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;
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 221413 - FACILITY STORM DRAINAGE 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. Pipe, tube, and fittings.
2. Specialty pipe fittings.

1.3 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:

1. Storm Drainage Piping: 10-foot head of water.

B. Seismic Performance: Storm drainage piping and support and installation shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. LEED Submittal:

1. Product Data for Credit EQ 4.1: For solvent cements and adhesive primers, documentation including printed statement of VOC content.

C. Shop Drawings: For controlled-flow roof drainage system. Include calculations, plans, and details.

D. Seismic Qualification Certificates: For storm drainage 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 equipment anchorage devices on which the certification is based and their installation requirements.

E. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF/ANSI 14, "Plastics Piping System Components and Related Materials," for plastic piping components. Include marking with "NSF-drain" for plastic drain piping and "NSF-sewer" for plastic sewer piping.

1.6 PROJECT CONDITIONS

A. Interruption of Existing Storm-Drainage 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 Construction Manager and Owner no fewer than two days in advance of proposed interruption of storm-drainage service.
2. Do not proceed with interruption of storm-drainage service without Construction Manager's and Owner's written permission.

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 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 74, Service and Extra Heavy classes.

B. Gaskets: ASTM C 564, rubber.

C. Calking Materials: ASTM B 29, pure lead and oakum or hemp fiber.

2.3 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 888 or CISPI 301.

B. Heavy-Duty, Hubless-Piping Couplings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. ANACO-Husky.
b. Clamp-All Corp.
c. Dallas Specialty & Mfg. Co.
d. MIFAB, Inc.
e. Mission Rubber Company; a division of MCP Industries, Inc.
f. Stant.
g. Tyler Pipe.

2. Standards: ASTM C 1277 and ASTM C 1540.
3. Description: Stainless-steel shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

2.4 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. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

        1) Dallas Specialty & Mfg. Co.
        2) Fernco Inc.
        3) Mission Rubber Company; a division of MCP Industries, Inc.
        4) Plastic Oddities; a division of Diverse Corporate Technologies, Inc.

    b. Standard: ASTM C 1173.
    c. Description: Elastomeric, sleeve-type, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
    d. Sleeve Materials:

        1) For Cast-Iron Soil Pipes: ASTM C 564, rubber.

4. Shielded, Nonpressure Transition Couplings:

    a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

        1) Cascade Waterworks Mfg. Co.
        2) Mission Rubber Company; a division of MCP Industries, Inc.

    b. Standard: ASTM C 1460.
    c. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

5. Pressure Transition Couplings:

    a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

        1) Cascade Waterworks Mfg. Co.
        2) Dresser, Inc.
        3) EBAA Iron, Inc.
        4) Ford Meter Box Company, Inc. (The)
        5) JCM Industries, Inc.
        6) Romac Industries, Inc.
        7) Smith-Blair, Inc.; a Sensus company.
        8) Viking Johnson; c/o Mueller Co.

b. Standard: AWWA C219.
c. Description: Metal, sleeve-type couplings same size as, with pressure rating at least equal to and ends compatible with, pipes to be joined.
d. Center-Sleeve Material: Manufacturer's standard.
e. Gasket Material: Natural or synthetic rubber.
f. Metal Component Finish: Corrosion-resistant coating or material.

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. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Capitol Manufacturing Company.
2) Central Plastics Company.
3) Hart Industries International, Inc.
4) Jomar International Ltd.
5) Matco-Norca, Inc.
6) McDonald, A. Y. Mfg. Co.
7) Watts Regulator Co.; a division of Watts Water Technologies, Inc.

b. Description:

1) Standard: ASSE 1079.
2) Pressure Rating: 150 psig. End Connections: Solder-joint copper alloy and threaded ferrous.

3. Dielectric Flanges:

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Capitol Manufacturing Company.
2) Central Plastics Company.
3) Matco-Norca, Inc.
4) Watts Regulator Co.; a division of Watts Water Technologies, Inc.

b. Description:

1) Standard: ASSE 1079.
2) Factory-fabricated, bolted, companion-flange assembly.
3) Pressure Rating: 150 psig minimum.
4) End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

4. Dielectric-Flange Insulating Kits:

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Advance Products & Systems, Inc.
2) Calpico, Inc.

3) Central Plastics Company.
4) Pipeline Seal and Insulator, Inc.

b. 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. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Elster Perfection.
2) Grinnell Mechanical Products.
3) Matco-Norca, Inc.
4) Precision Plumbing Products, Inc.
5) Victaulic Company.

b. Description:

1) Electroplated steel nipple complying with ASTM F 1545.
2) Pressure Rating: 300 psig at 225 deg F.
3) End Connections: Male threaded or grooved.
4) Lining: Inert and noncorrosive, propylene.

PART 3 - EXECUTION

3.1 EARTH MOVING

A. Comply with requirements for excavating, trenching, and backfilling specified in Division 31 Section "Earth Moving."

3.2 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations from 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 Division 22 Section "Vibration and Seismic Controls for Plumbing Piping and Equipment."

K. Make changes in direction for storm drainage piping using appropriate branches, bends, and long-sweep bends. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

L. Lay buried building storm drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

M. Install storm drainage piping at the following minimum slopes unless otherwise indicated:

1. Building Storm Drain: 1 percent downward in direction of flow for piping NPS 3 and smaller; 1 percent downward in direction of flow for piping NPS 4 and larger.
2. Horizontal Storm-Drainage Piping: 1 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."

O. Install steel piping according to applicable plumbing code.

P. Install engineered controlled-flow drain specialties and storm drainage piping in locations indicated.

Q. Plumbing Specialties:

1. Install backwater valves in storm drainage gravity-flow piping. Comply with requirements for backwater valves specified in Division 22 Section "Storm Drainage Piping Specialties."
2. Install cleanouts at grade and extend to where building storm drains connect to building storm sewers in storm drainage gravity-flow piping. Install cleanout fitting with closure plug inside the building in storm drainage force-main piping. Comply with requirements for cleanouts specified in Division 22 Section "Storm Drainage Piping Specialties."
3. Install drains in storm drainage gravity-flow piping. Comply with requirements for drains specified in Division 22 Section "Storm Drainage 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. Comply with requirements for sleeves specified in Division 22 Section "Sleeves and Sleeve Seals for Plumbing Piping."

T. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Division 22 Section "Sleeves and Sleeve Seals for Plumbing Piping."

U. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Division 22 Section "Escutcheons for Plumbing Piping."

3.3 JOINT CONSTRUCTION

A. Hub-and-Spigot, Cast-Iron Soil Piping Gasketed Joints: Join according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.

B. Hub-and-Spigot, Cast-Iron Soil Piping Calked Joints: Join according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead-and-oakum calked joints.

C. Hubless, Cast-Iron Soil Piping Coupled Joints: Join according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.

D. 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 OD's.
2. In Drainage Piping: Shielded, nonpressure transition couplings.
3. In Aboveground Force-Main Piping: Fitting-type transition couplings.
4. In Underground Force-Main Piping:

    a. NPS 1-1/2 and Smaller: Fitting-type transition couplings.
    b. NPS 2 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 NPS 2 and Smaller: Use dielectric nipples or unions.
3. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flange kits or nipples.
4. Dielectric Fittings for NPS 5and Larger: Use dielectric flange kits.

3.5 VALVE INSTALLATION

A. General valve installation requirements are specified in Division 22 Section "General-Duty Valves for Plumbing Piping."

B. Check Valves: Install swing-check valve, between pump and shutoff valve, on each sump pump discharge.

C. Backwater Valves: Install backwater valves in piping subject to backflow.

1. Horizontal Piping: Horizontal backwater valves. Use normally closed type unless otherwise indicated.
2. Install backwater valves in accessible locations.
3. Comply with requirements for backwater valves specified in Division 22 Section "Storm Drainage Piping Specialties."

