
- (4) Samples must be of sufficient size or number to show the quality, type, range of color, finish and texture of the material. Each Sample shall be properly labeled to show the nature of the material, trade name of manufacturer, name and location of the work where the material represented by the Sample is to be used and the name of the Contractor submitting the Sample. Transportation charges to the Consultant must be prepaid on Samples forwarded to it.
- (5) Shop Drawings and Samples, submitted by the Contractor in accordance with the approved Shop Drawing and Sample schedule, will be reviewed by the Consultant within fifteen (15) working days and if satisfactory will be approved. A Shop Drawing, when approved, will be returned to the Contractor. If not satisfactory, the Drawings and Samples will be appropriately marked and returned to the Contractor for correction thereof, in which event the Contractor shall resubmit to the Consultant a corrected copy of the Shop Drawing or a new Sample, as the case may be. The Contractor shall make any correction required by the Consultant and shall appropriately note any changes or revisions on the Shop Drawing, dated to correspond with the date of the Consultant's request for the change. Upon approval of the Shop Drawing by the Consultant, the Contractor shall promptly furnish to the Consultant as many copies thereof as the Consultant may reasonably request.
- (6) At the time of submission of a Shop Drawing or Sample, the Contractor shall inform the Consultant and the University in writing of any deviation in the Shop Drawing or Sample from the requirements of the Contract Documents. Unless such deviation is specifically noted by the Contractor with a notation that such deviation will result in extra work for which the Contractor requests payment or requires additional time, the Contractor shall be deemed to have waived any claim for extra work, additional compensation or payment or an extension of time with respect to all work shown on, described in or related to the Shop Drawing or Sample.
- (7) The Consultant's approval of Shop Drawings or Samples is for design only and is not a complete check on the method of assembly, erection or construction. Approval shall in no way be construed as: (a) permitting any departure whatsoever from the Contract Documents, except where the Contractor, in accordance with the provisions of paragraph 6 of this Section, has previously notified the University and the Consultant of such departure; (b) relieving the Contractor of full responsibility for any error in quality of materials, details, dimensions, omissions or otherwise that may exist; (c) relieving the Contractor of full responsibility for adequate field connections, erection techniques, bracing or deficiencies in strength; (d) relieving the Contractor of full responsibility for satisfactory performance of all work and coordination with the work of all subcontractors and other contractors; or (e) permitting departure from additional details or instructions previously furnished by the Consultant.
- (8) No work requiring a Shop Drawing or Sample shall be commenced until a Shop Drawing or Sample is approved in writing by the Consultant and all such work shall be: (a) in accordance with the approved Shop Drawing, provided the latter conforms in all respects to the Contract Documents or to such deviations therefrom as have been previously noted by the Contractor in accordance with the provisions of paragraph 6 of this Section; and (b) in conformance in all respects to the sample furnished to and approved by the Consultant and, unless otherwise specified, as new and of good quality.

Section 2.20 Equivalents - Approved Equal

A. EQUIVALENTS OR APPROVALS - GENERAL

- (1) The words "similar and equal to", "or equal", "equivalent", and such other words of similar content and meaning shall, for the purposes of this Contract, be deemed to mean similar and equivalent to one of the named products. For the purposes of subdivisions A and B of this Section and for purposes of the Bidding Documents, the word "products" shall be deemed to include the words "articles", "materials", "items", "equipment" and "methods". Whenever in the Contract Documents one or more products are specified, the words "similar and equal to" shall be deemed inserted.
- (2) Whenever any product is specified in the Contract Documents by a reference to the name, trade name, make or catalog number of any manufacturer or supplier, the intent is not to limit competition, but to establish a standard of quality which the Consultant has determined is necessary for the Project. A Contractor may at its option use any product other than that specified in the Contract Documents provided the same is approved by the Consultant in accordance with the procedures set forth in subdivision B of this Section. In all cases the Consultant shall be the sole judge as to whether a proposed product is to be approved and the Contractor shall have the burden of proving, at its own cost and expense, to the satisfaction of the Consultant, that the proposed product is similar and equal to the named product. In making such determination the Consultant may establish such objective and appearance criteria as it may deem proper that the proposed product must meet in order for it to be approved.
- (3) Nothing in the Contract Document shall be construed as representing, expressly or implicitly, that the named product is available or that there is or there is not a product similar and equal to any of the named products and the Contractor shall have and make no claim by reason of the availability or lack of availability of the named product or of a product similar and equal to any named product.
- (4) The Contractor shall have and make no claim for an extension of time or for damages by reason of the time taken by the Consultant in considering a product proposed by the Contractor or by reason of the failure of the Consultant to approve a product proposed by the Contractor.
- (5) Requests for approval of proposed equivalents will be received by the Consultant only from the Contractor.

B. EQUIVALENTS OR APPROVALS AFTER BIDDING

- (1) Requests for approval of proposed equivalents will be considered by the Consultant after bidding only in the following cases: (a) the named product cannot be obtained by the Contractor because of strikes, lockouts, bankruptcies or discontinuance of manufacture and the Contractor makes a written request to the Consultant for consideration of the proposed equivalent within ten (10) calendar days of the date it ascertains it cannot obtain the named product; or (b) the proposed equivalent is superior, in the opinion of the Consultant, to the named product; or (c) the proposed equivalent, in the opinion of the Consultant, is equal to the named product and its use is to the advantage of the University, e.g., the University receives an equitable credit, acceptable to it, as a result of the estimated cost savings to the Contractor from the use of the proposed equivalent or the University determines that the Contractor has not failed to act diligently in placing the necessary purchase orders and a savings in the time required for the completion of the construction of the Project should result from the use of the proposed equivalent; or (d) the proposed equivalent, in the opinion of the Consultant, is equal to the named product and less than ninety (90) calendar days have elapsed since the Notice of Award of the Contract.
- (2) Where the Consultant pursuant to the provisions of the subdivision approves a product proposed by a Contractor and such proposed product requires a revision or redesign of any part of the work covered by this Contract, all such revision and redesign and all new Drawings and details required therefore shall be subject to the approval of the Consultant and shall be provided by the Contractor at its own cost and expense.
- (3) Where the Consultant pursuant to the provisions of this Section approves a product proposed by a Contractor and such proposed product requires a different quantity and/or arrangement of duct work, piping, wiring, conduit or any other part of the work from that specified, detailed or indicated in the Contract Documents, the Contractor shall provide the same at its own cost and expense.

Section 2.21 Patents, Trademarks and Copyrights

The Contractor acknowledges that the Contract consideration includes all royalties, license fees and costs arising from patents or trademarks in any way involved in the work, provided, however, that the Contract consideration shall not be deemed to have included therein any royalty, license fee or cost arising from a patent or trademark for a design prepared by the Consultant and neither the Contractor nor the University shall have any liability in connection therewith. Where the Contractor is required or desires to use any product, device, material or process covered by patent or trademark, the Contractor shall indemnify and save harmless the University and the State of New York from any and all claims, actions, causes of action or demands, for infringement by reason of the use of such patented product, device, material or process, and shall indemnify the University and the State of New York from any cost, liability, damage and expense, including reasonable attorneys' fees and court costs, which it may be obligated to incur or pay by reason of any claim or infringement at anytime both before or after the University's final acceptance of all the work to be performed under the Contract.

Section 2.22 Possession Prior to Completion

If before the final completion of all the work it shall be deemed advisable or necessary by the University to take over, use, occupy or operate any part of the completed or partly completed work or to place or install therein equipment and furnishings, the University, upon reasonable written notice to the Contractor, shall have the right to do so and the Contractor will not in any way interfere therewith or object to the same. Such action by the University shall in no way affect the obligations of the Contractor under the terms and provisions of the Contract Documents and the Contractor acknowledges that such action by the University does not in any way evidence the completion of the work or any part thereof or in any way signify the University's acceptance of the work or any part thereof, provided, however, that the period for the Contractor's warranties and guarantees under the Contract for the work so occupied or operated shall be deemed to commence on the date said work is occupied or operated. The Contractor agrees to continue the performance of all work covered by the Contract in a manner which will not unreasonably interfere with such takeover, use, occupancy, operation, placement or installation.

Section 2.23 Completion and Acceptance

A. PARTIAL COMPLETION AND ACCEPTANCE

If before the final completion of all the work any portion of the permanent construction has been satisfactorily completed and the same will be immediately useful to the University, the latter may, by written notice, advise the Contractor that it accepts such portion of the work. Such actions by the University shall in no way affect the obligations of the Contractor under the terms and provisions of the Contract with respect to any work not so completed and accepted.

B. SUBSTANTIAL COMPLETION

When all the work covered by the Contract is substantially completed, i.e., has reached such point of completion that the Project can be fully occupied and used for the purposes for which it was intended, the Contractor shall give written notice thereof to the University and the Consultant. The latter will then promptly make an inspection of the work and, if they shall determine that all the work is substantially completed, they shall so advise the Contractor. Such action shall in no way affect the obligations of the Contractor under the terms and provisions of the Contract with respect to any uncompleted (including untested or deferred work), unaccepted or corrective work or in any way affect, limit or preclude the issuance by the Consultant, from time to time thereafter, of "Punch Lists", i.e., lists of uncompleted or corrective work which the Contractor is to promptly complete and/or correct.

C. FULL COMPLETION AND ACCEPTANCE

After the completion of all the work the Contractor shall give written notice to the University and the Consultant that all the work is ready for inspection and final acceptance. The University and the Consultant shall promptly make such inspection and, if they shall determine that all the work has been satisfactorily completed, the University shall thereupon by written notice advise the Contractor that it accepts such work.

Section 2.24 Record Drawings

- (1) Prior to acceptance by the University of all work covered by the Contract, the Contractor shall furnish to the Consultant one (1) set of current Contract Drawings on which the Contractor has recorded, using colored pencil, in a neat and workmanlike manner, all instances where actual field construction differs from work as indicated on the Contract Drawings. These "Record" Drawings shall show the following information: (a) all significant changes in plans, sections, elevations and details, such as shifts in location of walls, doors, windows, stairs and the like made

during construction; (b) all significant changes in foundations, columns, beams, openings, concrete reinforcing, lintels, concealed anchorage and "knock-out" panels made during construction; (c) final location of electric panels, final arrangement of electric circuits and any significant changes made in electrical design as a result of Change Orders or job conditions; (d) final location and arrangement of all mechanical equipment and major concealed plumbing, including, but not limited to, supply and circulating mains, vent stacks, sanitary and storm water drainage; and (e) final location and arrangement of all underground utilities, connections to building and/or rerouting of existing utilities, including, but not limited to, sanitary, storm, heating, electric, signal gas, water and telephone.

- (2) Shop Drawings shall not be acceptable as "Record" Drawings.
- (3) The Contractor agrees to provide Record Drawings on "electronic media" or "hard copy" at the discretion of the University at no extra cost.

Section 2.25 Guarantees

- (1) The Contractor, at the convenience of the University, shall remove, replace and/or repair at its own cost and expense any defects in workmanship, materials, ratings, capacities or characteristics occurring in or to the work covered by the Contract within one (1) year or within such longer period as may otherwise be provided in the Contract, the period of such guarantee to commence with the University's final acceptance of all work covered under the Contract or at such other date or dates as the University may specify prior to that time, and the Contractor, upon demand, shall pay for all damage to all other work resulting from such defects and all expenses necessary to remove, replace and/or repair such other work which may be damaged in removing, replacing or repairing the said defects. The obligations of the Contractor under the provisions of this paragraph or any other guarantee provisions of the Contract Documents are not limited to the monies retained by the University under the Contract.
- (2) Unless such removal, replacement and/or repair shall be performed by the Contractor within ten (10) working days after it receives written notice from the University specifying such defect, or if such defect is of such a nature that it cannot be completely removed, repaired and/or replaced within said ten (10) day period and the Contractor shall not have diligently commenced removing, repairing and/or replacing such defect within said ten (10) day period and shall not thereafter with reasonable diligence and in good faith proceed to do such work, the University may employ such other person, firm or corporation as it may choose to perform such removal, replacement and/or repair and the Contractor agrees, upon demand, to pay to the University all amounts which it expends for such work.

Section 2.26 Default of Contractor

- (1) In addition to those instances specifically referred to in other Sections hereof, the University shall have the right to declare the Contractor in default of the whole or any part of the work if:
 - a. The Contractor makes an assignment for the benefit of creditors pursuant to the statutes of the State of New York; or if
 - b. A voluntary or involuntary petition in bankruptcy is filed by or against the Contractor; or if
 - c. A receiver or receivers are appointed to take charge of the Contractor's property or affairs; or if
 - d. The Contractor shall sublet, assign, transfer, convey, or otherwise dispose of the Contract other than as herein specified; or if
- (2) Before the University shall exercise its right to declare the Contractor in default by reason of the conditions set forth in this subsection, it shall give the Contractor three (3) working days' notice of its intention to declare the Contractor in default and unless, within such three (3) day period, the Contractor shall make arrangements, satisfactory to the University, to correct and/or eliminate the conditions set forth in the University's aforesaid notice, the Contractor may be declared in default at the expiration of such three (3) day period or at the expiration of such longer period of time as the University may determine. In addition to those instances specifically referred to above, the University shall have the right to declare the Contractor in default of the whole or any part of the work if, in the sole opinion of the University:
 - a. The Contractor becomes insolvent; or if
 - b. The Contractor fails to commence work when notified to do so by the Consultant; or if
 - c. The Contractor shall abandon the work; or if
 - d. The Contractor shall refuse to proceed with the work when and as directed by the Consultant; or if
 - e. The Contractor shall without just cause reduce its working force to a number which, if maintained, would be insufficient, in the opinion of the University, to complete the work in accordance with the approved time progress schedule, and shall fail or refuse to sufficiently increase such working force when ordered to do so by the Consultant; or if
 - f. The Contractor is or has been unnecessarily or unreasonably or willfully delaying the performance and completion of the work, or the award of necessary subcontracts, or the placing of necessary material and equipment orders; or if
 - g. The work cannot be completed within the time herein provided therefore or within the time to which such completion may have been extended; provided, however, that the impossibility of timely completion is, in the University's opinion, attributable to conditions within the Contractor's control; or if
 - h. The work is not completed within the time herein provided therefore or within the time to which the Contractor may be entitled to have such completed extended; or if
 - i. The Contractor is or has been willfully or in bad faith violating any of the provisions of this Contract; or if
 - j. The Contractor is not or has not been executing the Contract in good faith and in accordance with its terms.