3.6 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for seismic-restraint devices specified in Division 22 Section "Vibration and Seismic Controls for Plumbing Piping and Equipment."

B. Comply with requirements for pipe hanger and support devices and installation specified in Division 22 Section "Hangers and Supports 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. Vertical Piping: MSS Type 8 or Type 42, clamps.
4. 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.

5. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
6. 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. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
2. NPS 3: 60 inches with 1/2-inch rod.
3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
4. NPS 6 and NPS 8: 60 inches with 3/4-inch rod.
5. NPS 10 and NPS 12: 60 inches with 7/8-inch rod.
6. Spacing for 10-foot pipe 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. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.7 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect interior storm drainage piping to exterior storm drainage piping. Use transition fitting to join dissimilar piping materials.

C. Connect storm drainage piping to roof drains and storm drainage specialties.

1. Install test tees (wall cleanouts) in conductors near floor, and floor cleanouts with cover flush with floor.

2. Install horizontal backwater valves with cleanout cover flush with floor
3. Comply with requirements for backwater valves cleanouts and drains specified in Division 22 Section "Storm Drainage Piping Specialties."

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 NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3.8 IDENTIFICATION

A. Identify exposed storm drainage piping. Comply with requirements for identification specified in Division 22 Section "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.
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 storm drainage 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. 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 storm drainage piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Test Procedure: Test storm drainage piping on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts until completion of inspection, water level must not drop. Inspect joints for leaks.
4. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
5. Prepare reports for tests and required corrective action.

3.10 CLEANING

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains 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.

3.11 PIPING SCHEDULE

A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.

B. Aboveground storm drainage piping NPS 6 and smaller shall be the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings; heavy-duty, hubless-piping couplings; and coupled joints.
3. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

C. Aboveground, storm drainage piping NPS 8 and larger shall be the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings; heavy-duty, hubless-piping couplings; and coupled joints.
3. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

D. Underground storm drainage piping NPS 6 and smaller shall be the following:

1. Extra Heavy class, cast-iron soil pipe and fittings; gaskets; and gasketed or calking materials; and calked joints.
2. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

E. Underground, storm drainage piping NPS 8 and larger shall be the following:

1. Extra Heavy class, cast-iron soil pipe and fittings; gaskets; and gasketed or calking materials; and calked joints.
2. -core, sewer and drain series, PVC pipe; PVC socket fittings; and solvent-cemented joints.
3. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

END OF SECTION 221413

SECTION 221423 - STORM DRAINAGE 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. Roof drains.
2. Miscellaneous storm drainage piping specialties.
3. Cleanouts.
4. Through-penetration firestop assemblies.
5. Flashing materials.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 METAL ROOF DRAINS

A. Cast-Iron, Large-Sump, General-Purpose Roof Drains:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Josam Company.
b. Marathon Roofing Products.
c. MIFAB, Inc.
d. Smith, Jay R. Mfg. Co.
e. Tyler Pipe.
f. Watts Water Technologies, Inc.

2. Standard: ASME A112.6.4, for general-purpose roof drains.
3. Body Material: Cast iron.
4. Dimension of Body: Nominal 14-inch diameter.
5. Combination Flashing Ring and Gravel Stop: Required.

6. Flow-Control Weirs: Not required.
7. Outlet: Bottom.
8. Extension Collars: Not required
9. Underdeck Clamp: Required.
10. Expansion Joint: Not Required.
11. Sump Receiver Plate: Not required.
12. Dome Material: Cast iron.
13. Perforated Gravel Guard: Stainless steel.
14. Vandal-Proof Dome: Required.
15. Water Dam: Not required.

2.2 CLEANOUTS

A. Floor Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Josam Company.
    b. Oatey.
    c. Sioux Chief Manufacturing Company, Inc.
    d. Smith, Jay R. Mfg. Co.
    e. Tyler Pipe.
    f. Watts Water Technologies, Inc.

2. Standard: ASME A112.36.2M, for adjustable housing cleanouts.
3. Size: Same as connected branch.
4. Type: Adjustable housing
5. Body or Ferrule Material: Cast iron.
6. Clamping Device: Not required.
7. Outlet Connection: Inside calk or Spigot.
8. Closure: Brass plug with tapered threads.
9. Adjustable Housing Material: Cast iron with threads or set-screws or other 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, Extra-Heavy class, cast-iron drainage pipe fitting and riser to cleanout.

B. Test Tees:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Josam Company.
    b. MIFAB, Inc.
    c. Smith, Jay R. Mfg. Co.
    d. Tyler Pipe.
    e. Watts Water Technologies, Inc.

2. Standard: ASME A112.36.2M and ASTM A 74, ASTM A 888, or CISPI 301, for cleanout test tees.
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 Plug: Countersunk or raised head, brass.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.

C. Wall Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Josam Company.
   b. MIFAB, Inc.
   c. Smith, Jay R. Mfg. Co.
   d. Tyler Pipe.
   e. Watts Water Technologies, Inc.

2. Standard: ASME A112.36.2M, for cleanouts. Include wall access.
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.
7. Wall Access: Round, flat, chrome-plated brass or stainless-steel cover plate with screw.
8. Wall Access: Round, nickel-bronze, copper-alloy, or stainless-steel wall-installation frame and cover.

2.3 BACKWATER VALVES

A. Cast-Iron, Horizontal Backwater Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Josam Company.
   b. MIFAB, Inc.
   c. Smith, Jay R. Mfg. Co.
   d. Tyler Pipe.
   e. Watts Water Technologies, Inc.

2. Standard: ASME A112.14.1, for backwater valves.
3. Size: Same as connected piping.
4. Body Material: Cast iron.
5. Cover: Cast iron with bolted access check valve.
6. End Connections: Hub and spigot or hubless.
7. 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.

2.4 THROUGH-PENETRATION FIRESTOP ASSEMBLIES

A. Through-Penetration Firestop Assemblies:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. ProSet Systems Inc.

2. Standard: ASTM E 814, for through-penetration firestop assemblies.
3. Certification and Listing: Intertek Testing Service NA testing agency acceptable to authorities having jurisdiction for through-penetration firestop assemblies.
4. Size: Same as connected pipe.
5. Sleeve: Molded Steel, of length to match slab thickness and with integral nailing flange on one end for installation in cast-in-place concrete slabs.
6. Special Coating: Corrosion resistant on interior of fittings.

2.5 FLASHING MATERIALS

A. Copper Sheet: ASTM B 152/B 152M, 12 oz./sq. ft.

B. Zinc-Coated Steel Sheet: ASTM A 653/A 653M, with 0.20 percent copper content and 0.04-inch minimum thickness unless otherwise indicated. Include G90 hot-dip galvanized, mill-phosphatized finish for painting if indicated.

C. Elastic Membrane Sheet: ASTM D 4068, flexible, chlorinated polyethylene, 40-mil minimum thickness.

D. Fasteners: Metal compatible with material and substrate being fastened.

E. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.

F. Solder: ASTM B 32, lead-free alloy.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install roof drains at low points of roof areas according to roof membrane manufacturer's written installation instructions. Roofing materials are specified in Division 07 Sections.

1. Install flashing collar or flange of roof drain to prevent leakage between drain and adjoining roofing. Maintain integrity of waterproof membranes where penetrated.
2. Install expansion joints, if indicated, in roof drain outlets.
3. Position roof drains for easy access and maintenance.

B. Install cleanouts in aboveground piping and building drain piping according to the following instructions unless otherwise indicated:

1. Use cleanouts the same size as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
2. Locate cleanouts at each change in direction of piping greater than 45 degrees.
3. Locate cleanouts at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
4. Locate cleanouts 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 horizontal backwater valves in floor with cover flush with floor.

F. Install test tees in vertical conductors and near floor.

G. Install wall cleanouts in vertical conductors. Install access door in wall if indicated.

H. Install through-penetration firestop assemblies in plastic conductors at concrete floor penetrations.

I. Install sleeve flashing device with each conductor passing through floors with waterproof membrane.

3.2 CONNECTIONS

A. Comply with requirements for piping specified in Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

3.3 FLASHING INSTALLATION

A. Fabricate flashing from single piece of metal unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:

1. Lead Sheets: Burn joints of 6.0-lb/sq. ft. Lead sheets, 0.0938-inchthickness or thicker. Solder joints of 4.0-lb/sq. ft. lead sheets, 0.0625-inch thickness or thinner.
2. Copper Sheets: Solder joints of copper sheets.

B. 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 the pipe size, with a minimum length of 10 inches and with 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.

C. Set flashing on floors and roofs in solid coating of bituminous cement.

D. Secure flashing into sleeve and specialty clamping ring or device.

E. Fabricate and install flashing and pans, sumps, and other drainage shapes.

3.4 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 221423

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 vaccum 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 specifi 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 226659 - LABORATORY SAFETY DEVICE SYSTEM

PART 1 – GENERAL

1.1 SUMMARY:

A. Furnishings and installation of the Laboratory Safety Device System as shown on the Drawings as herein specified.

1.2 SCOPE OF WORK:

A. Provide a laboratory safety device system for each Science Room as shown on the Drawings.
B. Each system shall include, but not be limited to, a utility controller panel, solenoid valves, electrical contactor, remote emergency shut off button, gas detector and all interconnections. The Plumbing Contractor shall provide all materials. Installation shall be in accordance with Part 3 of this section.

1.3 CODES AND REGULATIONS:

A. NFPA 70, National Electrical Code.
B. NFPA 72, National Fire Alarm Code.
C. NFPA 90A, Installation of Air conditioning and Ventilation Systems.
D. Americans with Disabilities Act.
E. Uniform Building Codes (UBC).
F. Local and State Building Codes.
G. All requirements of the local Authority Having Jurisdiction.
H. UL61010-1 3rd Edition – Electrical Equipment for Measurement, control and Laboratory Use

1.4 WARRANTY:

A. Provide a manufacturer's parts warranty covering 3 Years from date of completion. B. Refer to Division 01 section "Warranties"

1.5 MANUFACTURER:

A. American Gas Safety is the basis of design. Approved equals meeting all specifications and drawing requirements are acceptable.
B. Separate components may be provided in lieu of the specified manufactured system. Including but not limited to enclosures, remote shut off buttons, contactors and solenoid valves. The system shall include all piping, wiring, conduits, and final connections for a complete operational system.

1.6 SUBMITTALS:

A. Comply with Division 01 Section "Submittals Procedures"
B. Product Data:
   1. Manufacturer
   2. Model Number
   3. Catalog Data sheet with Photographs
   4. Wiring and equipment connection diagrams clearly showing factory equipment and field installed equipment.
C. Provide all equipment, devices, conduit, operating power and other provisions for the Laboratory Safety System.

D. Shop Drawings
   1. Include plans, elevations, sections and mounting and attachments details.
   2. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   3. Wiring Diagrams
      a. Detail wiring for signal, power and control wiring

E. Operation and Maintenance Data
   1. Include in Emergency, Operation and Maintenance manuals.
   2. Refer to Division 01 Section "Operation and Maintenance Data" F. Manufacturer's recommended detailed installation instructions.

G. Equipment is not to be ordered without approved submittals

PART 2 – PRODUCTS

2.1 PRODUCTS IN THIS SECTION:

A. All Products and Devices for a complete Laboratory Safety Device System with all components designed to operate together as a system. The system shall and be UL listed and labelled and be as listed in the Equipment Schedule of the Section.

2.2 MERLIN UTILITY CONTROLLER:

At each science classroom and elsewhere as shown on Drawings, provide a Utility Controller with fascia panel mounted switches to activate remote solenoids and relays to control natural gas, domestic water and electrical convenience outlets or other indicated services or devices. Utility Controller shall comply with Underwriter's Laboratory UL61010-1 3rd Edition Standards. Controller shall have integrated printed circuit board and Microprocessor with adaptable programming features. Controller shall utilize and operate a pressure transducer to perform a pressure drop test on the natural gas line before allowing gas to be supplied. Controller shall continuously check incoming gas supply pressure throughout operation. Controller shall provide line voltage signals for output circuits. Controller shall provide inputs for remote EPO's and Gas Sensors. The Controller shall be equipped with an Authority Key Lock that restricts activation of output signals to the instructor or educator. Controller shall be provided with a fascia mounted EPO button. Output signals will require Key Lock authority for re-set.

2.4 PRESSURE TRANSDUCER:

Each Controller shall be provided with a UL approved pressure transducer to be installed on the natural gas pipe, either via the solenoid valve or via a reducing fitting located as close to the solenoid valve as is permissible on the downstream side.

2.5 SOLENOID VALVE:

At each science classroom and where shown on Drawings, provide UL approved solenoids for Gas services. Provide NSF 61 approved solenoids for water services. All solenoids shall be normally closed and fail closed on loss of power. Number of solenoids, intended use and pipe sizes are as noted in Equipment Schedule or Drawings.

2.6 REMOTE PANIC BUTTON:

Where shown on Drawings and where classroom size and configuration restricts clear path from work areas to Utility Controller, provide a wall mounted Remote Panic Button.
Assembly shall be located as shown on Drawings and as stipulated in Equipment Schedule. Integrate assembly with low voltage input on Controller.

2.7 FUEL GAS SENSOR:

Where shown on Drawings and in Equipment Schedule, furnish and install a AGS Merlin Fuel Gas Sensor in order to detect raw fuel gas within the classroom. Integrate Fuel Gas Sensor with the Controller.

2.8 MERLIN CARBON MONOXIDE SENSOR:

Where shown on Drawings and in Equipment Schedule, furnish and install a Merlin CO Sensor in order to detect high levels of CO within the classroom. Integrate CO Sensor with the Controller. Locate sensor as shown in Drawings and per manufacturer's recommendations.

2.9 MERLIN CARBON DIOXIDE NDIR (Non-Dispersive Infra-Red) Monitor:

Where shown on Drawings and in Equipment Schedule, furnish and install a Merlin CO_2 NDIR Monitor. Integrate CO_2 Monitor with the Controller. Locate Monitor as shown in Drawings and per manufacturer's recommendations.

PART 3 – INTERGRATION AND CONFIGERATION

3.1 Building Automation or Management Systems (BMS):

A. Where shown on Drawings, provide low voltage integration wiring from each Controller to connection point on BMS. Merlin Controller provides a NO, COM and NC relay output for BAS / BMS integration, the relay will change state in "Alarm" or "Gas On". The Merlin Controller can accept low voltage signal from Fire Alarm to shutdown utilities in case of fire alarm. Final connection by others.

3.3 Exhaust Fan:

A. Where shown on Drawings, provide low voltage integration wiring from each Controller to connection point on Exhaust Fan controller. Alternatively utilize permanent 12vdc output and BMS output to connect to a 12vdc relay to interrupt manual control of the exhaust fans. Final connection by others.

3.4 SYSTEM CONFIGURATION:

1. Utility Controllers shall be factory configured to the standard configurations and shall be capable of field adjustments to meet specific project modification requirements. Configurations are limited to DIP switch adjustments on rear of fascia panel without the requirement of additional equipment.
2. Classroom Utilities:
   Each utility service with outlets at student work-stations shall be controlled by independent output circuit at the Utility Controller. Control of services can be combined onto one output circuit as indicated on Drawings. Services shall be activated by Controller fascia panel master control switches and the engaging of the authority control key. Activation of utility services shall be restricted to the instructor by means of the authority key lock switch.