- (3) The right to declare in default for any of the grounds specified or referred to shall be exercised by the University sending the Contractor a written notice setting forth the ground or grounds upon which such default is declared. Upon receipt of notice that it has been declared in default, the Contractor shall immediately discontinue all further operations under the Contract and shall immediately quit the site, leaving untouched all plant, materials, equipment, tools and supplies then on site.
- (4) The University, after declaring the Contractor in default, may then have the work completed by such means and in such manner, by contract, with or without public letting, or otherwise, as it may deem advisable, utilizing for such purpose such of the Contractor's plant, materials, equipment, tools and supplies remaining on the site, and also such subcontractors as it may deem advisable, or it may call upon the Contractor's surety at its own expense to do so.
- (5) In the event that the University declared the Contractor in default of the work or any part of the work, the Contractor, in addition to any other liability to the University hereunder or otherwise provided for or allowed by law, shall be liable to the University for any costs it incurs for additional architectural and engineering services necessary, in its opinion, because of the default and the total amount of liquidated damages from the date when the work should have been completed by the Contractor in accordance with the terms hereof to the date of actual completion of the work, both of which items shall be considered as expenses incurred by the University in completing the work and the amount of which may be charged against and deducted out of such monies as would have been payable to the Contractor or its surety if the work had been completed without a default.
- (6) If the University completes the work, the Consultant shall issue a certificate stating the expenses incurred in such completion, including the cost of re-letting. Such certificates shall be final, binding and conclusive upon the Contractor, its surety, and any person claiming under or through the Contractor, as to the amount thereof.
- (7) The expense of such completion, as so certified by the Consultant, shall be charged against and deducted out of such monies as would have been payable to the Contractor if it had completed the work; the balance of such monies, if any, subject to the other provisions of the Contract, to be paid to the Contractor without interest after such completion. Should the expense of such completion, so certified by the Consultant, exceed the total sum which would have been payable under the Contract if the same had been completed by the Contractor, any such excess shall be paid by the Contractor to the University upon demand.
- (8) In the event the University shall determine to complete the work without calling upon the Contractor's surety to do so, the Contractor shall not be entitled, from and after the effective date of the declaration of the default, to receive any further payment under the Contract until the said work shall be wholly completed and accepted by the University.
- (9) In case the University shall declare the Contractor in default as to a part of the work only, the Contractor shall discontinue such part, shall continue performing the remainder of the work in strict conformity with the terms of the Contract, and shall in no way hinder or interfere with any other contractors or persons whom the University may engage to complete the work as to which the Contractor was declared in default.
- (10) The provisions relating to declaring the Contractor in default as to the entire work shall be equally applicable to a declaration of partial default, except that the University shall be entitled to utilize for completion of the part of the work as to which the Contractor was declared in default only such plant, materials, equipment, tools and supplies as had been previously used by the Contractor on such part.
- (11) In completing the whole or any part of the work, the Consultant and the University shall have the power to depart from, change or vary the terms and provisions of the Contract; provided, however, that such departure, change or variation is made for the purpose of reducing the time or expense of such completion. Such departure, change or variations, even to the extent of accepting a lesser or different performance, shall not affect the conclusiveness of the Consultant's certificate of the cost of completion, nor shall it constitute a defense to any action to recover the amount by which such certificate exceeds the amount which would have been payable to the Contractor hereunder but for its default.
- (12) The provisions of this Section shall be in addition to any and all other legal or equitable remedies provided by this Agreement and otherwise available by law.

Section 2.27 Termination

- (1) The performance of work under this Contract may be terminated by the University, in whole or in part, whenever the University shall determine that such termination is in the best interest of the University; or in the event the State Finance Law Sections 139-j and 139-k certifications are found to be intentionally false or intentionally incomplete; or in the event the information provided in Sales Tax Certifications ST-220TD and/or ST-220CA is found to be false or incomplete. Any such termination shall be effected by a notice in writing to the Contractor specifying the date upon which such termination shall become effective and the extent to which performance of the Contract shall be terminated. Such termination shall be effective on the date and to the extent specified in said notice.
- (2) Upon receipt of a notice of termination, and except as otherwise directed in writing by the University, the Contractor shall:
 - a. Discontinue all work and the placing of all orders for materials and facilities otherwise required for the performance thereof;
 - b. Cancel all existing orders and subcontracts to the extent such orders and subcontracts relate to the performance of work terminated by the notice of termination;
 - c. Take such actions as may be necessary to secure to the University the benefits of any rights of the Contractor under orders or subcontracts which relate to the performance of work terminated by the notice of termination, including, but not limited to, the assignment to the University, in the manner and to the extent directed by the University, all the right, title and interest of the Contractor under the orders or subcontracts so terminated and canceled. In the event of such assignment, the University shall have the right, in its discretion, to settle or pay any or all claims arising out of the termination and cancellation of such orders and subcontracts;
 - d. Transfer title and deliver to the University, in accordance with the direction of the University, all materials, supplies, work in process, facilities, equipment, machines or tools produced as a part of or acquired by the Contractor in connection with the work terminated by said notice, and all plans, Drawings, Working Drawings, sketches, Specifications and information for use in connection therewith; provided, however, that the Contractor may retain any of the foregoing if it so elects and forgoes reimbursement therefore;

- e. Take such action as may be necessary or as the Consultant or the University may prescribe for the protection and preservation of all property in the possession or control of the Contractor in which the University, under the provisions of the Contract, has or may acquire an interest.
- (3) Notwithstanding the foregoing, should the notice of termination relate to only a portion of the work covered by the Contract, the Contractor will proceed with the completion of such portions of the work as are not terminated.
 - (4) The University will pay and the Contractor shall accept, in full consideration for the performance and completion of the portions of the work as are not terminated, a sum calculated by determining the percentage the portions of the work not terminated bear to the total amount of the work covered by the Contract, and by multiplying the Contract consideration by such percentage the product thereof being the amount to be paid to the Contractor. The University shall determine the amount of such consideration in accordance with the foregoing.
 - (5) Upon compliance by the Contractor with the foregoing provisions of this Section and subject to deductions for payments previously made, the University, for the portions of the work terminated, shall compensate the Contractor as follows:
 - a. By reimbursing the Contractor for actual expenditures made with respect to such work, including expenditures made in connection with any portion thereof which may have been completed prior to termination, as well as expenditures made after termination in completing those portions of the work covered by the Contract which the Contractor may have been required by the notice of termination to complete. The University shall determine the allocability and amount of such expenditures.
 - b. By reimbursing the Contractor for all actual expenditures made, with the prior written approval of the University or pursuant to a court judgment, in settling or discharging any outstanding contractual obligations or commitments incurred or entered into by the Contractor in good faith with respect to the Contract and resulting from the termination thereof.
 - c. By reimbursing the Contractor for all actual expenditures made after the effective date of the notice of termination resulting from or caused by the Contractor taking necessary action or action prescribed by the Consultant or the University for the protection and preservation of all property in the possession or control of the Contractor in which the University, under the provisions of the Contract, has or may acquire an interest.
 - d. By paying the Contractor a markup, which is to be calculated in the same manner as that provided for in subdivision c of paragraph (1) of Section 4.02 for extra work, on the foregoing expenditures, which markup is to cover the Contractor's overhead and profit; provided, however, that if it appears that the Contractor would have sustained a loss on the entire Contract had it been completed, said markup shall be reduced by one-third.
 - (6) The sum of all amounts payable under this Section, plus the sum of all amounts previously paid by the University under the provisions of the Contract, shall not exceed the amount of the Contract consideration. In no event shall the Contractor be entitled to any payment for loss of anticipated profits on uncompleted work and the University shall not be liable for the same.
 - (7) Termination by the University under the provisions of this Section shall be without prejudice to any claims or rights which the University may have against the Contractor. The University may retain from the amount due to the Contractor under the provisions of this Section such monies as may be necessary to satisfy any claim which the University may have against the Contractor in connection with the Contract; provided, however, that the University's failure to retain such monies shall not be deemed a waiver of any of its rights or claims against the Contractor.
 - (8) Notwithstanding the foregoing, where the Contractor and the Consultant can agree upon another method of determining the amount of the consideration to be paid to the Contractor under the provisions of the Section, such method, subject to the approval of the University, may, at the option of the University, be substituted for the method set forth above.

ARTICLE III

Time of Performance

Section 3.01 Commencement, Prosecution and Completion of Work

- (1) The Contractor agrees that it will begin the work upon receipt of a fully executed contract, unless the University consents in writing to begin on a different date, and that it will prosecute the same with such diligence that all work covered by the Contract shall be entirely completed and performed on or before the time specified on page one of the Agreement.
- (2) The Contractor further agrees that time is of the essence in this Contract and that the work shall be prosecuted in such manner and with sufficient plant and forces to complete all the work by the specified completion date.

Section 3.02 Time Progress Schedule

- (1) To show compliance with the requirements of Section 3.01 of the Agreement, provide and maintain a time progress schedule. After Contract Award, but before processing second progress payment application, the Contractor, unless otherwise directed by the University, shall submit to the University and the Consultant for their acceptance its proposed working plan and time progress schedule for all the work covered by the Contract, and shall include activities for preparation and submission of all Shop Drawings and Samples.
- (2) The working plan and time progress schedule shall be in the form of suitable charts, diagrams or bar graphs and shall be based on the Contractor's logic and time estimates. Such plan and schedule shall be sufficiently detailed to show clearly, in sequence, all salient features of the work of each trade including: the anticipated time of commencement and completion of such work and the interrelationship between such work, submission of Shop Drawings and Samples for approval, approval of Shop Drawings and Samples, placing of orders of materials, fabrication and delivery of materials, installation and testing of materials, contiguous or related work under other contracts, and other items pertinent to the work.

- (3) Phases of work shall include time in the schedule for training crews, acclimating trades to the sequence and apportionment of activities, additional meetings with the owner, consultant, Contractor and the significant subcontractors, and re-sequencing activities to recover from start-up delays typically caused by normal activities associated with the start-up of field work.
- (4) The aforesaid proposed working plan and schedule shall be revised by the Contractor until they are satisfactory to the University and the Consultant, and the same shall be periodically revised thereafter and submitted by the Contractor to the University and the Consultant for approval at such time or times as the University or the Consultant may request.
- (5) The proposed working plan and schedule, including any revision or revisions thereof, when approved by both the University and the Consultant shall be known as the Schedule of Record. The Schedule of Record, as the same may be revised from time to time by the Contractor and approved by the University and the Consultant, shall be strictly adhered to by the Contractor.
- (6) If through the fault of the Contractor or any subcontractor the Contractor shall fail to adhere to the time progress schedule, it must promptly adopt such other and additional means and methods of construction as will make up for the time lost and will assure completion in accordance with such schedule.
- (7) The failure of the Contractor to submit a Time Progress Schedule, the University's or the Consultant's acceptance of the Contractor's time progress schedule or lack of such acceptance, the means and/or methods of construction employed by the Contractor, including any revisions thereof, and/or its failure to revise the same shall not relieve the Contractor of its obligation to accomplish the result required by the Contract in the time specified on page 1 of the Agreement, nor shall the exercise of such right to reject, create or give rise to any claim, action or cause of action, legal, equitable or otherwise, against the Consultant or the University.

Section 3.03 Time Schedule for Shop Drawings and Samples

- (1) The Contractor shall include activities for the preparation and submission of all Shop Drawings and Samples in the Time Progress Schedule in Section 3.02.

Section 3.04 Notice of Conditions Causing Delay

- (1) Within ten (10) working days after the commencement of any condition which is causing or may cause delay in completion, the Contractor must notify the Consultant and the University in writing of the effect, if any, of such condition upon the time progress schedule, and must state why and in what respects, if any, the condition is causing or may cause such delay.
- (2) Failure to strictly comply with this requirement may, in the discretion of the University, be deemed sufficient cause to deny any extension of time on account of delay in completion arising out of or resulting from any change, extra work, suspension, or other condition.

Section 3.05 Extension of Time

- (1) An extension or extensions of time for the completion of the work may be granted by the University subject to the provisions of this Section, but only upon written application therefore by the Contractor to the University and the Consultant.
- (2) An application for an extension of time must set forth in detail the source and the nature of each alleged cause of delay in the completion of the work, the date upon which each such cause of delay began and ended and the number of days of delay attributable to each of such causes. It must be submitted prior to completion of the work.
- (3) If such an application is made, the Contractor shall be entitled to an extension of time for delay in completion of the work caused solely: (a) by the acts or omissions of the University, its trustees, officers, agents or employees; or (b) by the acts or omissions of other contractors, not including subcontractors of the Contractor, on this Project; or (c) by unforeseeable supervening conditions entirely beyond the control of either party hereto (such as, but not limited to, acts of God or the public enemy, war or other national emergency making performance temporarily impossible or illegal, or strikes or labor disputes).
- (4) The Contractor shall, however, be entitled to an extension of time for such causes only for the number of calendar days of delay which the University may determine to be due solely to such causes, and then only if the Contractor shall have strictly complied with all of the requirements of this Section and Section 3.04. The University shall make such determination within ninety (90) calendar days after receipt of the Contractor's application for an extension of time; provided, however, said application complies with the requirements of this Section.
- (5) The Contractor shall not be entitled to receive a separate extension of time for each one of several causes of delay operating concurrently, but, if at all, only for the actual period of delay in completion of the work as determined by the University, irrespective of the number of causes contributing to produce such delay. If one of several causes of delay operating concurrently results from any act, fault or omission of the Contractor or of its subcontractors or materialmen, and would of itself (irrespective of the concurrent causes) have delayed the work, no extension of time will be allowed for the period of delay resulting from such act, fault or omission.
- (6) The granting of an application for an extension of time for causes of delay other than those herein referred to shall be entirely within the discretion of the University.
- (7) If the Contractor shall claim to have sustained any damages by reason of delays, extraordinary or otherwise, or hindrances which it claims to be due to any action, omission, direction or order by the University or the Consultant, the Contractor shall be entitled only to an extension of time as hereinabove provided and shall not have or assert any claim or prosecute any suit, action, cause of action or proceeding against the University based upon such delays or hindrances, unless such delays or hindrances were caused by the University's bad faith or its willful, malicious, or grossly negligent conduct, or un contemplated delays, or delays so unreasonable that they constitute an intentional abandonment of the contract by the University, or delays resulting from the University's breach of a fundamental obligation of the contract.

Section 3.06 Contractor's Progress Reports

After commencement of the work the Contractor shall furnish the Consultant with written monthly reports setting forth the condition and general progress of the work, the percentage of each part of the work that has been finished, those parts of the work which have been completed within the scheduled time and those parts of the work which have not been finished within the scheduled time, and the general progress of the work that is being performed away from the site and the approximate date when such work will be finished and delivered to the site.

ARTICLE IV

Payment

Section 4.01 Compensation to Be Paid Contractor

The University shall pay to the Contractor and the latter shall accept as full and complete payment for the performance of this Contract, subject to additions or deductions as provided herein, the sum indicated on page 1 of this Agreement which sum is the amount of the total contract compensation. The Contractor shall provide complete and accurate billing invoices to the University in order to receive payment for its services. Billing invoices submitted to the University must contain all information and supporting documentation required by the University and the Office of the State Comptroller (OSC). **Payment for invoices submitted by the Contractor shall only be rendered electronically** unless payment by paper check is expressly authorized by the Chief Financial Officer or designee, in her/his sole discretion, due to extenuating circumstances. Such electronic payment shall be made in accordance with ordinary New York State procedures and practices. The Contractor shall comply with the OSC procedures to authorize electronic payments. Authorization forms are available at the OSC website at <https://osc.state.ny.us/vendors/epayments.htm> and epayments@osc.state.ny.us, by email at epunit@osc.state.ny.us or by telephone at 518-474-4032. The Contractor acknowledges that it will not receive payment on any invoices submitted under this contract if it does not comply with the OSC's electronic payment procedures, except where the Chief Financial Officer has expressly authorized payment by paper check as set forth above.

Section 4.02 Value of Omitted and Extra Work

- (1) The amount by which the Contract consideration is to be increased or decreased by any Change Order shall be determined by the University by one or more of the following methods:
 - a. By accepting an amount agreed upon by both parties, which amount is to be calculated in a manner similar to that provided in subdivision c hereof.
 - b. By applying the applicable price or prices set forth in the attached Schedule "I" of this Agreement or by applying a unit price agreed to by both parties. Subject to the provisions of Sections 4.04, this method must be used if the Contract Documents contain applicable unit prices.
 - c. By estimating the fair and reasonable cost of: (i) labor, including all wages, required wage supplements and insurance required by law (workers' compensation, social security, disability, unemployment, etc.) paid to or on behalf of foremen, workers and other employees below the rank of superintendent directly employed at the site of the Project; (ii) materials; and (iii) equipment, excluding hand tools, which, in the judgment of the University, would have been or will be employed exclusively and directly on the omitted work or extra work, as the case may be; and, in the case of extra work, where the same is performed directly by the Contractor, by adding to the total of such estimated costs a sum equal to 15 percent thereof, but, where the extra work is performed by a subcontractor, by adding a sum equal to 15 percent of said costs for the benefit of such subcontractor, and by adding, for the benefit of the Contractor (no further allowance will be made where extra work is performed by the sub-subcontractor), an additional sum equal to 10 percent of the first \$10,000 of the above-estimated costs, including the subcontractor's percentage override, plus 5 percent of the next \$90,000 of the total of said items, plus 3 percent of any sum in excess of \$100,000 of the total of said items. For the purposes of the aforesaid percentage overrides, the words "extra work" shall be defined as a complete item of added, modified or changed work as described in the Consultant's written instructions to the Contractor. Such "extra work" may include the work of one or more trades and/or subcontractors or sub-subcontractors and shall include all labor, materials, plant, equipment, tools and all incidentals directly and/or indirectly necessary, related, involved in or convenient to the successful completion of the extra work item. Where the Consultant's aforesaid written instructions to the Contractor involve both an increase and a reduction in similar or related work, the above percentage overrides will be applied only on the amount, if any, the cost of the increased work exceeds the cost of the reduced work.

All profit, overhead and expense of whatsoever kind and nature, other than those set forth above in items (i) through (iii), of the Contractor, its subcontractors and sub-subcontractors, are covered by the aforesaid percentage overrides and no additional payment therefore will be made by the University. The University may make such cost estimate either before or after the extra work is completed by the Contractor.
 - d. By determining the actual cost of the extra work in the same manner as in the above subdivision c except that actual costs of the Contractor shall be utilized in lieu of estimated costs. The University shall have the option of utilizing this method provided it notifies the Contractor of its intent to do so prior to the time the Contractor commences performance of such extra work.
- (2) Irrespective of the method used or to be used by the University in determining the value of a Change Order, the Contractor, within fifteen (15) working days after a request for the same, must submit to the University and the Consultant a detailed breakdown of the Contractor's estimate of the value of the omitted and/or extra work.
- (3) For the purposes of paragraph (1) hereof, the cost of equipment shall be determined, irrespective of the actual price for any rental or actual cost associated with such equipment and irrespective of whether the equipment is or is not owned by the Contractor, as follows: (a) for the first 40 hours of use by taking the monthly rate listed in the "Green Book" (the publication of the Associated Equipment Distributors of Oakbrook, Illinois) and dividing the same by 176 hours to establish an hourly rate and then multiplying such hourly rate by the actual number of hours that the equipment was used; and (b) for any period of time in excess of the first 40 hours of use by taking 50 percent of the hourly rate established in accordance with the above for equipment used for periods of less than 40 hours, and then multiplying such rate by the actual number of hours in excess of 40 hours that the equipment was used. In the event that the "Green Book" does not list the item of equipment used, the applicable

rate shall be determined in the same manner as that set forth above except that the monthly rate shall be that set forth in the "Blue Book" (published by Equipment Guidebook Co. of Palo Alto, California). If no listing or rates for an item of equipment is contained in either the "Green Book" or the "Blue Book", the University shall determine the reasonable rate of rental of the particular item of equipment by such other means as it finds appropriate. The editions of the "Green Book" and the "Blue Book" to be used shall be those in effect on the date of the receipt of bids for this Contract. None of the provisions of the "Green Book" or the "Blue Book" shall be deemed referred to or included in this Contract excepting only the aforesaid monthly rates. To the cost of equipment as determined above, there is to be added the actual cost of gasoline, oil, grease and maintenance required for operation of such equipment and, in the case of equipment utilized only for extra work when, in the opinion of the Consultant, suitable equipment therefore was not available on the site, the reasonable cost of transporting said equipment to and from the site. Notwithstanding the foregoing, if the Consultant should determine that the nature or size of the equipment used by the Contractor in connection with the extra work is larger or more elaborate, as the case may be, than the size or nature of the minimum equipment determined by the Consultant to be suitable for the extra work, the cost of equipment will not be based upon the equipment used by the Contractor but instead will be based on the smallest or least elaborate equipment determined by the Consultant to have been suitable for the performance of the extra work.

- (4) Unless otherwise specifically provided for in a Change Order, the compensation specified therein for extra work includes full payment for both the extra work covered thereby and for any damage or expense caused the Contractor by any delays to other work to be done under the Contract resulting from or on account of said extra work, and the Contractor waives all rights to any other compensation for said extra work, damage or expense.

Section 4.03 Adjustment for Bond and Insurance Premiums

Upon final acceptance of the work to be performed under this Contract, the University shall adjust the Contract consideration to reflect any changes in the cost of all required Bonds and liability and builder's risk insurance premiums which the Contractor had to pay for on all extra work and would have had to furnish and pay for on all omitted work. Unless such cost is agreed upon by the University and the Contractor, the University shall calculate and determine the amount of the adjustment in the Contract consideration by estimating such cost.

Section 4.04 Unit Prices

- (1) Except as otherwise provided in the second paragraph of this Section, the unit prices, set forth in the attached Schedule I will be binding upon both the University and the Contractor in determining the value of omitted and/or extra work, and, in the case of extra work, such unit prices shall be deemed to include all profit, overhead and expenses of whatever kind and nature of the Contractor, its subcontractors and sub-subcontractors, and the Contractor agrees that it shall make no claim for any profit, overhead, expense or percentage override in connection therewith.
- (2) Where Schedule I sets forth a unit price for added and/or deducted work, the University shall have the option, whenever it is found that the quantity of changed work varies by more than 15 percent from the quantity that is stated or that can be determined by the Contract Documents at the time of execution thereof, to accept or reject such unit price for the quantity that the changed work varies by more than 15 percent from the stated or determinable quantity. Where a quantity is not specifically stated in the Contract Documents, the University's determination of the amount of said quantity included in the Contract Documents shall determine the applicability of this paragraph. Where the University, pursuant to the foregoing provisions, exercises its aforesaid option, the amount of the increase or decrease in the Contract consideration for the quantity of work which varies by more than 15 percent from the stated or determinable quantity shall be determined in accordance with the provisions of Section 4.02 of the Agreement as if there was no unit price therefore set forth in said Proposal.

Section 4.05 Allowances

- (1) The Contractor acknowledges that the Contract consideration includes the allowances set forth in the attached Schedule I and, except for quantitative allowances, it agrees to cause the work covered thereby to be done by such contractors for such sums as the University may direct. Where cash allowances are provided, the allowances shall be deemed to include the purchase of the materials and/or equipment and the delivery of the same to the job site. Unless otherwise specified in the Contract Documents, cash allowances do not include the proper installation of the materials and/or equipment or the connection for final utilities thereto; the cost of said installation and/or connection having been included in the amount of the Contract consideration.
- (2) The Contractor acknowledges that the Contract consideration includes such sums for expenses and profit on account of cash allowances as it deems proper and that it shall make no claim for expenses or profit or any percentage override in addition thereto; said items having been included in the amount of the Contract consideration.
- (3) In the event any cash allowance listed below is either higher or lower than the cost of having the work done in accordance herewith, the Contract consideration shall be adjusted to reflect such variance, the amount of said adjustment to be the difference between the amount of the allowance and the actual cost of performing the work covered thereby.
- (4) When quantitative allowances are provided, progress payments thereof to the Contractor will be based upon the applicable unit prices set forth in the attached Schedule I, subject, however to the provisions of paragraph (2) of Section 4.04. In the event any of said quantitative allowances are more than or less than the actual quantity of work performed, the Contract consideration shall be adjusted to reflect such variance, the amount of said adjustment to be determined in accordance with the provisions of Section 4.02 and Section 4.04 of the Agreement.

Section 4.06 Deductions for Unperformed and/or Uncorrected Work

- (1) Without prejudice to any other rights, remedies or claims of the University, in the event that the Contractor at any time fails or neglects to supply working forces and materials of the proper quantity and quality necessary, in the opinion of the Consultant or the University, to comply with the approved time progress schedule, or fails in any respect to prosecute the work with promptness and diligence or causes by any action or omission the stoppage or delay of or interference with the work of any other contractor having a contract with the University, or fails in the performance of any obligations and responsibilities under this Contract, then, and in that event, the University, acting itself or through the Consultant, may, upon three (3) working days' notice to the Contractor, either itself provide or have any other contractor provide any and all labor or materials or both necessary, in its opinion, to correct any aforesaid deficiency of the Contractor, and the University will thereafter back

charge the Contractor by issuing a Change Order reducing the amount of the Contract consideration for all costs and expenses it incurs in connection with the correction of such deficiency.

- (2) Notwithstanding any provisions in the Contract Documents to the contrary, if the University deems it inexpedient to correct work not done in accordance with the Contract or any work damaged as a result thereof, it shall notify the Contractor of such fact and the latter shall not remedy or correct the same. In such event, however, the amount of the Contract consideration shall be decreased by an amount, determined by the University, which is equal to the difference in value of the work as performed by the Contractor and the value of the work had it been satisfactorily performed in accordance with the Contract or which is equal to the cost of performing the corrective work, whichever shall be the higher amount.

Section 4.07 Liquidated Damages

In the event that the Contractor shall fail to substantially complete all the work within the time fixed for such completion on page one of this Agreement, or within the time to which such completion may have been extended, or in the event that the Contractor abandons the work and the same is not substantially completed within the aforesaid time for such completion, the Contractor must pay to the University as damages for each calendar day of delay in completing the work the amount set forth on page one of this Agreement. In view of the difficulty of accurately ascertaining the loss which the University will suffer by reason of delay in completion of the work hereunder, said sum is hereby fixed and agreed as liquidated damages which the University will suffer by reason of such delay and not as a penalty. The University may deduct and retain out of the monies which may become due hereunder to the Contractor the amount of any such liquidated damages and, in case the amount which may become due to the Contractor under the provisions of the Contract may be less than the liquidated damages suffered by the University, the Contractor shall pay the difference, upon demand, to the University.

Section 4.08 Contract Breakdown

Prior to the submission of its first application for a progress payment, the Contractor shall present to the University and the Consultant for their approval a detailed schedule showing the breakdown of the Contract consideration. Such schedule must contain the amount estimated for each part of the work and quantity survey for each part of the work. It shall also list the estimated value of the Contractor's guarantee obligations under the provisions of the Contract Documents, which is hereby fixed at \$5,000 or one-half of one percent (1/2%) of the Contract award amount, whichever is the lesser sum. Such schedule shall be revised by the Contractor until the same shall be satisfactory to the University and the Consultant and shall not be changed after the University and the Consultant have approved the same. The amounts set forth in the schedule will not be considered as fixing the basis for additions to or deductions from the Contract consideration.

Section 4.09 Prompt Payment Requirements

- (1) For the purposes of Article XI-A of the State Finance Law, the campus for which the work is being performed is the University's designated payment office. Applications for payment must contain the approval of the Consultant before being submitted to the University.
- (2) Whenever the Consultant's approval of an application for payment is required under the Contract, the Consultant shall have fifteen (15) calendar days after receipt of such application to inspect the work before acting on the application.
- (3) This Contract is subject to the approval of the Comptroller of the State of New York. Until such approval is given, the thirty (30) day period referred to in Article XI-A of the State Finance Law for the payment of invoices without interest shall not begin.

Section 4.10 Progress Payments

- (1) Unless otherwise provided in the Contract, progress payments will be made as the work progresses upon applications submitted by the Contractor and approved by the Consultant and the University. Payment of such approved applications shall be made by the University within thirty (30) days after such approval has been given.
- (2) The University shall make progress payments to the Contractor on the basis of such approved applications, less an amount equal to 5 percent thereof, plus an amount necessary, in the University's judgment, to satisfy any claims, liens or judgments against the Contractor which have not been suitably discharged, which it shall reserve from each such payment until all of the work covered by the Contract has been completed.
- (3) When the University and the Consultant have determined that all the work is substantially completed, or that a substantial portion of the permanent construction has been completed and accepted, the University shall make a progress payment to the Contractor, on the basis of an application submitted by the Contractor and approved by the Consultant and the University, which shall reduce the unpaid amount due to the Contractor under the terms of the Contract, including all monies retained by the University from previous progress payments to the Contractor, to an amount equal to two (2) times the cost, estimated by the Consultant, of performing, in accordance with the Contract, all uncompleted, unaccepted and corrective work, plus an amount necessary, in the University's judgment, to satisfy any claims, liens or judgments against the Contractor which have not been suitably discharged. As the remaining items of work are satisfactorily completed or corrected, the University shall make progress payments to the Contractor, on the basis of applications submitted by the Contractor and approved by the University and the Consultant, covering said items of work less an amount necessary, in the University's judgment, to satisfy any claims, liens or judgments against the Contractor which have not been suitably discharged.

Section 4.11 Applications for Progress Payments

The Contractor shall prepare all applications for progress payments for work performed, together with supporting data and computations as are deemed necessary by the Consultant to determine the accuracy of the application. The application for payment shall be submitted on the form prescribed by the University. Failure of the Contractor to submit applications for progress payments, or lack of complete and accurate supporting data, shall be sufficient reason for withholding payment until such omissions or errors are rectified. Unless otherwise directed, such applications, signed and certified as correct by the Contractor, shall be delivered by the Contractor to the Consultant once each month showing the total value of work completed and in place on the last day of the payment period covered by the application.

Section 4.12 Progress Payments for Materials Delivered to Site

- (1) Progress payments made in accordance with Section 4.10 shall include a payment for materials and equipment to be furnished and installed under the Contract, after such materials and equipment have been delivered and accepted at the site of the work.
- (2) Materials and equipment for which such progress payment has been made shall not be removed from the site, shall be stored until incorporated into the work in a location approved by the Consultant and shall be adequately protected from fire, theft and vandalism, the effects of the elements and any other damage whatsoever, and shall at all times be available for inspection by the Consultant and the University.

Section 4.13 Transfer of Title to Materials Delivered to Site

Title to all supplies and materials to be furnished or provided by the Contractor to the University pursuant to the provisions of the Contract Documents shall immediately vest in and become the sole property of the University upon delivery of such supplies and materials to the site. Notwithstanding such transfer of title, the Contractor shall have the full continuing responsibility to install such materials and supplies, protect them, maintain them in proper condition and forthwith repair, replace and make good any damage thereto without cost to the University until such time as the work covered by the Contract is fully accepted by the University. Such transfer of title shall in no way affect any of the Contractor's obligations under the Contract. In the event that, after title has passed to the University, any of such supplies and materials are rejected as being defective or otherwise unsatisfactory, title to all such supplies and materials shall be deemed to have been transferred back to the Contractor.

Section 4.14 Progress Payments for Materials Stored Off Site

- (1) Progress payments made in accordance with Section 4.10 shall include a payment for materials and equipment which are in short and/or critical supply or have been specially fabricated for the Project. Materials and equipment, for which a progress payment is made pursuant to the preceding sentence, shall be stored by the Contractor, after fabrication, until such time as their delivery to the site is required, at a facility and location approved by the Consultant; shall be adequately protected from fire, theft and vandalism, the effects of the elements and any other damage whatsoever; and shall at all times be available for inspection by the Consultant and the University. No progress payment shall, however, be made for said materials and equipment until:
 - a. The Contractor furnishes to the University a bill of sale listing quantity and costs of said materials and equipment f.o.b. point of origin;
 - b. The Consultant shall have inspected said materials and equipment and recommended payment therefore; and
 - c. The Contractor furnishes to the University a builder's risk insurance policy, with the broad form extended coverage endorsement, for said materials and equipment, in an amount equal to 100 percent of the value thereof, which policy shall be maintained, at the sole cost and expense of the Contractor, until said materials and equipment have been incorporated into the Project. The said insurance policy shall contain a provision that the loss, if any, is to be made adjustable with and payable to the University as trustee for the insured, i.e., the University and the Contractor, and a provision that it shall not be changed or canceled and that it will be automatically renewed upon expiration and continued in force unless the University is given fifteen (15) days' written notice to the contrary.
- (2) Materials and equipment for which a progress payment has been made by the University pursuant to this Section shall be, become and remain the sole property of the University; provided, however, that the Contractor shall have the full continuing responsibility to install such materials and equipment, to deliver it to the site, to protect it, to maintain it in proper condition and to forthwith repair, replace and make good any damage thereto without cost to the University until such time as the work covered by the Contract is fully accepted by the University. Such transfer of title shall in no way affect any of the Contractor's obligations under the Contract.