3. Time-Out Function:

Each Controller be pre-set to shut down after either 2hrs, 4hrs 8hrs or have this function disabled. This configuration shall be adjusted via the DIP switches on the reverse side of the fascia panel.

4. Panic Alarm Re-Set:
Unless stated elsewhere on Drawings, The Controller shall only re-set from panic alarm after engagement of the authority key on fascia panel and after local panic alarm has been re-set.

5. Fire Alarm Re-set:
Unless stated elsewhere on Drawings, the Utility Controller shall be configured so that continued fire alarm signal to Controller shall prevent re-set.

6. Purge-Exhaust Fan:
Where indicated by the Drawings, classrooms having an exhaust fan shall have fan configured with Utility Controller so that the fan will automatically purge classroom in case of emergency. Fan shall be integrated with Controller via the BMS output. Provide control wiring from Controller contacts to BMS and configure the Controller via the DIP switches on the reverse side of the fascia panel. See manufacturer's installation instructions for switch options

7. EPO's and Panic Buttons:
Each Controller shall be configured so that pressing remote EPO or Panic Buttons will disable all utilities. If required; Water and Electrical utilities can be configured to stay on in an emergency. Each Controller shall be configured so that Gas services will automatically shut down in all alarm modes.

8. Fuel Gas Sensor:
Where shown in Drawings, unit shall integrate with Controller and shut down all designated outputs. Each Controller can utilize up to three fuel gas sensors.

9. MERLIN Carbon Monoxide Sensors:
Where shown in Drawings, unit shall integrate with Controller and shut down all designated outputs.

10. MERLIN Carbon Dioxide NDIR Monitor:
Where shown on Drawings, unit shall integrate with Controller and shut down all designated outputs. Monitor shall be configured to have an audible alarm for high CO_2 and or high Temperature. Monitor can integrate with BMS or Exhaust Fan via two NO or NC relay outputs. 0-10v output available for variable speed drives. Monitor is hard wired line voltage and can operate as a standalone unit.

11. Emergency Showers:
Where shown on Drawings, provide an Emergency Shower flow switch on the upstream side of the supply pipe. Flow switch shall integrate with Controller via the EPO input contact.

PART 4 – EXECUTION

4.1 INSTALLATION:

A. Install in accordance with manufacturer's recommendations and instructions. Verify manufacturer's mounting heights to comply with ADA or other standards.

B. Finish and install all devices as shown in Drawings and as specified herein. Where device is to be installed by other trades, furnish and then turn over to appropriate trade for installation.

C. Furnish, install and make final connections to monitoring and remote EPO's and Panic Buttons as indicated on Drawings and specified herein. Furnish and install low voltage and volt free control wiring from Utility Controller to connection point on BMS and Exhaust Fan controller. Final connection by others.

4.2 PLUMBING:

A. Make final connections to all piping systems where indicated by Drawings and specifications. Install in accordance with SECTION 221116

4.3 ELECTRICAL:

A. Electrical Contractor shall furnish all conduit and wiring, making final wiring connections to all equipment as indicated by Drawings and specifications. Contractor shall be responsible for all system configurations, integration, test and start-up.

PART 5 – SYSTEM TEST AND START-UP

A. Prior to placing the Utility Controller System into service, perform ALL Start-Up procedures and checklists as stated in Manufacturer's Operations and Maintenance Procedure

B. Verify that all components and devices comply with manufacturer's requirements and recommendations and that all devices and installations conform to Drawings and specification requirements.

C. Upon completion of ALL Start-Up tests, place the system into service. Complete all warranty registration documents. Submit originals with other project related closeout and O & M documentation. Review all operating procedures with a representative of the owner. Provide all System Authority Keys to the owner's representative.

PART 6 – EQUIPMENT SCHEDULE

Product	Model	Description	Remarks
Gas Only	Merlin1000S	c/w Pressure Transducer	Single Output Controller
Gas and Electrical	Merlin1000S+	c/w Pressure Transducer	Dual Output Controller
Gas, Electrical and Water	Merlin1000SW+	c/w Pressure Transducer	Triple Output Controller
Remote EPO	AGSEPOTW	Twist Release	Mushroom Type
Remote EPO	AGSEPOKL	Key Lock Release	Mushroom Type
Remote EPO	AGSEPOBG	Break Glass Type	Plastic Cover
Remote Cover	AGSEPOcover	Clear Hinged Cover	All EPO Types
Nat Gas Sensor	AGSNGXS	Methane	*
CO Sensor	AGSCOXS	Carbon Monoxide	*
LPG Sensor	AGSLPGXS	LPG	*

Audible Beacon	AGSAAB	Alarm Beacon	Mount Outside Classroom
CO2 Monitor	AGSCO2120B	NDIR Sensor	*
Solenoid Valve	Various	As per Drawings and specifications	HW, CW, Gas, CA, O_2
NEMA Enclosure	Various	As per Drawings and specifications	Solenoid Valves, Electrical contactors, Transformers

* All sensors should be mounted for the desired gas requirements. Consult manufacturer for recommendations and

END OF SECTION 226659

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 233423	HVAC POWER VENTILATORS
Section 233533	LISTED KITCHEN VENTILATION SYSTEM EXHAUST DUCTS
Section 233713.13	AIR DIFFUSERS
Section 233713.23	REGISTERS, AND GRILLES
Section 237423.13	PACKAGED, DIRECT-FIRED, OUTDOOR, HEATING ONLY MAKE-UP AIR UNITS
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: “xxx” 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, safety 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 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 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 or 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 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 bum 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 (I) 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.

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. Trerice, 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 ¼ 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): Ss = 0.267
4. Design Spectral Response Acceleration at 1.0-Second Period: S1 = 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

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

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, ¼ inch.
2. NPS 1: Maximum span, 7 feet; minimum rod size, ¼ 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 for10-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-inchtrapped 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-nch 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-inchbutt 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 233423 - HVAC POWER VENTILATORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Centrifugal roof ventilators.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Wiring Diagrams: For power, signal, and control wiring.
3. 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.
4. Design Calculations: Calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.

1.3 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.4 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. AMCA Compliance: Fans shall have AMCA-Certified performance ratings and shall bear the AMCA-Certified Ratings Seal.

PART 2 - PRODUCTS

2.1 CENTRIFUGAL ROOF VENTILATORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Captiveaire
2. Greenheck Fan Corporation
3. Loren Cook Company

B. Housing: Removable, spun-aluminum, dome top and outlet baffle; square, one-piece, aluminum base with venturi inlet cone.

1. Upblast Units: Provide spun-aluminum discharge baffle to direct discharge air upward, with rain and snow drains and grease collector.
2. Hinged Subbase: Galvanized-steel hinged arrangement permitting service and maintenance.

C. Fan Wheels: Aluminum hub and wheel with backward-inclined blades.

D. Belt Drives:

1. Resiliently mounted to housing.
2. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
3. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.
4. Pulleys: Cast-iron, adjustable-pitch motor pulley.
5. Fan and motor isolated from exhaust airstream.

E. Accessories:

1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
2. Disconnect Switch: Nonfusible type, with thermal-overload protection mounted outside fan housing, factory wired through an internal aluminum conduit.
3. Bird Screens: Removable, 1/2-inch mesh, aluminum or brass wire.
4. Dampers: Counterbalanced, parallel-blade, backdraft dampers mounted in curb base; factory set to close when fan stops.
5. Motorized Dampers: Parallel-blade dampers mounted in curb base with electric actuator; wired to close when fan stops.

F. Roof Curbs: Galvanized steel; mitered and welded corners; 1-1/2-inch-thick, rigid, fiberglass insulation adhered to inside walls; and 1-1/2-inch wood nailer. Size as required to suit roof opening and fan base.