Section 4.15 Withholding of Progress Payments

Notwithstanding anything contained in the Contract to the contrary, the University may withhold payment of all or any part of a progress, final or guarantee payment, in such an amount as it may deem proper to enforce the provisions of the Contract and to satisfy the claims of third parties, when:

- a. The University shall learn of any claim, of whatever nature or kind, against the University or the Contractor, which in any way arises or is alleged to arise out of or as a result of or in connection with the performance by the Contractor of the work covered by the Contract or out of or in connection with the Contractor's operations or performance at or in the vicinity of the construction site, that, in the opinion of the University, may not be adequately covered by insurance.

If an action on such claim is timely commenced and the liability of the University and/or the Contractor shall have been established therein by a final judgment of a court of competent jurisdiction, or if such claim shall have been admitted by the Contractor to be valid, the University shall pay such judgment or admitted claim out of the monies retained by it under the provisions of the Contract and return the balance, if any, without interest, to the Contractor.

The University may withhold from the Contractor any payments retained by it until such time as all such claims are either satisfied or barred by law from being presented. At such time the University, upon written demand by the Contractor, shall return to the Contractor the amount so withheld, without interest.

- b. The Contractor has not complied with any lawful or proper direction of the Consultant or the University or their representatives concerning the work covered by the Contract or the performance of the Contract or the production of records as required under the provisions of the Contract.
- c. There exists any of the conditions, listed in Section 2.26, which would allow the University to declare the Contractor in default of the whole or any part of the work.
- d. The Contractor is a foreign contractor and has not furnished satisfactory proof that all taxes due by such Contractor under the provisions of the Tax Law have been paid. The Certificate of the New York State Tax Commission to the effect that all such taxes have been paid shall be conclusive proof of the payment of such taxes. The term "foreign contractor" as used herein means, in the case of an individual, a person who is not a resident of the State of New York; in the case of a partnership, one having one or more partners not a resident of the State; and in the case of a corporation, one not organized under the laws of the State of New York.

- e. The Contractor, upon request of the University at any time after the initial progress payment by the University to the Contractor, fails to furnish the University with such documentary evidence that the University may deem necessary to prove to it that material and labor paid for by the University under previous applications for payment submitted have been paid for by the Contractor and that there are no outstanding claims or liens in connection therewith or fails to satisfy the University that the Contractor, with good cause, has sufficiently provided for the payment and/or satisfaction of claims for said material and labor.

Section 4.16 Lien Law

The attention of the Contractor is specifically called to the provisions of the Lien Law of the State of New York, wherein funds received by a Contractor for a public improvement are declared to constitute trust funds in the hands of such Contractor to be applied first to the payment of certain claims.

Section 4.17 Substitution of Securities for Retainage

Any time after 50 percent of all the work has been completed, the University, if the progress and performance of the work is satisfactory to it, on request of the Contractor, will allow the Contractor to withdraw up to 50 percent of the aforesaid amount retained by the University by depositing with the Comptroller of the State of New York government securities, of the type and kind specified in Section 139 of the State Finance Law, having a market value not exceeding par, at the time of deposit, equal to the amount so withdrawn. The Comptroller of the State of New York shall, from time to time, collect all interest or income on the obligations so deposited, and shall pay the same, when and as collected, to the Contractor. If the deposit is in the form of coupon bonds, the coupons as they respectively become due shall be delivered to the Contractor; provided, however, that the Contractor shall not be entitled to interest or coupons or income on any of the deposited securities, the proceeds of which have or will be used or applied by the University. In the event that the Contractor does not, in accordance with the terms and provisions of the Contract, comply with and fulfill all of its obligations and responsibilities thereunder, the Comptroller of the State of New York shall have the right to sell, assign, transfer or otherwise dispose of the aforesaid securities and the University shall have the right to use and apply all or any part of the monies obtained by the Comptroller of the State of New York from such a sale, assignment, transfer or disposition or from the collection of interest or income from said securities to the performance and fulfillment of said obligations and responsibilities. Notwithstanding the foregoing, when the University makes a payment under Section 4.10 (3) of the Agreement, it will return to the Contractor, as part of such payment, its substituted securities, and thereafter all retention of the University shall be in funds and not in substituted securities.

Section 4.18 Final Payment

Upon acceptance of all the work, except for the Contractor's guarantee obligations under Section 2.25 of the Agreement and the Contractor's guarantee obligations under any provision of the Specifications, the contractor shall prepare and submit to the University and the Consultant, for their approval, a final application for payment, which the University, within thirty (30) days after its approval of the same, shall pay. Such application and payment shall be in an amount equal to 100 percent of the Contract consideration, excluding the Contractor's guarantee obligations (reference Section 4.08), less:

- a. All previous payments by the University to the Contractor;
- b. All deductions authorized to be made by the University under the Contract; and
- c. An amount necessary, in the University's judgment, to satisfy any claims, liens or judgments against the Contractor which have not been suitably discharged.

Section 4.19 Acceptance of Final Payment

- (1) The acceptance by the Contractor, or by anyone claiming by or through it, of the final payment shall, except with respect to the amount retained by the University pursuant to the provisions of subdivisions b and c of Section 4.18 of the Agreement, constitute and operate as a release to the University from any and all claims of any liability for anything theretofore done or furnished for or relating to or arising out of the work covered by the Contract and for any prior act, neglect or default on the part of the University or any of its trustees, officers, agents or employees in connection therewith.
- (2) Should the Contractor refuse to accept the final payment as tendered by the University or should the Contractor refuse to execute the final application for payment without protest and without reserving any rights or claims against the University, it shall constitute a waiver of any right to interest on the amount of the payment so tendered and/or on the amount set forth in said final application for payment.

Section 4.20 Guarantee Payment

- (1) Subject to the provisions of the second paragraph of this Section, at the expiration of one (1) year after the University has accepted all the work covered by the Contract, the Contractor shall prepare and submit to the University and the Consultant, for their approval, a guarantee application for payment, which the University, within thirty (30) days after its approval of the same, shall pay. Such application and payment shall be in an amount equal to the monies retained by the University for the Contractor's guarantee obligations under the Agreement, less any monies deducted by the University under this Section. The Contractor shall not be entitled to any interest on the monies retained by the University pursuant to subdivision c of Section 4.18 of the Agreement.
- (2) In the event the Contractor does not, in accordance with the terms and provisions of the Contract, complete all corrective work or comply with and fulfill its contractual obligations, the University may use and apply all or any part of the monies retained by it to have such work or obligations performed or fulfilled by a person, firm or corporation other than the Contractor. The obligations of the Contractor, under the terms and provisions of the Contract, shall not, however, be limited to the monies retained by the University pursuant to the provisions of the Contract.
- (3) No payments may be made under this agreement for work completed more than 365 days after

{Insert Contract Closing Date}

Unless the date/duration listed on page one of this Agreement, is extended in writing by the University.

Section 4.21 Acceptance of Guarantee Payment

The acceptance by the Contractor, or by anyone claiming by or through it, of the guarantee payment shall constitute and operate as a release to the University from any and all claims in connection with monies retained by the University. Should the Contractor refuse to accept the guarantee payment as tendered by the University or should the Contractor refuse to execute the guarantee application for payment without protest and without reserving any rights or claims against the University, it shall constitute a waiver of any right to interest on the amount of the payment so tendered and/or on the amount set forth in said guarantee application for payment.

Section 4.22 Contractor Limited to Money Damages

Inasmuch as the Contractor can be compensated adequately by money damages for any breach of the Contract which may be committed by the University, the Contractor agrees that no default, act or omission of the University shall constitute a material breach of the Contract entitling it to cancel or rescind the same or to suspend or abandon performance thereof; and it hereby waives any and all rights and remedies to which it might otherwise be or become entitled to because of any wrongful act or omission of the University or its representatives, saving only its right to money damages.

Section 4.23 No Estoppel or Waiver

- (1) The University shall not be precluded or estopped by any inspection, acceptance, application for payment or payment, final or otherwise, issued or made under the Contract or otherwise issued or made by it, the Consultant, or any trustee, officer, agent or employee of the University, from showing at any time the true amount and character of the work performed, or from showing that any such inspection, acceptance, application for payment or payment is incorrect or was improperly issued or made; and the University shall not be precluded or estopped, notwithstanding any such inspection, acceptance, application for payment or payment, from recovering from the Contractor any damages which it may sustain by reason of any failure on its part to comply strictly with the Contract and any monies which may be paid to it or for its account in excess of those to which it is lawfully entitled.
- (2) Neither the acceptance of all or any part of the work covered by the Contract; nor any payment therefore; nor any order or application for payment issued under the Contract or otherwise issued by the University, the Consultant, or any trustee, officer, agent or employee of the University; nor any permission or direction to continue with the performance of the Contract before or after its specified completion date; nor any performance by the University of any of the Contractor's duties or obligations; nor any aid lent to the Contractor by the University in its performance of such duties or obligations; nor any delay or omission by the University to exercise any right or remedy accruing to it under the terms of the Contract or existing at law or in equity or by statute or otherwise; nor any other thing done or omitted to be done by the University, its trustees, officers, agents or employees; shall be deemed to be a release to the Contractor or its sureties from any obligations, liabilities or undertakings in connection with the Contract or the Performance Bond or a waiver of any provision of the Contract or of any rights or remedies to which the University may be entitled because of any breach thereof, excepting only a written instrument expressly providing for such release or waiver. No cancellation, rescission or annulment hereof, in whole or as to any part of the Contract, because of any breach hereof, shall be deemed a waiver of any money damages to which the University may be entitled because of such breach. No waiver by the University of any breach of the Contract shall be deemed to be a waiver of any other or any subsequent breach.

Section 4.24 Limitation of Actions

- (1) No action or proceeding shall be maintained by the Contractor, or anyone claiming under or through the Contractor, against the University, or its trustees, officers, agents or employees, upon any claim arising out of or based upon the Contract or any breach thereof or by reason of any act or omission or requirement of the University, or its trustees, officers agents or employees, unless:
 - a. Such action or proceeding is instituted in the Court of Claims for the State of New York;
 - b. The Contractor or the person claiming under or through it shall have strictly complied with all requirements relating to the giving of notices and information with respect to such claims; and
 - c. Such action or proceeding shall be commenced within one (1) year after the submission to the University of the final application for payment or, if the claim is based upon monies required to be retained for any period after the date of the final application for payment, such action is commenced within six (6) months after such monies become due and payable under the terms of the Contract; or
 - d. If the Contract is terminated or the Contractor declared in default by the University, such action is commenced within six (6) months after the date of such termination or declaration of default by the University.
- (2) Notwithstanding anything in the laws of the State of New York to the contrary, the Contractor, or anyone claiming under or through the Contractor, shall not be entitled to any additional time to begin anew any other action if an action commenced within the times herein specified is dismissed or discontinued for any reason whatsoever.

ARTICLE V

Protection of Rights and Property

Section 5.01 Accidents and Accident Prevention

The Contractor shall at all times take reasonable precautions for the safety of persons engaged in the performance of the work. The Contractor shall comply fully with all applicable provisions of the laws of the State of New York, OSHA, and with all valid rules and regulations adopted or promulgated by the agencies of the State of New York pursuant thereto. The Contractor's attention is specifically called to the applicable rules and regulations, codes and bulletins of the New York State Department of Labor.

Section 5.02 Adjoining Property

The Contractor shall be required to protect all the adjoining property and to repair or replace any such properties damaged or destroyed by it, its employees or subcontractors through, by reason of or as a result of activities under, for or related to the Contract.

Section 5.03 Emergencies

- (1) In case of an emergency which threatens loss or injury to persons or property, the Contractor will be allowed to act, without previous instructions from the Consultant or the University, in a diligent manner, to the extent required to avoid or limit such loss or injury, and it shall notify the Consultant and the University immediately thereafter of the action taken by it and of such emergency. Where the Contractor has not taken action but has notified the Consultant or the University of an emergency which threatens loss or injury to persons or property, it shall act in accordance with the instructions and/or authorization by the Consultant or the University.
- (2) In the event that the Contractor performs extra work in accordance with the preceding paragraph, it will be compensated therefore in accordance with the provisions of Section 4.02.

Section 5.04 Fire Safety

- (1) In the event that a municipal fire alarm box is not located within 300 feet from the site of the Project, the Contractor will be required to provide at the site of the Project, at a location approved by the Consultant, a private unlisted telephone reserved for fire calls only. The phone must be in addition to regular business phones and a rule prohibiting its use for purposes other than alarm for fire or other emergencies must be strictly enforced. The phone itself should be colored red and be located at a point quickly available to all employees, including watchmen. Clear instructions for the sending of a fire alarm should be conspicuously posted by the phone and all personnel customarily at work near the phone shall be acquainted with the procedure. If such a phone is required, the Contractor, at its sole cost and expense, must provide the same from the time the University first approves the Contract breakdown to be submitted by the Contractor pursuant to the provisions of Section 4.08 up until the time the University accepts all the work covered by the Contract.
- (2) All solid fuel salamanders and U. L. approved heaters used by the Contractor or any of its subcontractors shall be arranged in a standard manner. All other salamanders used by the Contractor or any of its subcontractors shall require constant attendance of competent persons on each floor where in use.
- (3) All temporary fabric used by the Contractor or any of its subcontractors for curtains or awnings shall be either non-combustible or flame retarded so that it will not burn or propagate flame.

Section 5.05 Risks Assumed by Contractor

- (1) The Contractor solely assumes the following distinct several risks whether they arise from acts or omissions (whether negligent or not and whether supervisory or otherwise) of the Contractor, of the University, of third persons or from any other cause, including unforeseen obstacles and difficulties which may be encountered in the prosecution of the work covered by the Contract, whether such risks are within or beyond the control of the Contractor and whether such risks involve a legal duty, primary or otherwise, imposed upon the State University Construction Fund, the Dormitory Authority of the State of New York, the State of New York or the State University of New York, excepting only risks which arise from defects in maps, plans, designs or Specifications prepared, acquired or used by the Consultant or the University, from the negligence of the University, its agents or employees or from affirmative acts of the State University Construction Fund, the Dormitory Authority of the State of New York, the State of New York or the State University of New York or their trustees, officers, agents or employees committed with intent to cause the loss, damage and injuries herein below set forth:
 - a. The risk of loss or damage, direct or indirect, to the work covered by the Contract or to any plant, equipment, tools, materials or property furnished, used, installed or received by the University or by the Contractor or any subcontractor, materialman or worker performing services or furnishing materials for the work covered hereunder.

The Contractor shall bear such risk of loss or damage until the work covered by the Contract has been fully accepted by the University or until completion of removal of such plant, equipment, tools, materials or property from the construction site and the vicinity thereof, whichever event occurs last. In the event of such loss or damage, the Contractor shall forthwith repair, replace and/or make good any such loss or damage without cost to the University.
 - b. The risk of claims, just or unjust, by third persons against the Contractor, the State University Construction Fund, the Dormitory Authority of the State of New York, the State of New York, or the State University of New York on account of wrongful death, bodily injuries and property damage, direct or consequential, loss or damage of any kind whatsoever arising or alleged to arise out of or as a result of or in connection with the performance by the Contractor of the work covered by the Contract (whether actually caused by or resulting from the performance of the Contract) or out of or in connection with the Contractor's operations or presence at or in the vicinity of the construction site. The Contractor shall bear such risk for all such deaths, injuries, damages or losses sustained or alleged to have been sustained prior to the final acceptance by the University of all work covered by the Contract. The Contractor shall also bear the risk of claims for wrongful death occurring subsequent to said final acceptance provided such death is caused, contributed to or is a consequence of bodily injuries sustained or alleged to have been sustained prior to said final acceptance.
- (2) The Contractor shall indemnify and save harmless the State University Construction Fund, the Dormitory Authority of the State of New York, the State of New York and the State University of New York, their trustees, officers, agents or employees against all claims described above and for all costs and expenses incurred by them in the defense, settlement or satisfaction thereof, including attorneys' fees and court costs. If so directed, the Contractor shall at its own expense defend against such claims, in which event it shall not, without obtaining express advance permission from Counsel of the University, raise any defense involving in any way jurisdiction of the tribunal over the University, governmental nature of the University or the provisions of any statutes respecting suits against the University.
- (3) Neither the University's final acceptance of the work to be performed hereunder nor the making of any payment shall release the Contractor from its obligations under this Section. The enumeration elsewhere in the Contract of particular risks assumed by the Contractor or of particular

claims for which it is responsible shall not be deemed to limit the effect of the provision of this Section or to imply that it assumes or is responsible for only risks or claims of the type enumerated.