1. Configuration: Built-in cant and mounting flange.
2. Overall Height: 12 inches.
3. Sound Curb: Curb with sound-absorbing insulation.
4. Pitch Mounting: Manufacture curb for roof slope.
5. Metal Liner: Galvanized steel.
6. Mounting Pedestal: Galvanized steel with removable access panel.
7. Vented Curb: Unlined with louvered vents in vertical sides.

G. Capacities and Characteristics:

1. See Mechanical Schedules sheet for capacities and characteristics.
2. Electrical Characteristics:

a. Volts: 208.
b. Phase: 3.
c. Hertz: 60.

2.2 MOTORS

A. 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.

B. Enclosure Type: Totally enclosed, fan cooled.

2.3 SOURCE QUALITY CONTROL

A. Certify sound-power level ratings according to AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.

B. Certify fan performance ratings, including flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests according to AMCA 210, "Laboratory Methods of Testing Fans for Aerodynamic Performance Rating." Label fans with the AMCA-Certified Ratings Seal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Equipment Mounting:
1. Comply with requirements for vibration isolation and seismic control devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."
2. Comply with requirements for vibration isolation devices specified in Section 230548.13 "Vibration Controls for HVAC."

B. Secure roof-mounted fans to roof curbs with cadmium-plated hardware. See Section 077200 "Roof Accessories" for installation of roof curbs.

C. Install units with clearances for service and maintenance.

D. Label units according to requirements specified in Section 230553 "Identification for HVAC Piping and Equipment."

3.2 CONNECTIONS

A. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Section 233300 "Air Duct Accessories."

B. Install ducts adjacent to power ventilators 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 FIELD QUALITY CONTROL

A. 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.

B. Tests and Inspections:

1. Verify that shipping, blocking, and bracing are removed.
2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
3. Verify that cleaning and adjusting are complete.
4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
5. Adjust belt tension.
6. Adjust damper linkages for proper damper operation.
7. Verify lubrication for bearings and other moving parts.
8. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
9. Disable automatic temperature-control operators, energize motor and adjust fan to indicated rpm, and measure and record motor voltage and amperage.
10. Shut unit down and reconnect automatic temperature-control operators.
11. Remove and replace malfunctioning units and retest as specified above.

C. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Prepare test and inspection reports.

3.4 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Adjust belt tension.

C. Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.

D. Replace fan and motor pulleys as required to achieve design airflow.

E. Lubricate bearings.

END OF SECTION 233423

SECTION 233533 - LISTED KITCHEN VENTILATION SYSTEM EXHAUST DUCTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Listed grease ducts.
2. Access doors.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For listed grease ducts.

1. Include plans, elevations, sections, 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. Detail fabrication and assembly of hangers and seismic restraints.

1.3 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.4 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
2. AWS D9.1/D9.1M, "Sheet Metal Welding Code," for shop and field welding of joints and seams in listed grease ducts and field-fabricated grease ducts.

PART 2 - PRODUCTS

2.1 LISTED GREASE DUCTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AMPCO Stacks.
2. McGill AirFlow LLC.
3. Metal-Fab, Inc.

B. Description: Factory-fabricated, -listed, and -labeled, double-wall ducts tested according to UL 1978 and rated for 500 deg F continuously, or 2000 deg F for 30 minutes; with positive or negative duct pressure and complying with NFPA 211.

C. Construction: Inner shell and outer jacket separated by at least a [1-inch] [2-inch] [3-inch] [4-inch] annular space filled with high-temperature, ceramic-fiber insulation.

1. Inner Shell: ASTM A 666, Type 304 or Type 316 stainless steel.
2. Outer Jacket: Stainless steel where concealed. Stainless steel where exposed.

D. Gaskets and Flanges: Ensure that gaskets and sealing materials are rated at 1500 deg F minimum.

E. Hood Connectors: Constructed from same material as grease duct with internal or external continuously welded or brazed joints.

F. Accessories: Tees, elbows, increasers, terminations, adjustable roof flashings, storm collars, support assemblies, thimbles, firestop spacers, and fasteners; fabricated from similar materials and designs as vent-pipe straight sections; all listed for same assembly. Include unique components required to comply with NFPA 96 including cleanouts, transitions, adapters, and drain fittings.

G. Grease Duct Supports: Construct duct bracing and supports from non-combustible material.

1. Design bracing and supports to carry static and seismic loads within stress limitations of the International Building Code.
2. Ensure that bolts, screws, rivets and other mechanical fasteners do not penetrate duct walls.

H. Comply with ASTM E 2336.

I. Factory Tests: Test and inspect fire resistance of grease duct system according to ASTM E 2336 in presence of Owner.

1. Allow consultant two days' minimum notification before test is performed.

2.2 ACCESS DOORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. 3M.
2. Acudor Products, Inc.
3. Ductmate Industries, Inc.
4. Sachwin Products, Inc.

B. Description: Factory-fabricated, -listed, and -labeled, double-wall maintenance access doors tested according to UL 1978 and rated for 500 deg F continuously, or 2000 deg F for 30 minutes; with positive or negative duct pressure and complying with NFPA 211.

1. Construction: Type 304 or Type 316 stainless-steel inner shell and stainless-steel outer cover with two handles.
2. Fasteners: Stainless-steel bolts and wing nuts.

a. Ensure that bolts do not penetrate interior of duct space.

3. Maintenance Access Door Dimensions: 7 x 7 inches.
4. Door Label: Mark door with uppercase lettering as follows: "ACCESS PANEL. DO NOT OBSTRUCT."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Coordinate installation of roof curbs, equipment supports, and roof penetrations. Comply with requirements in Section 077200 "Roof Accessories."

B. Coordinate connections to kitchen exhaust hoods with requirements in Section 233813 "Commercial-Kitchen Hoods."

C. Coordinate connections to exhaust fans with requirements in Section 233423 "HVAC Power Ventilators."

D. Coordinate firestopping where grease ducts penetrate fire separations with requirements in Section 078413 "Penetration Firestopping."

E. Comply with minimum clearances from combustibles and minimum termination heights according to product listing or NFPA 211 and UL 2221, whichever is most stringent.

F. Install airtight maintenance access doors where indicated.

G. Seal between sections of grease exhaust ducts according to manufacturer's written installation instructions, using sealants recommended by manufacturer.

H. Connections: Make grease duct connections according to the International Mechanical Code.

1. Grease duct to exhaust fan connections: Connect grease ducts to inlet side of fan using flanges, gaskets, and bolts.
2. Grease duct to hood connections:

    a. Make grease duct to hood joints connections using internal or external continuously welded or brazed joints.
    b. Make watertight grease duct to hood joints connections using flanges, gaskets, and bolts.

I. Support ducts at intervals recommended by manufacturer to support weight of ducts and accessories, without applying loading on kitchen hoods.

1. Securely attach supports and bracing to structure.

J. Grease Duct Enclosures: Comply with requirements of the International Building Code and ASTM E 2336.

K. Coordinate fire-rated enclosure construction with Section 092116.23 "Gypsum Board Shaft Wall Assemblies."

L. Repair damage to adjacent materials caused by listed kitchen ventilation system exhaust ducts installation.

3.2 FIELD QUALITY CONTROL

A. Perform air leakage test in presence of Owner before concealment of any portion of the grease duct system.

1. Notify Owner a minimum of two days before test is performed.

END OF SECTION 233533

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 237423.13 - PACKAGED, DIRECT-FIRED, OUTDOOR, HEATING-ONLY MAKEUP-AIR UNITS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes direct-fired heating and ventilating units.