Section 5.06 Insurance

(1) General Requirements

- a. Prior to the commencement of the work to be performed by the Contractor, the Contractor shall procure at its sole cost and expense, and maintain in force at all times during this Agreement until Final Payment and as further required by the contract, policies of insurance as herein set forth below. All insurance shall be written by insurance carriers approved by the University licensed to do business in the State of New York ("admitted" carriers), and rated at least "A-" by A.M. Best Company.
- b. Prior to the commencement of the work, the Contractor shall submit to the University, certificates of insurance, in a form acceptable to the University, showing evidence of compliance with all insurance requirements contained in this Agreement. Certificates of Insurance (with the exception of Workers' Compensation and Disability) must be provided on an ACORD 25 Certificate of Insurance, or an equivalent form. Certificates of Insurance shall disclose any deductible, self insured retention, aggregate limit or any exclusion to the policy that materially changes the coverage required by the contract; specify the additional insureds and named insureds as required herein; and be signed by an authorized representative of the insurance carrier or producer. Deductibles or self-insured retentions above \$25,000 are subject to approval by the University and additional security may be required. Certificates shall reference the Contract number. Only original documents will be accepted.
- c. All insurance shall provide that the required coverage apply on a primary and not on an excess or contributing basis as to any other insurance that may be available to the University for any claim arising from the Contractor's work under this Agreement, or as a result of Contractor's activities. Any other insurance maintained by the University shall be in excess of and shall not contribute with the Contractor's insurance, regardless of the "other insurance" clause contained in the University's own policy of insurance. A copy of the endorsement reflecting this requirement may be requested by the University.
- d. Not less than thirty days prior to the expiration date or renewal date, the Contractor shall supply the University with updated replacement certificates of insurance and endorsements. The Contractor shall advise the University of any letter or notification that cancels, materially changes, or non- renews the policy and Contractor shall require the insurance carrier(s) to copy the University on any letter or notification that cancels, materially changes, or non- renews the policy. If, at any time during the period of the Agreement, insurance as required is not in effect, or proof thereof is not provided to the University, the University shall have the options to (i) direct the Contractor to stop work with no additional cost or extension of time due on account thereof; or (ii) treat such failure as an event of default under Section 2.26 of the Agreement. At any time the coverage provisions and limits of the policies required herein do not meet the provisions and limits set forth in the Agreement the Contractor shall immediately cease Work on the Project. The Contractor shall not resume Work on the Project until authorized to do so by the University. Any delay or time lost as a result of the Contractor not having insurance required by the Agreement shall not give rise to a delay claim or any other claim against the University. If required by the University, Contractor shall deliver to the University within forty-five (45) days of such request, a copy of any or all policies of insurance not previously provided, certified by the insurance carrier as true and complete.
- e. Should the Contractor engage a subcontractor, the Contractor shall impose the insurance requirements of this document on those entities, as applicable. Required insurance limits should be determined commensurate with the work of the subcontractor. Contractor shall keep the subcontractor certificates of insurance on file and produce them upon the demand of the University.
- f. The aggregate insurance limits set forth herein shall apply separately to each contract for which a certificate of insurance and/or policy is issued.
- g. Unless otherwise agreed to in writing by the University, policies must be endorsed to provide that there shall be no right of subrogation against the University. To the extent that any of the policies of insurance prohibit such a waiver of subrogation, Contractor shall secure the necessary permission to make this waiver.
- h. Except as otherwise specifically provided herein or agreed in writing, policies must be written on an occurrence basis. The insurance policy(ies) shall name the State University Construction Fund, State University of New York, State of New York, its officers, agents, and employees as additional insureds thereunder. The additional insured requirement does not apply to Workers' Compensation or Disability coverage. Include ISO Endorsement CG 20 10 11 85 or its equivalent.

(2) Specific Coverage and Limits

The Contractor shall obtain and maintain in full force and effect, the following insurance with limits not less than those described below and as required by the terms of the contract, or as required by law, whichever is greater. The Commercial General Liability policy, and any umbrella/excess policies used to meet the "Each occurrence" limits specified below, must be endorsed to be primary with respects to the coverage afforded the Additional Insureds.

- a. Commercial General Liability Insurance. A Commercial General Liability insurance policy with coverage that shall include, but not be limited to coverage for bodily injury, property damage, personal/advertising injury, premises liability, independent contractors, blanket contractual liability including tort liability of another assumed in contract, liability arising from all work and operations under this Agreement, defense and indemnification obligations, including those assumed under contract, cross liability coverage for additional insureds, products/completed operations for a term no less than three years commencing upon acceptance of the work, explosion, collapse, and underground hazards, contractor means and methods, and liability resulting from Section 240 or Section 241 of the NYS Labor Law. The limits under such policy shall not be less than \$2,000,000 each occurrence; \$2,000,000 general aggregate; and products/completed operations with an aggregate limit of \$2,000,000.
- b. Workers Compensation and Disability Benefits as required by New York State for the life of this Agreement for the benefit of

employees required to be covered by the New York State Workers Compensation Law and the New York State Disability Benefits Law. Evidence of coverage must be provided on forms specified by the Chairman of the Workers Compensation Board.

- c. Comprehensive Business Automobile Liability Insurance. A policy with a combined single limit for bodily injury and property damage of no less than \$1,000,000 covering liability arising out of the use of any motor vehicle in connection with the work, including owned, leased, hired, and non owned vehicles bearing, or, under the circumstances under which they are being used, required by the Motor Vehicle Laws of the State of New York to bear license plates and shall name the State of New York, State University of New York, and the State University Construction Fund as additional insureds. If the contract involves the removal of hazardous waste from the project site or otherwise transporting hazardous materials, pollution liability coverage for covered autos shall be provided by form CA 99 48 03 06 or CA 00 12 03 06 and the Motor Carrier Act Endorsement (MCS90) shall be attached.
- d. Umbrella and Excess Liability. When the limits of the Commercial General Liability, Auto, and/or Employers Liability policies procured are insufficient to meet the limits specified, the Contractor shall procure and maintain Commercial Umbrella and/or Excess Liability policies with limits in excess of the primary, provided, however, that the total amount of insurance coverage is at least equal to the requirements set forth above. Such policies shall follow the same form as the primary. Any insurance maintained by the University or additional insured shall be considered excess of and shall not contribute with any other insurance procured or maintained by the Contractor including primary, umbrella and excess liability regardless of the "other insurance" clause contained in either party's policy.
- e. Owner's Protective Liability Insurance. A policy issued to and covering the liability for damages imposed by law upon the State University Construction Fund, the Dormitory Authority of the State of New York, the State of New York and The State University of New York, its trustees, officers, agents and employees, , with respect to all operations under this Contract by the Contractor and its subcontractors, and/or their interest in the Project and the property upon which work under the Contract is to be performed, including in such coverage any omissions and supervisory acts of the State University Construction Fund, the Dormitory Authority and the State University of New York, its trustees, officers, agents and employees. The State University of New York shall be the named insured in the OCP Policy. OCP policy limits shall be no less than \$1,000,000 each occurrence and \$2,000,000 general aggregate.
- f. Asbestos Abatement Insurance. A liability insurance policy issued to and covering the liability, of the Contractor and/or subcontractor engaged in the removal, handling or wrapping of asbestos, if any of such work is to be performed under the Contract, for bodily injury, illness, sickness or property damage caused by exposure to asbestos in an amount not less than \$1,000,000 per occurrence and \$2,000,000 aggregate. The Contractor and/or its aforesaid subcontractor shall either obtain an endorsement to the aforesaid required insurance policy adding the State University Construction Fund, the Dormitory Authority of the State of New York, the State of New York and the State University of New York, their trustees, officers, agents or employees, as additional parties insured thereunder or shall obtain a separate owner's protective liability insurance policy for such parties with coverage similar to that required by the first sentence of this subdivision. In addition, any Contractor or subcontractor engaged in the removal, handling, or wrapping of asbestos shall, to the fullest extent permitted by law, hold harmless and indemnify the State University Construction Fund, the Dormitory Authority of the State of New York, the State of New York and the State University of New York, their trustees, officers, agents or employees, for any claims or liabilities in connection with illness or sickness arising from work performed, not performed, or which should have been performed. The Contractor shall have said hold-harmless and indemnification conditions stipulated in all Contracts with subcontractors.

Section 5.07 Builder's Risk Insurance

- (1) The Contractor shall procure and maintain, at its own cost and expense, until final acceptance of all work covered by this Contract or until the Project has been turned over for use by the State University of New York, whichever event occurs earlier, a builder's risk insurance policy covering all risks, with fire, extended coverage, vandalism and malicious mischief coverage. The policy shall cover the cost of removing debris, including demolition as may be legally necessary by operation of any law, ordinance, or regulation, and property of the State held in their care, custody and/or control.
- (2) The policy shall be in an amount equal to the Project's insurable value, i.e., the Contract consideration less the cost of the Contractor's Performance and Labor and Material Bonds; the cost of trees, shrubbery, lawn grass, plants and the maintenance of the same; the cost of demolition; the cost of excavation; the cost of foundations, piers or other supports which are below the undersurface of the lowest basement floor, or where there is no basement, which are below the surface of the ground, concrete and masonry work; the cost of underground flues, pipes or wiring; the cost of earthmoving, grading and the cost of paving, roads, walks, parking lots or athletic fields; and the cost of bridges, tunnels, dams, piers, wharves, docks, retaining walls and radio and/or television towers and antennas.
- (3) The policy may contain a provision for a \$500 deductible for each loss to a Project having an insurable value of less than \$1,500,000 and a \$1,000 deductible for each loss to a Project having an insurable value of \$1,500,000 or more.
- (4) The Builders' Risk policy shall contain an endorsement to provide that The State of New York, The University, the Contractor and its subcontractors shall be named as loss payee for the Work in order of precedence, as their interests may appear in said policy.
- (5) The Builders' Risk policy shall contain an endorsement to provide that in the event the loss occurs at an occupied facility, occupancy shall be permitted without the consent of the insurance company.
- (6) The Contractor shall have the sole responsibility to promptly report any loss to the insurer and/or its representatives and to furnish the latter with all necessary details relating to the occurrence of the loss and the amount thereof. The University, the Contractor and all subcontractors of the Contractor waive all rights, each against the others, for damages caused by fire or other perils covered by insurance provided under the terms of this Section, except such rights as they may have to the proceeds of insurance received; provided, however, this waiver shall not apply to any manufacturer, supplier or similar agent under any guarantee or warranty.
- (7) The Contractor shall not violate or permit to be violated any condition of such policy and shall at all times satisfy the fire safety requirements of the University and the insurance company issuing the same.

- (8) The procurement and maintenance of said policy shall in no way be construed or be deemed to relieve the Contractor from any of the obligations and risks imposed upon it by this Contract or to be a limitation on the nature or extent of such obligations and risks.
- (9) Not less than thirty days prior to the expiration date or renewal date, the Contractor shall supply the University with an updated replacement certificate of insurance and endorsements. The Contractor shall advise the University of any letter or notification that cancels, materially changes, or non- renews the policy and Contractor shall require the insurance carrier(s) to copy the University on any letter or notification that cancels, materially changes, or non- renews the policy. Before the Contractor shall be entitled to have any progress payment rendered on account of the work which is to be insured pursuant to this Section, it shall furnish to the University a certificate in duplicate of the insurance herein required. Such insurance must be procured from an insurance carrier approved by the University, licensed to do business in the State of New York ("admitted" carrier), and rated at least "A-" by A.M. Best Company.
- (10) In the event that the Builders' Risk policy has been issued by a mutual insurance company, the following language shall be included: "The State University of New York is not liable for any premium or assessment under this policy of insurance. The First Named Insured is solely liable therefore."

Section 5.08 Effect of Procurement of Insurance

Neither the procurement nor the maintenance of such insurance shall in any way affect or limit the obligations, responsibilities or liabilities of the Contractor hereunder.

Section 5.09 No Third Party Rights

Nothing in the Contract shall create or give to third parties, except the State University Construction Fund, the Dormitory Authority of the State of New York, the State of New York and the State University of New York, any claim or right of action against the Contractor, the Consultant, the State University Construction Fund, the Dormitory Authority of the State of New York, the State of New York or the State University of New York beyond such as may legally exist irrespective of the Contract.

ARTICLE VI

Affirmative Action

The State University's requirements for affirmative action are set forth in "Exhibit A-1" which is attached hereto and made a part hereof, and shall be deemed to be inserted herein and the Contract shall be read and enforced as though it were included herein and, in the event any such provision is not inserted or is not correctly inserted, then, upon the application of either party, this Contract shall forthwith be physically amended to make such insertion or correction.

ARTICLE VII

Provisions Required by Law

Section 7.01 Provisions Deemed Inserted

Each and every provision required by law to be inserted in the Contract, including, but not limited to, the provisions set forth in Exhibit "A" which is attached hereto and made a part hereof, shall be deemed to be inserted herein and the Contract shall be read and enforced as though it were included herein and, in the event any such provision is not inserted or is not correctly inserted, then, upon the application of either party, this Contract shall forthwith be physically amended to make such insertion or correction.

Section 7.02 Entire Agreement

This Agreement consists of 1) the IFB; 2) the contractor's proposal; and 3) Exhibits A and A-1. This Agreement supersedes all previous understandings and agreements with respect to the Project or any of the provisions thereof. No statement, promise, condition, understanding, inducement, or representation, oral or written, expressed or implied, which is not contained herein shall be binding or valid and this Agreement shall not be changed, modified or altered in any manner except by an instrument in writing executed by the parties hereto.

Section 7.03 Hierarchy of Precedent

In the event of any controversy regarding the provisions of this Agreement, the terms of Exhibits A and A1 shall take precedence followed by this Agreement, the IFB and the contractor's proposal.

Section 7.04 Wage Rates

The Contractor shall post the appropriate prevailing wage schedules in a conspicuous place at the construction site. The Department of Labor shall provide the Contractor with posters relating to prevailing wage rates and the same shall be displayed by the Contractor in a conspicuous place at the construction site. The Contractor shall also distribute wallet cards, to be provided by the Department of Labor, to all workers engaged at the construction site containing information relating to wage rates and telephone numbers to call if a worker believes his or her rights are being violated. The Contractor shall provide each worker with a written notice, informing them of the applicable prevailing wage requirements, and the Contractor must obtain a signed statement or declaration from such worker attesting to the fact that he or she has been given this information. Further, the Contractor is required to keep certified copies of its payrolls at the construction site.

Section 7.05 Contractor Responsibility

(a) *General Responsibility.* The Contractor shall at all times during the term of this Agreement remain responsible. The Contractor agrees, if requested by the SUNY Chancellor or his or her designee, to present evidence of its continuing legal authority to do business in New York State, integrity, experience, ability, prior performance, and organizational and financial capacity. (b) *Suspension of Work for Non-Responsibility.* The SUNY Chancellor, in his or her sole discretion, reserves the right to suspend any or all activities under this Agreement at any time when he or she discovers information that calls into question the responsibility of the Contractor. In the event of such suspension, the Contractor will be given written notice outlining the particulars of such suspension. Upon issuance of such notice, the Contractor must comply with the terms of the suspension order. Activity under this Agreement may resume at such time as the SUNY Chancellor or his or her designee issues a written notice authorizing a resumption of performance under the Agreement. (c) *Termination for Non-Responsibility.* Upon written notice to the Contractor and a reasonable opportunity to be heard with appropriate SUNY officials or staff, this Agreement may be terminated by the SUNY Chancellor or his or her designee at the Contractor's expense, where the Contractor is determined by the SUNY Chancellor or his or her designee to be non-responsible. In such event, the SUNY Chancellor or his or her designee may complete the contractual requirements in any manner he or she may deem advisable and pursue available legal or equitable remedies for breach.