1.2 ACTION SUBMITTALS

A. Product Data: For each type and configuration of outdoor, direct-fired heating and ventilating unit.

1. Complete fan performance curves for supply air, with system operating conditions indicated, as tested in an AMCA Certified Chamber.
2. Sound performance data for supply air, as tested in an AMCA Certified Chamber.
3. Motor ratings, electrical characteristics and motor and fan accessories.
4. Dimensioned drawings for each type of installation, showing isometric and plan view, to include location of attached ductwork and service clearance requirements.
5. Estimated gross weight of each installed unit.
6. Installation, Operating and Maintenance manual (IOM) for each model.
7. Remote panel description to include all functions.

B. Sustainable Design Submittals:

1. Product Data: For ventilation equipment, indicating compliance with ASHRAE 62.1, Section 5 - "Systems and Equipment."

C. Shop Drawings: For each type and configuration of outdoor, direct-fired heating and ventilating unit.

1. Include plans, elevations, sections, 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. Design Calculations: Calculate requirements for selecting vibration isolators and seismic restraints.

1.3 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For manufacturer's special warranty.

B. Seismic Qualification Certificates: For outdoor, direct-fired heating and ventilating units, accessories, and components, from manufacturer.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.5 QUALITY ASSURANCE

A. Comply with NFPA 70.

B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

C. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

1.6 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of direct-fired heating and ventilating units that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Heat Exchangers: Manufacturer's standard, but not less than 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Greenheck
2. Captiveaire
3. Trane

2.2 SYSTEM DESCRIPTION

A. Factory-assembled, prewired, self-contained unit consisting of metal cabinet, supply air blower assembly, electrical control center, filters, curb assembly, outdoor air intake weatherhood with aluminum mesh, motorized intake damper, and direct-fired gas burner to be installed exterior to the building. All specified components and internal accessories factory installed and prepared for single-point high voltage connection.

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 UNIT CASINGS

A. General Fabrication Requirements for Casings:

1. Forming: Form walls, roofs, and floors with at least two breaks at each joint.
2. Casing Joints: Sheet metal screws or pop rivets, factory sealed with water-resistant sealant.
3. Factory Finish for Steel and Galvanized-Steel Casings: Apply manufacturer's standard primer immediately after cleaning and pretreating.

4. Air-Handling-Unit Mounting Frame: Formed galvanized-steel channel or structural channel supports, designed for low deflection, welded with integral lifting lugs.

    a. Seismic Fabrication Requirements: Fabricate mounting base and attachment to air-handling-unit sections, accessories, and components with reinforcement strong enough to withstand seismic forces defined in Section 230548 "Vibration and Seismic Controls for HVAC" when air-handling-unit frame is anchored to building structure.

5. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

B. Configuration: Horizontal unit with bottom discharge for roof-mounting installation.

C. Cabinet: Double-wall insulated metal cabinet, fabricated to permit access to internal components for maintenance. Formed to ensure rigidity and supported by galvanized-steel channels or structural channel supports with lifting lugs. Duct flanges at inlet and outlet. Pitched roof panels and knockouts with grommet seals for electrical and piping connections and lifting lugs.

D. Outer Casing: 18 gauge, galvanized (G90) steel meeting ASTM A653 for components that do not receive a painted finish. Pre-painted components as supplied by the factory shall have polyester urethane paint on 18 gauge G60 galvanized steel. Base rail shall be 12 gauge, galvanized (G90) steel.

E. Inner Casing:

1. Burner Section Inner Casing: 24 gauge galvanized (G90) steel.
2. Double-wall casing with inner wall of solid steel, for the following sections:

    a. Blower section.
    b. Filter section.
    c. Mixing box.
    d. Inlet plenum.
    e. Discharge plenum.
    f. Access Panels: Hinged with handles for burner and fan motor assemblies.

3. Internal Insulation: Fibrous-glass duct lining, neoprene coated, comply with ASTM C 1071, Type II, applied on complete unit.

    a. Thickness: 1 inch.
    b. Insulation Adhesive: Comply with ASTM C 916, Type I.
    c. Density: per manufacturer’s recommendations.
    d. Mechanical Fasteners: Galvanized steel suitable for adhesive, mechanical, or welding attachment to casing without damaging liner when applied as recommended by manufacturer and without causing air leakage.

F. Discharge Section: Down-discharge plenum insulated with 1-inch, 1.5-lb/cu. ft. fibrous glass.

G. Casing Insulation and Adhesive:

1. Materials: ASTM C 1071, [Type I] [Type II].
2. Location and Application: Factory applied with adhesive and mechanical fasteners to the internal surface of section panels downstream from, and including, the heating-coil section.

H. Inspection and Access Panels and Access Doors: Formed and reinforced, single- or double-wall and insulated panels of same materials and thicknesses as casing.

2.4 ACCESSORIES

A. See Mechanical Schedules.

2.5 OUTDOOR-AIR INTAKE HOOD

A. Type: Manufacturer's standard hood or louver.

B. Materials: Match cabinet.

C. Bird Screen: Comply with requirements in ASHRAE 62.1.

D. Filter: Aluminum, cleanable.

E. Configuration: Designed to inhibit wind-driven rain and snow from entering unit.

2.6 ROOF CURBS

A. Materials: Galvanized steel with corrosion-protection coating, watertight gaskets, and factory-installed wood nailer; complying with NRCA standards.

1. Curb Insulation and Adhesive: Comply with NFPA 90A or NFPA 90B.
2. Thickness: 1 inch.
3. Application: Factory applied with adhesive and mechanical fasteners to the internal surface of curb.

a. Liner Adhesive: Comply with ASTM C 916, Type I.
b. Mechanical Fasteners: Galvanized steel, suitable for adhesive attachment, mechanical attachment, or welding attachment to duct without damaging liner when applied as recommended by manufacturer and without causing leakage in cabinet.
c. Liner materials applied in this location shall have air-stream surface coated with a temperature-resistant coating or faced with a plain or coated fibrous mat or fabric depending on service air velocity.
d. Liner Adhesive: Comply with ASTM C 916, Type I.

B. Curb Height: Minimum 8 inches.

2.7 SUPPLY-AIR FAN

A. Fan Type: Centrifugal, rated according to AMCA 210; statically and dynamically balanced, galvanized steel; mounted on solid-steel shaft with heavy-duty, permanently lubricated ball bearings. Bearing rating: L10 of 120,000 hours.

B. Drive: Direct Drive with factory mounted VFD.

C. Mounting: Fan wheel, motor, and drives shall be mounted in fan casing with neoprene isolators.

D. Fan-Shaft Lubrication Lines: Extended to a location outside the casing.

2.8 AIR FILTERS

A. Units shall have 2" thick MERV 13 disposable pleated filters following the outdoor air intake in a V-bank arrangement and shall be accessible from the exterior of the unit.

2.9 DAMPERS

A. Outdoor-Air Damper: Motorized Inlet Air Dampers: to be of low leakage type and shall be factory installed.

2.10 DIRECT-FIRED GAS BURNER

A. Description: Factory assembled, piped, and wired; and complying with ANSI Z21.47, "Gas-Fired Central Furnaces," and with NFPA 54, "National Fuel Gas Code."

1. Unit shall be factory assembled, piped and wired. Direct gas-fired system will be 92% efficient while supplying a burner that is capable of providing 25:1 turndown. Unit will utilize a draw through design and incorporate adjustable burner baffles plates for field adjustments. Unit will have a Pilot ignition system.
2. Burners: Burner construction shall consist of a cast aluminum burner manifold and 400 series stainless steel mixing plates. No air from inside the space shall be allowed to pass across the burner at any time. Flame sensing shall be provided by a flame rod. Burner control shall have a digital coded fault indicator capable of storing the last five faults.
3. Shall be equipped for operation on Natural gas with a maximum rated inlet gas pressure of 1/2 psi.
4. Burner Control option to include the following: discharge temperature.

B. Safety Controls:
1. Manual Reset, High Limit Switch: Main gas valve closes if high-limit temperature is exceeded.
2. Dual safety shutoff valves shall be provided that do not exceed 120 VAC control signals.
3. High Gas Pressure Switch(es): Main gas valve closes if high pressure switch defaults.

2.11 CONTROLS

A. The unit shall be constructed so that it can function as a stand-alone heating system controlled by a factory-supplied remote panel, thermostats and sensors or it can be operated as a heating system controlled by a Building Management System (BMS).

B. Remote Panel: Manufacturer shall provide and contractor shall install a Commercial Kitchen type remote panel that functions as a remote indicator of owner-selected operating parameters.

C. Sensors to be provided with the unit:
1. Heating Inlet Air Sensor
2. Dirty Filter Sensor
3. 120/24V Smoke Detector

D. Fan Control: Interlock fan to start with exhaust fan(s) to which this heating and ventilating unit is associated for makeup air.

E. Outdoor-Air Damper Control, 100 Percent Outdoor-Air Units: Outdoor-air damper shall open when supply fan starts, and close when fan stops.

F. Temperature Control: Operates gas valve to maintain supply-air temperature.

1. Operates gas valve to maintain discharge-air temperature with factory-mounted sensor in blower outlet.

2.12 MOTORS

A. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."

B. General: Blower motors greater than 3/4 horsepower shall be “NEMA Premium” unless otherwise indicated. Compliance with EPAct minimum energy-efficiency standards for single speed ODP and TE enclosures is not acceptable. Motors shall be heavy-duty, permanently lubricated type to match the fan load and furnished at the specified voltage, phase, and enclosure.

2.13 CAPACITIES AND CHARACTERISTICS

A. Fan:

1. See Mechanical Schedules Sheet.

B. Fan Motor:

1. See Mechanical Schedules Sheet.

C. Single-Point Electrical Connection:

1. See Mechanical Schedules Sheet.

D. Direct-Fired Gas Burner:

1. See Mechanical Schedules Sheet.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Equipment Mounting:
1. Comply with requirements for vibration isolation and seismic control devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."

B. Unit Support: Install heating and ventilating unit level on structural curbs. Coordinate roof penetrations and flashing with roof construction. Secure units to structural support with anchor bolts.

C. Install gas-fired units according to NFPA 54, "National Fuel Gas Code."

D. Install controls and equipment shipped by manufacturer for field installation with direct-fired heating and ventilating units.

E. Roof Curb: Install units on curbs and coordinate roof penetrations and flashing with roof construction specified in Section 077200 "Roof Accessories." Secure units to upper curb rail, and secure curb base to roof framing or concrete base with anchor bolts.

3.2 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

1. Gas Piping: Comply with requirements in Section 231123 "Facility Natural-Gas Piping." Connect gas piping with shutoff valve and union, and with sufficient clearance for burner removal and service. Make final connections of gas piping to unit with corrugated, stainless-steel tubing flexible connectors complying with ANSI LC 1/CSA 6.26 equipment connections.

B. Drain: Comply with requirements in Section 221316 "Sanitary Waste and Vent Piping" for traps and accessories on piping connections to condensate drain pans under condensing heat exchangers. Where installing piping adjacent to heating and ventilating units, allow space for service and maintenance.

C. Duct Connections: Connect supply ducts to direct-fired heating and ventilating units with flexible duct connectors. Comply with requirements in Section 233300 "Air Duct Accessories" for flexible duct connectors.

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."

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections with the assistance of a factory-authorized service representative.

B. Units will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

3.4 ADJUSTING

A. Adjust initial temperature set points.

B. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain heating and ventilating units.

END OF SECTION 237423.13

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
15. Section 262813 FUSES
16. Section 262816 ENCLOSED SWITCHES AND CIRCUIT BREAKERS
17. Section 262913.03 MANUAL AND MAGNETIC MOTOR CONTROLLERS
18. Section 265119 LED INTERIOR LIGHTING
19. 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, safety 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 or 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 Crawlspaces: Type THHN/THWN-2, single conductors in raceway.

C. Exposed Branch Circuits, Including in Crawlspaces: 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-inchclearance 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 galvanneal 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.

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 graft 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. Pigtailing 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.

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 galvannealed 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 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

31 2000 EARTH MOVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Excavation, filling, and backfilling for structures, and pavement.
2. Trenching and backfilling for utilities.
3. Dewatering.
4. Boring under crossings.

B. Related Sections
1. 31 3200 Soil Stabilization
2. 31 2500 Erosion Control and Sedimentation.
3. 31 3500 Slope Protection

1.2 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by the basic designation only.

B. ASTM International (ASTM)
1. ASTM D 422 - Standard Test Method For Particle Size Analysis of Soil
2. ASTM D 698 - Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3 (600 kN.m/m^3))
3. ASTM D 1557 - Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3 (2,700 Kn.m/m^3))
4. ASTM D 2922 - Density of Soil and Soil-Aggregate In Place by Nuclear Methods (Shallow Depth)
5. ASTM D 4318 - Liquid Limit, Plastic Limit, and Plasticity Index of Soils

C. American Association of State Highway and Transportation Officials (AASHTO)
1. AASHTO T 88 - Particle Size Analysis of Soils

D. New York State Department of Transportation (NYSDOT) Standard Specifications (latest addition January 1, 2018).

E. National Fire Protection Association (NFPA)
1. NFPA 70 - National Electrical Code

F. American Water Works Association (AWWA)
1. AWWA C200 - Standard For Steel Water Pipe - 6 In. (150 Mm) And Larger
2. AWWA C206 - Field Welding Of Steel Water Pipe

1.3 QUALITY ASSURANCE

A. An Independent Testing Laboratory (ITL), selected and paid for by the Owner, is recommended to be retained to perform construction testing on site.
1. The ITL shall prepare test reports that indicate test location, elevation data, and test results. Owner, Civil Engineering Consultant, and Contractor shall be provided with copies of reports within 96 hours of time

that test was performed. In event that test performed fails to meet Specifications, the independent testing laboratory shall notify Owner and Contractor immediately.

2. Costs related to retesting due to failures shall be paid for by the Contractor at no additional expense to Owner. Contractor shall provide free access to site for testing activities.
3. Quality assurance testing will be conducted in accordance with Paragraph "Field Testing" in Part 3 hereinafter.

1.4 DEFINITIONS

A. Satisfactory Materials: ASTM D 2487 soil classification groups GW, GP, GM, SW, SP, SM, ML, CL, or a combination of these group symbols.
   1. Fill material shall further conform to the plasticity index and liquid limits (PI and LL) specified in Paragraph FILLING hereinafter.
   2. Satisfactory materials shall be free of rock or gravel larger than allowed for fill or backfill material as specified hereinafter or as shown on the drawings.
   3. Satisfactory materials shall contain no debris, waste, frozen materials, vegetation, and other deleterious matter.
   4. Unless specifically stated otherwise on the Drawings, the following table stipulates maximum allowable values for plasticity index (PI) and liquid limit (LL) of satisfactory materials to be used as fill in specified areas:

Location	PI	LL
Building area (below upper four feet)	20	50
Building area (upper four feet)	12	40
Areas outside the building pad		
(below upper two feet)	20	50
(upper two feet, except for depth to receive topsoil)	15	40

(References to depth are to proposed subgrade elevations)

B. Unsatisfactory Materials: Materials which do not comply with the requirements for satisfactory materials are unsatisfactoy.
   1. Unsatisfactory materials also include man-made fills; trash; refuse; backfills from previous construction; and material classified as satisfactory materials which contains root and other organic matter or frozen material. The ITL shall be notified of any contaminated materials.
   2. Unsatisfactory materials also include satisfactory materials not maintained within 2 percent of optimum moisture content at time of compaction.