Section 7.06 – Governing Law

This Agreement shall be governed, construed and enforced in accordance with the laws of New York State, excluding New York State's choice of law principles, and all claims relating to or arising out of this Agreement or the breach thereof, whether sounding in contract, tort or otherwise, shall likewise be governed by the laws of New York State, excluding the New York choice of law principles. Consultant agrees to submit itself to such courts' jurisdiction.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement as of the day and year first above written.

Agency Certification: "In addition to the acceptance of this Contract, it is certified that an originally executed copy of this signature page will be attached to an exact copy of the Contract Documents, and forwarded to the Contractor".

STATE UNIVERSITY OF NEW YORK

By: _____ Date ____/____/____ Agency Code **28260**
(campus official)

CONTRACTOR

(If Corporation, Affix Seal)

By: _____ Date ____/____/____

(If Corporation, Affix Seal)

ACKNOWLEDGMENTS
(ACKNOWLEDGMENT BY AN INDIVIDUAL)

STATE OF NEW YORK)
) ss.:
COUNTY OF)

On this _____ day of _____, 20_____, before me personally came

_____, to me known and known to me to be the person(s) described in and
who executed the foregoing instrument and he/she acknowledged to me that he/she executed the same.

Notary Public

(ACKNOWLEDGMENT BY A PARTNERSHIP)

STATE OF NEW YORK)
) ss.:
COUNTY OF)

On this _____ day of _____, 20_____, before me personally
came _____

_____, to me known and known to me to be the person who executed the above instrument,
who, being duly sworn by me, did for themself depose and say that they are a member of the firm of _____

_____, consisting of themself and

_____, that he/she executed the foregoing instrument in the firm name _____
_____, and that he/she had authority to sign the same, and that he/she did duly
acknowledge to me that he/she executed the same as the act and deed of the aforementioned firm for the purposes mentioned therein.

Notary Public

(ACKNOWLEDGMENT BY A CORPORATION)

STATE OF)
) ss.:
COUNTY OF)

On this _____ day of _____, 20_____, before me personally
came _____

_____, to me known, who, being duly sworn, did depose and say that he/she reside in
_____; that he/she is the

of the _____, the corporation described in and
which executed the foregoing instrument; that he/she knows the seal of said corporation; that the seal affixed to said instrument was such
corporate seal; that it was affixed by the order of the Board of Directors of said corporation, and that he/she signed their name thereto by
like order.

Notary Public

Attach Exhibit A and Exhibit A-1

SCHEDULE I

The following Unit Prices shall apply for additional work authorized by Change Order:

UNIT PRICES

<u>Description of Unit Price</u>	<u>Amount of Unit Price</u>
None	

The total bid includes the following Allowances:

ALLOWANCES

BMS Controls as furnished by Siemens - Forty-five thousand three hundred dollars and no cents (\$45,300.00) + tax

EXHIBIT A

The parties to the attached contract, license, lease, amendment or other agreement (hereinafter, "contract") agree to be bound by the following clauses which are hereby made a part of the contract (the word "Contractor" herein refers to any party other than the State, whether a Contractor, licensor, licensee, lessor, lessee or any other party):

1. EXECUTORY CLAUSE. In accordance with Section 41 of the State Finance Law, the State shall have no liability under this contract to the Contractor or to anyone else beyond funds appropriated and available for this contract.

2. PROHIBITION AGAINST ASSIGNMENT
Except for the assignment of its right to receive payments subject to Article 5-A of the State Finance Law, the Contractor selected to perform the services herein are prohibited in accordance with Section 138 of the State Finance Law from assigning, transferring, conveying, subletting or otherwise disposing of its rights, title or interest in the contract without the prior written consent of SUNY and attempts to do so are null and void. Notwithstanding the foregoing, SUNY may, with the concurrence of the New York Office of State Comptroller, waive prior written consent of the assignment, transfer, conveyance, sublease or other disposition of a contract let pursuant to Article XI of the State Finance Law if the assignment, transfer, conveyance, sublease or other disposition is due to a reorganization, merger or consolidation of Contractor's its business entity or enterprise and Contractor so certifies to SUNY. SUNY retains the right, as provided in Section 138 of the State Finance Law, to accept or reject an assignment, transfer, conveyance, sublease or other disposition of the contract, and to require that any Contractor demonstrate its responsibility to do business with SUNY.

3. COMPTROLLER'S APPROVAL. (a) In accordance with Section 112 of the State Finance Law, Section 355 of New York State Education Law, and 8 NYCRR 316, Comptroller's approval is not required for the following contracts: (i) materials; (ii) equipment and supplies, including computer equipment; (iii) motor vehicles; (iv) construction; (v) construction-related services; (vi) printing; and (vii) goods for State University health care facilities, including contracts for goods made with joint or group purchasing arrangements.

(b) Comptroller's approval is required for the following contracts: (i) contracts for services not listed in Paragraph (3)(a) above made by a State University campus or health care facility certified by the Vice Chancellor and Chief Financial Officer, if the contract value exceeds \$250,000; (ii) contracts for services not listed in Paragraph (3)(a) above made by a State University campus not certified by the Vice Chancellor and Chief Financial Officer, if the contract value exceeds \$50,000; (iii) contracts for services not listed in Paragraph (3)(a) above made by health care facilities not certified by the Vice Chancellor and Chief Financial Officer, if the contract value exceeds \$75,000; (iv) contracts whereby the State University agrees to give something other than money, when the value or reasonably estimated value of such consideration exceeds \$10,000; (v) contracts for real property transactions if the contract value exceeds \$50,000; (vi) all other contracts not listed in Paragraph 3(a) above, if the contract value exceeds \$50,000, e.g. SUNY acquisition of a business and New York State Finance Article 11-B contracts and (vii) amendments for any amount to contracts not listed in Paragraph (3)(a) above, when as so amended, the contract exceeds the threshold amounts stated in Paragraph (b) herein. However, such pre-approval shall not be required for any contract established as a centralized contract through the Office of General Services or for a purchase order or other transaction issued under such centralized contract.

(c) Any contract that requires Comptroller approval shall not be valid, effective or binding

upon the State University until it has been approved by the Comptroller and filed in the Comptroller's office.

4. WORKERS' COMPENSATION BENEFITS. In accordance with Section 142 of the State Finance Law, this contract shall be void and of no force and effect unless the Contractor shall provide and maintain coverage during the life of this contract for the benefit of such employees as are required to be covered by the provisions of the Workers' Compensation Law.

5. NON-DISCRIMINATION REQUIREMENTS. To the extent required by Article 15 of the Executive Law (also known as the Human Rights Law) and all other State and Federal statutory and constitutional non-discrimination provisions, the Contractor will not discriminate against any employee or applicant for employment because of race, creed, color, sex, (including gender identity or expression), national origin, sexual orientation, military status, age, disability, predisposing genetic characteristics, marital status or domestic violence victim status. Furthermore, in accordance with Section 220-e of the Labor Law, if this is a contract for the construction, alteration or repair of any public building or public work or for the manufacture, sale or distribution of materials, equipment or supplies, and to the extent that this contract shall be performed within the State of New York, Contractor agrees that neither it nor its subcontractors shall, by reason of race, creed, color, disability, sex, or national origin: (a) discriminate in hiring against any New York State citizen who is qualified and available to perform the work; or (b) discriminate against or intimidate any employee hired for the performance of work under this contract. If this is a building service contract as defined in Section 230 of the Labor Law, then, in accordance with Section 239 thereof, Contractor agrees that neither it nor its subcontractors shall by reason of race, creed, color, national origin, age, sex or disability: (a) discriminate in hiring against any New York State citizen who is qualified and available to perform the work; or (b) discriminate against or intimidate any employee hired for the performance of work under this contract. Contractor is subject to fines of \$50.00 per person per day for any violation of Section 220-e or Section 239 as well as possible termination of this contract and forfeiture of all moneys due hereunder for a second or subsequent violation

6. WAGE AND HOURS PROVISIONS. If this is a public work contract covered by Article 8 of the Labor Law or a building service contract covered by Article 9 thereof, neither Contractor's employees nor the employees of its subcontractors may be required or permitted to work more than the number of hours or days stated in said statutes, except as otherwise provided in the Labor Law and as set forth in prevailing wage and supplement schedules issued by the State Labor Department. Furthermore, Contractor and its subcontractors must pay at least the prevailing wage rate and pay or provide the prevailing supplements, including the premium rates for overtime pay, as determined by the State Labor Department in accordance with the Labor Law. Additionally, effective April 28, 2008, if this is a public work contract covered by Article 8 of the Labor Law, the Contractor understands and agrees that the filing of payrolls in a manner consistent with Subdivision 3-a of Section 220 of the Labor Law shall be a condition precedent to payment by SUNY of any SUNY-approved sums due and owing for work done upon the project.

7. NON-COLLUSIVE BIDDING CERTIFICATION. In accordance with Section 139-d of the State Finance Law, if this contract was awarded based on the submission of competitive bids, Contractor affirms, under penalty of perjury, and each person signing on behalf of Contractor, and in the case of a joint bid each party thereto certifies as to its own organization, under penalty of perjury, that to the best of its knowledge and belief that its bid was arrived at independently and without collusion aimed at restricting competition. Contractor further affirms that, at the time Contractor submitted its bid, an authorized and responsible person executed and delivered it to SUNY a non-collusive bidding certification on Contractor's behalf.

8. INTERNATIONAL BOYCOTT PROHIBITION. In accordance with Section 220-f of the Labor Law and Section 139-h of the State Finance Law, if this contract exceeds \$5,000, the Contractor agrees, as a material condition of the contract, that neither the Contractor nor any substantially owned or affiliated person, firm, partnership or corporation has participated, is participating, or shall participate in an international boycott in violation of the federal Export Administration Act of 1979 (50 USC App. Sections 2401 *et seq.*) or regulations thereunder. If such Contractor, or any of the aforesaid affiliates of Contractor, is convicted or is otherwise found to have violated said laws or regulations upon the final determination of the United States Commerce Department or any other appropriate agency of the United States subsequent to the contract's execution, such contract, amendment or modification thereto shall be rendered forfeit and void. The Contractor shall so notify the State Comptroller within five (5) business days of such conviction, determination or disposition of appeal (2 NYCRR 105.4).

9. SET-OFF RIGHTS. The State shall have all of its common law, equitable and statutory rights of set-off. These rights shall include, but not be limited to, the State's option to withhold for the purposes of set-off any moneys due to the Contractor under this contract up to any amounts due and owing to the State with regard to this contract, any other contract with any State department or agency, including any contract for a term commencing prior to the term of this contract, plus any amounts due and owing to the State for any other reason including, without limitation, tax delinquencies or monetary penalties relative thereto. The State shall exercise its set-off rights in accordance with normal State practices including, in cases of set-off pursuant to an audit, the finalization of such audit by the State, its representatives, or the State Comptroller.

10. RECORDS. The Contractor shall establish and maintain complete and accurate books, records, documents, accounts and other evidence directly pertinent to performance under this contract (hereinafter, collectively, "the Records"). The Records must be kept for the balance of the calendar year in which they were made and for six (6) additional years thereafter. The State Comptroller, the Attorney General and any other person or entity authorized to conduct an examination, as SUNY and its representatives and entities involved in this contract, shall have access to the Records during normal business hours at an office of the Contractor within the State of New York or, if no such office is available, at a mutually agreeable and reasonable venue within the State, for the term specified above for the purposes of inspection, auditing and copying. SUNY shall take reasonable steps to protect from public disclosure any of the Records which are

exempt from disclosure under Section 87 of the Public Officers Law (the "Statute") provided that: (i) the Contractor shall timely inform an appropriate SUNY official, in writing, that said Records should not be disclosed; and (ii) said Records shall be sufficiently identified; and (iii) designation of said Records as exempt under the Statute is reasonable. Nothing contained herein shall diminish, or in any way adversely affect, SUNY's or the State's right to discovery in any pending or future litigation.

11. IDENTIFYING INFORMATION AND PRIVACY NOTIFICATION.

Identification Number(s). Every invoice or New York State Claim for Payment submitted to the State University of New York by a payee, for payment for the sale of goods or services or for transactions (e.g., leases, easements, licenses, etc.) related to real or personal property must include the payee's identification number. The number is any or all of the following: (i) the payee's Federal employer identification number, (ii) the payee's Federal social security number, and/or (iii) the payee's Vendor Identification Number assigned by the Statewide Financial System. Failure to include such number or numbers may delay payment. Where the payee does not have such number or numbers, the payee, on its invoice or Claim for Payment, must give the reason or reasons why the payee does not have such number or numbers.

(b) Privacy Notification. (1) The authority to request the above personal information from a seller of goods or services or a lessor of real or personal property, and the authority to maintain such information, is found in Section 5 of the State Tax Law. Disclosure of this information by the seller or lessor to the State University of New York is mandatory. The principal purpose for which the information is collected is to enable the State to identify individuals, businesses and others who have been delinquent in filing tax returns or may have understated their tax liabilities and to generally identify persons affected by the taxes administered by the Commissioner of Taxation and Finance. The information will be used for tax administration purposes and for any other purpose authorized by law. (2) The personal information is requested by the purchasing unit of the State University of New York contracting to purchase the goods or services or lease the real or personal property covered by this contract or lease. The information is maintained in the Statewide Financial System by the Vendor Management Unit within the Bureau of State Expenditures, Office of the State Comptroller, 110 State Street, Albany, New York 12236.

12. EQUAL EMPLOYMENT OPPORTUNITIES FOR MINORITIES AND WOMEN.

(a) In accordance with Section 312 of the Executive Law and 5 NYCRR 143, if this contract is: (i) a written agreement or purchase order instrument, providing for a total expenditure in excess of \$25,000.00, whereby a contracting agency is committed to expend or does expend funds in return for labor, services, supplies, equipment, materials or any combination of the foregoing, to be performed for, or rendered or furnished to the contracting agency; or (ii) a written agreement in excess of \$100,000.00 whereby a contracting agency is committed to expend or does expend funds for the acquisition, construction, demolition, replacement, major repair or renovation of real property and improvements thereon; or (iii) a written agreement in excess of \$100,000.00 whereby the owner of a State assisted housing project is committed to expend or does expend funds for the acquisition, construction, demolition, replacement, major repair or renovation of real property and improvements thereon for such project, then the following shall apply and by signing this agreement the Contractor certifies and affirms that it is Contractor's equal employment opportunity policy that:

(1) The Contractor will not discriminate against employees or applicants for employment because of race, creed, color, national origin, sex, age, disability or marital status, and will undertake or

continue existing programs of affirmative action to ensure that minority group members and women are afforded equal employment opportunities without discrimination. Affirmative action shall mean recruitment, employment, job assignment, promotion, upgradings, demotion, transfer, layoff, or termination and rates of pay or other forms of compensation;

(2) at SUNY's request, Contractor shall request each employment agency, labor union, or authorized representative of workers with which it has a collective bargaining or other agreement or understanding, to furnish a written statement that such employment agency, labor union or representative will not discriminate on the basis of race, creed, color, national origin, sex, age, disability or marital status and that such union or representative will affirmatively cooperate in the implementation of the Contractor's obligations herein; and

(3) Contractor shall state, in all solicitations or advertisements for employees, that, in the performance of the State contract, all qualified applicants will be afforded equal employment opportunities without discrimination because of race, creed, color, national origin, sex, age, disability or marital status.

(b) Contractor will include the provisions of "1", "2" and "3", above, in every subcontract over \$25,000.00 for the construction, demolition, replacement, major repair, renovation, planning or design of real property and improvements thereon (the "Work") except where the Work is for the beneficial use of the Contractor. Section 312 does not apply to: (i) work, goods or services unrelated to this contract; or (ii) employment outside New York State. The State shall consider compliance by a Contractor or sub-contractor with the requirements of any federal law concerning equal employment opportunity which effectuates the purpose of this section. SUNY shall determine whether the imposition of the requirements of the provisions hereof duplicate or conflict with any such federal law and if such duplication or conflict exists, SUNY shall waive the applicability of Section 312 to the extent of such duplication or conflict. Contractor will comply with all duly promulgated and lawful rules and regulations of the Department of Economic Development's Division of Minority and Women's Business Development pertaining hereto.

13. **CONFLICTING TERMS.** In the event of a conflict between the terms of the contract (including any and all attachments thereto and amendments thereof) and the terms of this Exhibit A, the terms of this Exhibit A shall control.

14. **GOVERNING LAW.** This contract shall be governed by the laws of the State of New York except where the Federal supremacy clause requires otherwise.

15. **LATE PAYMENT.** Timeliness of payment and any interest to be paid to Contractor for late payment shall be governed by Article 11-A of the State Finance Law to the extent required by law.

16. **NO ARBITRATION.** Disputes involving this contract, including the breach or alleged breach thereof, may not be submitted to binding arbitration (except where statutorily authorized) but must, instead, be heard in a court of competent jurisdiction of the State of New York.

17. **SERVICE OF PROCESS.** In addition to the methods of service allowed by the State Civil Practice Law & Rules ("CPLR"), Contractor hereby consents to service of process upon it by registered or certified mail, return receipt requested. Service hereunder shall be complete upon Contractor's actual receipt of process or upon the State's receipt of the return thereof by the United States Postal Service as refused or undeliverable. Contractor must promptly notify the State, in writing, of each and every change of address to which service of process can be made. Service by the State to the last known address shall be sufficient. Contractor will have thirty (30) calendar days after service hereunder is complete

in which to respond.

18. **PROHIBITION ON PURCHASE OF TROPICAL HARDWOODS.** The Contractor certifies and warrants that all wood products to be used under this contract award will be in accordance with, but not limited to, the specifications and provisions of State Finance Law §165 (Use of Tropical Hardwoods), which prohibits purchase and use of tropical hardwoods, unless specifically exempted, by the State or any governmental agency or political subdivision or public benefit corporation. Qualification for an exemption under this law will be the responsibility of the contractor to establish to meet with the approval of the State. In addition, when any portion of this contract involving the use of woods, whether supply or installation, is to be performed by any subcontractor, the prime Contractor will indicate and certify in the submitted bid proposal that the subcontractor has been informed and is in compliance with specifications and provisions regarding use of tropical hardwoods as detailed in Section 165 of the State Finance Law. Any such use must meet with the approval of the State, otherwise, the bid may not be considered responsive. Under bidder certification, proof of qualification for exemption will be the responsibility of the Contractor to meet with the approval of the State.

19. **MacBRIDE FAIR EMPLOYMENT PRINCIPLES.** In accordance with the MacBride Fair Employment Principles (Chapter 807 of the Laws of 1992), the Contractor hereby stipulates that Contractor and any individual or legal entity in which the Contractor holds a ten percent or greater ownership interest and any individual or legal entity that holds a ten percent or greater ownership interest in the Contractor either (a) have no business operations in Northern Ireland, or (b) shall take lawful steps in good faith to conduct any business operations in Northern Ireland in accordance with the MacBride Fair Employment Principles (as described in Section 165(5) of the State Finance Law), and shall permit independent monitoring of compliance with such principles.

20. **OMNIBUS PROCUREMENT ACT OF 1992.** It is the policy of New York State to maximize opportunities for the participation of New York State business enterprises, including minority and women-owned business enterprises as bidders, subcontractors and suppliers on its procurement contracts.

Information on the availability of New York State subcontractors and suppliers is available from:

NYS Department of Economic Development
Division for Small Business
30 South Pearl St., 7th Floor
Albany, NY 12245
Tel: 518-292-5100
Fax: 518-292-5884
email: opa@esd.ny.gov

A directory of certified minority and women-owned business enterprises is available from:

NYS Department of Economic Development
Division of Minority and Women's Business Development
633 Third Avenue
New York, NY 10017
212-803-2414

email: mwbecertification@esd.ny.gov
<https://ny.newnyccontracts.com/FrontEnd/VendorSearchPublic.asp>

The Omnibus Procurement Act of 1992 requires that by signing this bid proposal or contract, as applicable, Contractors certify that whenever the total bid amount is greater than \$1 million:

(a) The Contractor has made reasonable efforts to encourage the participation of New York State Business Enterprises as suppliers and subcontractors, including certified minority and women-owned business enterprises, on this project, and has retained the documentation of

these efforts to be provided upon request to SUNY;

(b) The Contractor has complied with the Federal Equal Employment Opportunity Act of 1972 (P.L. 92-261), as amended;

(c) The Contractor agrees to make reasonable efforts to provide notification to New York State residents of employment opportunities on this project through listing any such positions with the Job Search Division of the New York State Department of Labor, or providing such notification in such manner as is consistent with existing collective bargaining contracts or agreements. The contractor agrees to document these efforts and to provide said documentation to the State upon request; and

(d) The Contractor acknowledges notice that SUNY may seek to obtain offset credits from foreign countries as a result of this contract and agrees to cooperate with SUNY in these efforts.

21. RECIPROCITY AND SANCTIONS

PROVISIONS. Bidders are hereby notified that if their principal place of business is located in a country, nation, province, state or political subdivision that penalizes New York State vendors, and if the goods or services they offer will be substantially produced or performed outside New York State, the Omnibus Procurement Act of 1994 and 2000 amendments (Chapter 684 and Chapter 383, respectively) require that they be denied contracts which they would otherwise obtain. Contact the NYS Department of Economic Development, Division for Small Business, 30 South Pearl Street, Albany, New York 12245, for a current list of jurisdictions subject to this provision.

22. COMPLIANCE WITH NEW YORK STATE INFORMATION SECURITY BREACH AND NOTIFICATION ACT. Contractor shall comply with the provisions of the New York State Information Security Breach and Notification Act (General Business Law Section 899-aa; State Technology Law Section 208).

23. COMPLIANCE WITH CONSULTANT DISCLOSURE LAW If this is a contract for consulting services, defined for purposes of this requirement to include analysis, evaluation, research, training, data processing, computer

programming, engineering, environmental health and mental health services, accounting, auditing, paralegal, legal or similar services, then in accordance with Section 163(4-g) of the State Finance Law, the Contractor shall timely, accurately and properly comply with the requirement to submit an annual employment report for the contract to SUNY, the Department of Civil Service and the State Comptroller.

24. PURCHASES OF APPAREL AND SPORTS EQUIPMENT. In accordance with State Finance Law Section 165(7), SUNY may determine that a bidder on a contract for the purchase of apparel or sports equipment is not a responsible bidder as defined in State Finance Law Section 163 based on (a) the labor standards applicable to the manufacture of the apparel or sports equipment, including employee compensation, working conditions, employee rights to form unions and the use of child labor; or (b) bidder's failure to provide information sufficient for SUNY to determine the labor conditions applicable to the manufacture of the apparel or sports equipment.

25. PROCUREMENT LOBBYING. To the extent this agreement is a "procurement contract" as defined by State Finance Law Sections 139-j and 139-k, by signing this agreement the contractor certifies and affirms that all disclosures made in accordance with State Finance Law Sections 139-j and 139-k are complete, true and accurate. In the event such certification is found to be intentionally false or intentionally incomplete, the State may terminate the agreement by providing written notification to the Contractor in accordance with the terms of the agreement.

26. CERTIFICATION OF REGISTRATION TO COLLECT SALES AND COMPENSATING USE TAX BY CERTAIN STATE CONTRACTORS, AFFILIATES AND SUBCONTRACTORS. To the extent this agreement is a contract as defined by Tax Law Section 5-a, if the Contractor fails to make the certification required by Tax Law Section 5-a or if during the term of the contract, the Department of Taxation and Finance or SUNY discovers that the certification, made under penalty of perjury, is false, then such failure to file or false certification shall be a material breach of this contract and this contract may be terminated, by providing written notification to the Contractor

in accordance with the terms of the agreement, if SUNY determines that such action is in the best interests of the State.

27. IRAN DIVESTMENT ACT. By entering into this Agreement, Contractor certifies in accordance with State Finance Law §165-a that it is not on the "Entities Determined to be Non-Responsive Bidders/Offerers pursuant to the New York State Iran Divestment Act of 2012" ("Prohibited Entities List") posted at:

<http://www.oqs.ny.gov/about/regs/docs/ListofEntities.pdf>

Contractor further certifies that it will not utilize on this Contract any subcontractor that is identified on the Prohibited Entities List. Contractor agrees that should it seek to renew or extend this Contract, it must provide the same certification at the time the Contract is renewed or extended. Contractor also agrees that any proposed Assignee of this Contract will be required to certify that it is not on the Prohibited Entities List before the contract assignment will be approved by the State.

During the term of the Contract, should the state agency receive information that a person (as defined in State Finance Law §165-a) is in violation of the above-referenced certifications, the state agency will review such information and offer the person an opportunity to respond. If the person fails to demonstrate that it has ceased its engagement in the investment activity which is in violation of the Act within 90 days after the determination of such violation, then the state agency shall take such action as may be appropriate and provided for by law, rule, or contract, including, but not limited to, imposing sanctions, seeking compliance, recovering damages, or declaring the Contractor in default.

The state agency reserves the right to reject any bid, request for assignment, renewal or extension for an entity that appears on the Prohibited Entities List prior to the award, assignment, renewal or extension of a contract, and to pursue a responsibility review with respect to any entity that is awarded a contract and appears on the Prohibited Entities list after contract award.

THE FOLLOWING PROVISIONS SHALL APPLY ONLY TO THOSE CONTRACTS TO WHICH A HOSPITAL OR OTHER HEALTH SERVICE FACILITY IS A PARTY

28. Notwithstanding any other provision in this contract, the hospital or other health service facility remains responsible for insuring that any service provided pursuant to this contract complies with all pertinent provisions of Federal, state and local statutes, rules and regulations. In the foregoing sentence, the word "service" shall be construed to refer to the health care service rendered by the hospital or other health service facility.

29. (a) In accordance with the 1980 Omnibus Reconciliation Act (Public Law 96-499), Contractor hereby agrees that until the expiration of four years after the furnishing of services under this agreement, Contractor shall make available upon written request to the Secretary of Health and Human Services, or upon request, to the Comptroller General of the United States or any of their duly authorized representatives, copies of this contract, books, documents and records of the Contractor that are necessary to certify the nature and extent of the costs hereunder.

(b) If Contractor carries out any of the duties of the contract hereunder, through a subcontract having a value or cost of \$10,000 or more over a twelve-month period, such subcontract shall contain a clause to the effect that, until the expiration of four years after the furnishing of such services pursuant to such subcontract, the subcontractor shall make available upon written request to the Secretary of Health and Human Services or upon request to the Comptroller General of the United States, or any of their duly authorized representatives, copies of the subcontract and books, documents and records of the subcontractor that are necessary to verify the nature and extent of the costs of such subcontract.

(c) The provisions of this section shall apply only to such contracts as are within the definition established by the Health Care Financing Administration, as may be amended or modified from time to time.

1. DEFINITIONS. The following terms shall be defined in accordance with Section 310 of the Executive Law:

STATE CONTRACT herein referred to as "State Contract", shall mean: (a) a written agreement or purchase order instrument, providing for a total expenditure in excess of twenty-five thousand dollars (\$25,000.00), whereby the State University of New York ("University") is committed to expend or does expend funds in return for labor, services including but not limited to legal, financial and other professional services, supplies, equipment, materials or an combination of the foregoing, to be performed for, or rendered or furnished to the University; (b) a written agreement in excess of one hundred thousand dollars (\$100,000.00) whereby the University is committed to expend or does expend funds for the acquisition, construction, demolition, replacement, major repair or renovation of real property and improvements thereon; and (c) a written agreement in excess of one hundred thousand dollars (\$100,000.00) whereby the University as an owner of a state assisted housing project is committed to expend or does expend funds for the acquisition, construction, demolition, replacement, major repair or renovation of real property and improvements thereon for such project.

SUBCONTRACT herein referred to as "Subcontract", shall mean any agreement for a total expenditure in excess of \$25,000 providing for services, including non-staffing expenditures, supplies or materials of any kind between a State agency and a prime contractor, in which a portion of the prime contractor's obligation under the State contract is undertaken or assumed by a business enterprise not controlled by the prime contractor.

WOMEN-OWNED BUSINESS ENTERPRISE herein referred to as "WBE", shall mean a business enterprise, including a sole proprietorship, partnership or corporation that is: (a) at least fifty-one percent (51%) owned by one or more United States citizens or permanent resident aliens who are women; (b) an enterprise in which the ownership interest of such women is real, substantial and continuing; (c) an enterprise in which such women ownership has and exercises the authority to control independently the day-to-day business decisions of the enterprise; (d) an enterprise authorized to do business in this state and independently owned and operated; (e) an enterprise owned by an individual or individuals, whose ownership, control and operation are relied upon for certification, with a personal net worth that does not exceed three million five hundred thousand dollars (\$3,500,000), as adjusted annually on the first of January for inflation according to the consumer price index of the previous year; and (f) an enterprise that is a small business pursuant to subdivision twenty of this section.

A firm owned by a minority group member who is also a woman may be certified as a minority-owned business enterprise, a women-owned business enterprise, or both, and may be counted towards either a minority-owned business enterprise goal or a women-owned business enterprise goal, in regard to any Contract or any goal, set by an agency or authority, but such participation may not be counted towards both such goals. Such an enterprise's participation in a Contract may not be divided between the minority-owned business enterprise goal and the women-owned business enterprise goal.

MINORITY-OWNED BUSINESS ENTERPRISE herein referred to as

"MBE", shall mean a business enterprise, including a sole proprietorship, partnership or corporation that is: (a) at least fifty-one percent (51%) owned by one or more minority group members; (b) an enterprise in which such minority ownership is real, substantial and continuing; (c) an enterprise in which such minority ownership has and exercises the authority to control independently the day-to-day business decisions of the enterprise; (d) an enterprise authorized to do business in this state and independently owned and operated; (e) an enterprise owned by an individual or individuals, whose ownership, control and operation are relied upon for certification, with a personal net worth that does not exceed three million five hundred thousand dollars (\$3,500,000.00), as adjusted annually on the first of January for inflation according to the consumer price index of the previous year; and (f) an enterprise that is a small business pursuant to subdivision twenty of this section.

MINORITY GROUP MEMBER shall mean a United States citizen or permanent resident alien who is and can demonstrate membership in one of the following groups: (a) Black persons having origins in any of the Black African racial groups; (b) Hispanic persons of Mexican, Puerto Rican, Domini- can, Cuban, Central or South American of either Indian or Hispanic origin, regardless of race; (c) Native American or Alaskan native persons having origins in any of the original peoples of North America. (d) Asian and Pacific Islander persons having origins in any of the Far East countries, South East Asia, the Indian Subcontinent or Pacific Islands.

CERTIFIED ENTERPRISE OR BUSINESS shall mean a business verified as a minority or women-owned business enterprise pursuant to section 314 of the Executive Law.

A business enterprise which has been approved by the New York Division of Minority & Women Business Development ("DMWBD") for minority or women-owned enterprise status subsequent to verification that the business enterprise is owned, operated, and controlled by minority group members or women, and that also meets the financial requirements set forth in the regulations.

2. TERMS. The parties to the attached State Contract agree to be bound by the following provisions which are made a part hereof (the word "Contractor" herein refers to any party other than the University:

1(a) Contractor and its Subcontractors shall undertake or continue existing programs of affirmative action to ensure that minority group members and women are afforded equal employment opportunities without discrimination. For these purposes, affirmative action shall apply in the areas of recruitment, employment, job assignment, promotion, upgrading, demotion, transfer, layoff, or termination and rates of pay or other forms of compensation.

(b) Prior to the award of a State Contract, the Contractor shall submit an equal employment opportunity (EEO) policy statement to the University within the time frame established by the University.

(c) As part of the Contractor's EEO policy statement, the Contractor, as a precondition to entering into a valid and binding State Contract, shall agree to the following in the performance of the State Contract: (i) The Contractor will not discriminate against any employee or applicant for employment, will undertake or continue existing programs of affirmative action to ensure that minority group members and women are afforded equal employment opportunities without discrimination, and shall make and document its conscientious and active efforts to employ and utilize minority group members and women in its work force on State Contracts; (ii) The Contractor

shall state in all solicitations or advertisements for employees that, in the performance of the State Contract, all qualified applicants will be afforded equal employment opportunities without discrimination; (iii) At the request of the University the Contractor shall request each employment agency, labor union, or authorized representative of workers with which it has a collective bargaining or other agreement or understanding, to furnish a written statement that such employment agency, labor union, or representative will not discriminate, and that such union or representative will affirmatively cooperate in the implementation of the Contractor's obligations herein.

(d) Form 108 - Staffing Plan To ensure compliance with this Section, the Contractor shall submit a staffing plan to document the composition of the proposed workforce to be utilized in the performance of the Contract by the specified categories listed, including ethnic background, gender, and Federal occupational categories. Contractors shall complete the Staffing plan form and submit it as part of their bid or proposal or within a reasonable time, but no later than the time of award of the contract.

(e) Form 112 - Workforce Employment Utilization Report ("Workforce Report")

(i) Once a contract has been awarded and during the term of Contract, Contractor is responsible for updating and providing notice to SUNY of any changes to the previously submitted Staffing Plan. This information is to be submitted on a quarterly basis during the term of the contract to report the actual workforce utilized in the performance of the contract by the specified categories listed including ethnic background, gender, and Federal occupational categories. The Workforce Report must be submitted to report this information.

(ii) Separate forms shall be completed by Contractor and any subcontractor performing work on the Contract.

(iii) In limited instances, Contractor

may not be able to separate out the workforce utilized in the performance of the Contract from Contractor's and/or subcontractor's total workforce. When a separation can be made, Contractor shall submit the Workforce Report and indicate that the information provided related to the actual workforce utilized on the Contract. When the workforce to be utilized on the contract cannot be separated out from Contractor's and/or subcontractor's total workforce, Contractor shall submit the Workforce Report and indicate that the information provided is Contractor's total workforce during the subject time frame, not limited to work specifically under the contract.

(f) Contractor shall comply with the provisions of the Human Rights Law, all other State and Federal statutory and constitutional non-discrimination provisions. Contractor and subcontractors shall not discriminate against any employee or applicant for employment because of race, creed (religion), color, sex, national origin, sexual orientation, military status, age, disability, predisposing genetic characteristic, marital status or domestic violence victim status, and shall also follow the requirements of the Human Rights Law with regard to non-discrimination on the basis of prior criminal conviction and prior arrest.

(g) The Contractor shall include the provisions of this section in every Subcontract in such a manner that the requirements of the provisions will be binding upon each Subcontractor as to work in connection with the State Contract, including the requirement that Subcontractors shall undertake or continue existing programs of affirmative action to ensure that minority group members and women are afforded equal employment opportunities without discrimination, and, when requested, provide to the Contractor information on the ethnic background, gender, and Federal occupational categories of the

employees to be utilized on the State Contract.

(h) To ensure compliance with the requirements of this paragraph, the University shall inquire of a Contractor whether the work force to be utilized in the performance of the State Contract can be separated out from the Contractor's and/or Subcontractors' total work force and where the work of the State Contract is to be performed. For Contractors who are unable to separate the portion of their work force which will be utilized for the performance of this State Contract, Contractor shall provide reports describing its entire work force by the specified ethnic background, gender, and Federal Occupational Categories, or other appropriate categories which the agency may specify.

(i) The University may require the Contractor and any Subcontractor to submit compliance reports, pursuant to the regulations relating to their operations and implementation of their affirmative action or equal employment opportunity program in effect as of the date the State Contract is executed.

(j) If a Contractor or Subcontractor does not have an existing affirmative action program, the University may provide to the Contractor or Subcontractor a model plan of an affirmative action program. Upon request, the Director of DMWBD shall provide a contracting agency with a model plan of an affirmative action program.

(k) Upon request, DMWBD shall provide the University with information on specific recruitment sources for minority group members and woman, and contracting agencies shall make such information available to Contractors

3. Contractor must provide the names, addresses and federal identification numbers of certified minority- and women-owned business enterprises which the Contractor intends to use to perform the State Contract and a description of the Contract scope of work which the Contractor intends to structure to

increase the participation by Certified minority- and/or women-owned business enterprises on the State Contract, and the estimated or, if known, actual dollar amounts to be paid to and performance dates of each component of a State Contract which the Contractor intends to be performed by a certified minority- or woman-owned business enterprise. In the event the Contractor responding to University solicitation is joint venture, teaming agreement, or other similar arrangement that includes a minority- and women owned business enterprise, the Contractor must submit for review and approval: i. the name, address, telephone number and federal identification of each partner or party to the agreement; ii. the federal identification number of the joint venture or entity established to respond to the solicitation, if applicable; iii. A copy of the joint venture, teaming or other similar arrangement which describes the percentage of interest owned by each party to the agreement and the value added by each party; iv. A copy of the mentor-protégé agreement between the parties, if applicable, and if not described in the joint venture, teaming agreement, or other similar arrangement.

4. PARTICIPATION BY MINORITY GROUP MEMBERS AND WOMEN. The University shall determine whether Contractor has made conscientious and active efforts to employ and utilize minority group members and women to perform this State Contract based upon an analysis of the following factors:

(a) Whether Contractor established and maintained a current list of recruitment sources for minority group members and women, and whether Contractor provided written notification to such recruitment sources that contractor had employment opportunities at the time such opportunities became available.

(b) Whether Contractor sent letters to recruiting sources, labor unions, or authorized representatives of workers with which contractor has

a collective bargaining or other agreement or understanding requesting assistance in locating minority group members and women for employment.

(c) Whether Contractor disseminated its EEO policy by including it in any advertising in the news media, and in particular, in minority and women news media.

(d) Whether Contractor has attempted to provide information concerning its EEO policy to Subcontractors with which it does business or had anticipated doing business.

(e) Whether internal procedures exist for, at a minimum, annual dissemination of the EEO policy to employees, specifically to employees having any responsibility for hiring, assignment, layoff, termination, or other employment decisions. Such dissemination may occur through distribution of employee policy manuals and handbooks, annual reports, staff meetings and public postings.

(f) Whether Contractor encourages and utilizes minority group members and women employees to assist in recruiting other employees.

(g) Whether Contractor has apprentice training programs approved by the N.Y.S. Department of Labor which provides for training and hiring of minority group members and women.

(h) Whether the terms of this section have been incorporated into each Subcontract which is entered into by the Contractor.

5. PARTICIPATION BY MINORITY AND WOMEN-OWNED BUSINESS ENTERPRISES. Based upon an analysis of the following factors, the University shall determine whether Contractor has made good faith efforts to provide for meaningful participation by minority-owned and women-owned business enterprises which have been certified by DMWBD:

(a) Whether Contractor has actively solicited bids for Subcontracts from qualified

M/WBEs, including those firms listed on the Directory of Certified Minority and Women-Owned Business Enterprises, and has documented its good faith efforts towards meeting minority and women owned business enterprise utilization plans by providing, copies of solicitations, copies of any advertisements for participation by certified minority- and women-owned business enterprises timely published in appropriate general circulation, trade and minority- or women-oriented publications, together with the listing(s) and date(s) of the publications of such advertisements; dates of attendance at any pre-bid, pre-award, or other meetings, if any, scheduled by the University, with certified minority- and women-owned business enterprises, and the reasons why any such firm was not selected to participate on the project.

(b) Whether Contractor has attempted to make project plans and specifications available to firms who are not members of associations with plan rooms and reduce fees for firms who are disadvantaged.

(c) Whether Contractor has utilized the services of organizations which provide technical assistance in connection with M/WBE participation.

(d) Whether Contractor has structured its Subcontracts so that opportunities exist to complete smaller portions of work.

(e) Whether Contractor has encouraged the formation of joint ventures, partnerships, or other similar arrangements among Subcontractors.

(f) Whether Contractor has requested the services of the Department of Economic Development (DED) to assist Subcontractors' efforts to satisfy bonding requirement.

(g) Whether Contractor has made progress payments promptly to its Subcontractors.

(h) Whether the terms of this section have been incorporated into each Subcontract which is entered into by the Contractor. It shall be the responsibility of Contractor to

ensure compliance by every Subcontractor with these provisions.

6. MWBE Utilization Plan.

(a) The Contractor represents and warrants that Contractor has submitted an MWBE Utilization Plan prior to the execution of the contract.

(b) MWBE Utilization Plan (Form 7557-107).

Contractors are required to submit a Utilization Plan on Form 7557-107 with their bid or proposal. Complete the following steps to prepare the Utilization Plan:

- i. list NYS Certified minority- and women-owned business enterprises which the Contractor intends to use to perform the State contract;
- ii. insert a description of the contract scope of work which the Contractor intends to structure to increase the participation by NYS Certified minority- and women-owned enterprises on the State contract;
- iii. insert the estimated or, if known, actual dollar amounts to be paid to and performance dates of each component of a State contract which the Contractor intends to be performed by a NYS Certified minority- or women-owned business; and

(c) Any modifications or changes to the agreed participation by NYS Certified MWBEs after the Contract Award and during the term of the contract must be reported on a revised MWBE Utilization Plan and submitted to the SUNY University-wide MWBE Program Office.

(d) The University will review the MWBE Utilization Plan and will issue the Contractor a written notice of acceptance or deficiency within twenty (20) day of its receipt. A notice of deficiency shall include the:

- i. list NYS Certified minority- and women-owned business enterprises which the

Contractor intends to use to perform the State contract;

- ii. name of any MWBE which is not acceptable for the purpose of complying with the MWBE participation goals;

- iii. reasons why it is not an acceptable element of the Contract scope of work which the MWBE Program Office has determined can be reasonably structured by the Contractor to increase the likelihood of participation in the Contract by MWBEs; and
- iv. other information which the MWBE Program Office determines to be relevant to the MWBE Utilization Plan.

(e) The Contractor shall respond to the notice of deficiency within seven (7) business days of receipt by submitting to the University a written remedy in response to the notice of deficiency.

- i. If the written remedy that is submitted is not timely or is found to be inadequate, the University-wide MWBE Program Office shall notify the Contractor and direct the Contractor to submit, within five (5) business days, a request for partial or total waiver of MWBE participation goals on forms provided by the University-wide MWBE Program Office.

- ii. Failure to file the waiver form in a timely manner may be grounds for disqualification of the bid or proposal.

(f) The University may disqualify a Contractor as being non-responsive under the following circumstances:

- i. If a Contractor fails to submit a MWBE Utilization Plan;
- ii. If a Contractor fails to submit a written remedy to a notice of deficiency in a MWBE Utilization Plan;
- iii. If a Contractor fails to submit a request for waiver; or

iv. If the MWBE Program Office determines that the Contractor has failed to document Good Faith Efforts.

(g) Contractor agrees to use such MWBE Utilization Plan for the performance of MWBEs on the Contract pursuant to the prescribed MWBE goals set forth in Section III-A of this Appendix.

(h) Contractor further agrees that a failure to submit and/or use such MWBE Utilization Plan shall constitute a material breach of the terms of the Contract. Upon the occurrence of such a material breach, SUNY shall be entitled to any remedy provided herein, including but not limited to, a finding of Contractor non-responsiveness.

7. Waivers.

(a) For Waiver Requests Contractor should use (Form 7557-114) – Waiver Request.

(b) If the Contractor, after making good faith efforts, is unable to comply with MWBE goals, the Contractor may submit a Request for Waiver form documenting good faith efforts by the Contractor to meet such goals. If the documentation included with the waiver request is complete the University shall evaluate the request and issue a written notice of acceptance or denial within twenty (20) days of receipt.

(c) If University, upon review of the MWBE Utilization Plan and updated Quarterly MWBE Contractor Compliance Reports determines that Contractor is failing or refusing to comply with the Contract goals and no waiver has been issued in regards to such non-compliance, the University may issue a notice of deficiency to the Contractor. The contractor must respond to the notice of deficiency within seven (7) business days of receipt. Such response may include a request for partial or total waiver of MWBE Contract Goals.

8. Quarterly MWBE Contractor Compliance Report.

Contractor is required to submit a Quarterly MWBE Contractor Compliance Report (Form 7557-114) to the University by the 5th day following each end of quarter over the term of the Contract documenting the progress made towards achievement of the MWBE goals of the Contract.

9. GOALS. (a) GOALS FOR MINORITY AND WOMEN WORK FORCE PARTICIPATION.

(i) The University shall include relevant work force availability data, which is provided by the DMWBD, in all documents which solicit bids for State Contracts and shall make efforts to assist Contractors in utilizing such data to determine expected levels of participation for minority group members and women on State Contracts.

(ii) Contractor shall exert good faith efforts to achieve such goals for minority and women's participation. To successfully achieve such goals, the employment of minority group members and women by Contractor must be substantially uniform during the entire term of this State Contract. In addition, Contractor should not participate in the transfer of employees from one employer or project to another for the sole purpose of achieving goals for minority and women's participation.

(b) GOALS FOR MINORITY AND WOMEN-OWNED BUSINESS ENTERPRISES PARTICIPATION.

For all State Contracts in excess of \$25,000.00 whereby the University is committed to expend or does expend funds in return for labor, services including but not limited to legal, financial and other professional services, supplies, equipment, materials or an combination of the foregoing or all State Contracts in excess of \$100,000.00 whereby the University is committed to expend or does expend funds for the acquisition, construction, demolition, replacement, major repair or

renovation of real property and improvements thereon, Contractor shall exert good faith efforts to achieve a participation goal of 22.06 percent (22.06%) for Certified Minority-Owned Business Enterprises and 7.94 percent (7.94%) for Certified Women-Owned Business Enterprises.

10. ENFORCEMENT. The University will be responsible for enforcement of each Contractor's compliance with these provisions. Contractor, and each Subcontractor, shall permit the University access to its books, records and accounts for the purpose of investigating and determining whether Contractor or Subcontractor is in compliance with the requirements of Article 15-A of the Executive Law. If the University determines that a Contractor or Subcontractor may not be in compliance with these provisions, the University may make every reasonable effort to resolve the issue and assist the Contractor or Subcontractor in its efforts to comply with these provisions. If the University is unable to resolve the issue of noncompliance, the University may file a complaint with the DMWBD.

Failure to comply with all of the requirements herein may result in a finding of non-responsiveness, non-responsibility and/or a breach of contract, leading to the withholding of funds or such other actions, remedies or enforcement proceedings as allowed by the Contract.

11. DAMAGES FOR NON COMPLIANCE.

Where the University determines that Contractor is not in compliance with the requirements of the Contract and Contractor refuses to comply with such requirements, or if Contractor is found to have willfully and intentionally failed to comply with the MWBE participation goals, Contractor shall be obligated to pay liquidated damages to the University. Such liquidated damages shall be

calculated as an amount equaling the difference between:

- a. All sums identified for payment to MWBEs had the Contractor achieved the contractual MWBE goals; and
- b. All sums actually paid to MWBEs for work performed or materials supplied under the Contract.

In the event a determination has been made which requires the payment of liquidated damages and such identified sums have not been withheld by the University, Contractor shall pay such liquidated damages to the University within sixty (60) days after such damages are assessed, unless prior to the expiration of such sixtieth day, the Contractor has filed a complaint with the Director of the

Division of Minority and Woman Business Development pursuant to Subdivision 8 of Section 313 of the Executive Law in which event the liquidated damages shall be payable if Director renders a decision in favor of the University.