1.5 SUBMITTALS

A. Submit 30-pound sample of each type of off-site fill material that is to be used at the site in airtight containers to the independent testing laboratory or submit gradation and certification of aggregate material that is to be used at the site to the independent testing laboratory for review.

B. Submit certification that all material obtained from off-site sources complies with specification requirements.

C. Submit name of each material supplier and specific type and source of each material. Change in source throughout project requires approval of Owner.

D. If fabrics or geogrids are to be used, design shall be submitted for approval to Owner.

E. Submit Dewatering Plans upon request by Owner.

F. Shop drawings or details pertaining to excavating and filling are not required unless otherwise shown on the Drawings or if contrary procedures to Construction Documents are proposed.

G. Shop drawings or details pertaining to site utilities are not required unless required by regulatory authorities or unless uses of materials, methods, equipment, or procedures that are contrary to The Drawings or Specifications are proposed. Do not perform work until Owner has accepted required shop drawings.

H. Contact utility companies and determine if additional easements will be required to complete project. Provide written confirmation of the status of all easements to Owner at time of Preconstruction Conference or no later than 90 days prior to project possession date.

PART 2 - PRODUCTS

2.1 SOIL AND ROCK MATERIALS

A. Bedding: Aggregate Type as indicated on the plans or naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No.200 sieve.

B. Common Fill: 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.

C. Granular Fill: Subgrade fill needed 12”below the structure slab base should be a mixture of sand, gravel and silt similar to that of the existing fill and native soils. Fill should be a material free from organic matter, frozen material and other deleterious substances meeting the requirements of Granular Borrow, as given below.

Granular Fill	
Sieve Size	**Percent Finer by Weight**
4 Inch	100
#40	30 to 90
#40	10 to 70
#200	0 to 15

D. Structural Fill: We recommend that backfill placed against the exterior side of the perimeter foundations, base materials below sidewalks, be a clean granular material meeting the gradation for Structural Fill, as given below.

(* Maximum 2 inch particle size within 12 inches of the underside of footings or slabls.)

Structural Fill (Terracon Recommendation)	
Sieve Size	**Percent Finer by Weight**
6 inch	100
3 inch	70 - 100
2 inch	(100)*
3/4 inch	45 to 95
#4	30 to 90

#10	25 - 80
#40	10 to 50
#200	0 to 12

E. Gravel Borrow: Shall conform New York State Department of Transportation (NYSDOT) Standard Specifications. Maximum size of stone in the gravel shall be 2" in its largest dimension. The gradation requirements for Gravel Borrow are as follows:

Gravel Borrow	
Sieve Size	**Percent Finer by Weight**
1/2 Inch	50 to 85
#4	40 to 75
#10	30-60
#40	10-35
#50	8 to 28
#100	5-20
#200	0 to 10

Processed Gravel: Aggregate Base for Pavements should be used as the base course layer below the asphalt pavements.

Processed Gravel for Subbase	
Sieve Size	**Percent Finer by Weight**
3 Inch	100
1 ½ Inch	70 to 100
¾ Inch	50 to 85
#4	30 to 60
#200	0 to 10

F. Trench Backfill: Trench backfill used above specified pipe bedding materials should be material similar to that in the trench sidewalls to lessen the potential for differential frost action between the trench and the adjacent materials.

G. ADS Crushed Stone: Class I – clean ¾ - 2 inch angular

H. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch sieve and 0 to 5 percent passing a No.4 sieve.

I. Topsoil: Topsoil shall consist of stripping material excavated from the site. Topsoil shall consist of organic surficial soil found in depth of not more than 6-inches. Topsoil shall be as further defined in Section 32 9000 – Planting.

2.2 APPURTENANT MATERIALS

A. Stabilization fabrics and geogrids: As specified in Section 31 3200.

B. Filter and drainage fabrics: As specified in Section 31 3200.

C. Steel Casing Pipe: Comply with AWWA C200 minimum grade B, size, and wall thickness as indicated on The Drawings.

D. Trench Utility Locator Tape: Heavy duty 6" wide underground warning tape. Tape shall be made from polyethylene material, 3.5 mils thick, with a minimum tensile strength of 1,750 psi. Place the tape at one-half the minimum depth of cover for the utility line or a maximum of 3 feet, which ever is the less, but never above the top of subgrade. Color of tape shall be determined by as follows:
1. Natural Gas or Propane - Yellow
2. Electric - Red
3. Telephone – Orange
4. Water – Blue
5. Sanitary Sewer – Green

2.3 EQUIPMENT

A. Transport off-site materials to project using well-maintained and operating vehicles. Once on site, transporting vehicles shall stay on designated haul roads and shall at no time endanger improvements by rutting, overloading, or pumping.

2.4 SOURCE QUALITY CONTROL

A. Laboratory testing of materials proposed for use in the project shall be by the Independent Testing Laboratory at no cost to Contractor. The Contractor shall provide samples of material obtained off-site.

B. Perform California Bearing Ratio (CBR) or Limerock Bearing Ratio (LBR) tests in outparcels and areas to receive pavement for each type of material that is imported from off-site. CBR or LBR value shall be equal to or above pavement design subgrade CBR or LBR value indicated on Construction Drawings

C. Following tests shall be performed on each type of on-site or imported soil material used as compacted fill:
1. Moisture and Density Relationship: ASTM D 698 or ASTM D 1557.
2. Mechanical Analysis: AASHTO T 88 or ASTM D422.
3. Plasticity Index: ASTM D 4318

PART 3 - EXECUTION

3.1 PREPARATION

A. Identify required lines, levels, contours, datum, elevations, and grades necessary for construction as shown on the drawings.

B. Notify utility companies to remove or relocate public utilities that are in conflict with proposed improvements.

C. Protect plant life, lawns, fences, existing structures, sidewalks, paving, and curbs, unless otherwise noted on the drawings from excavating equipment and vehicular traffic.

D. Protect benchmarks, property corners, and other survey monuments from damage or displacement. If marker needs to be removed it shall be referenced by licensed land surveyor and replaced, as necessary, by same.

E. Remove from site, material encountered in grading operations that, in opinion of Owner or the Owner's Independent Testing Laboratory (ITL) is unsatisfactory material or undesirable for backfilling, subgrade, or foundation purposes. Dispose of in manner satisfactory to Owner and local governing agencies. Backfill areas with layers of satisfactory material and compact as specified herein.

F. Prior to placing fill in low areas, such as previously existing creeks, ponds, or lakes, perform following procedures:
   1. Drain water out by gravity with ditch having flow line lower than lowest elevation in low area. If drainage cannot be performed by gravity ditch, use adequate pump to obtain the same results.
   2. After drainage of low area is complete, remove muck, mud, debris, and other unsatisfactory material by using acceptable equipment and methods that will keep natural soils underlying low area dry and undisturbed.
   3. All muck, mud, and other materials removed from low areas shall be dried on-site by spreading in thin layers for observation by the ITL. Material shall be inspected and, if found to be satisfactory for use as fill material, shall be incorporated into lowest elevation of site filling operation, but not under building subgrade or within 10'-0" of perimeter of building subgrade, paving or outparcell subgrade. If, after observation by the ITL, material is found to be shall be removed from site.

G. Locate and identify utilities that have previously been installed and protect from damage.

H. Locate and identify existing utilities that are to remain and protect from damage.

I. Maintain in operating condition existing utilities, previously installed utilities, and drainage systems encountered in utility installation. Repair surface or subsurface improvements shown on The Drawings.

J. Verify location, size, elevation, and other pertinent data required making connections to existing utilities and drainage systems as indicated on The Drawings.

K. Over excavate and properly prepare areas of subgrade that are not capable of supporting proposed systems. Stabilize these areas by using acceptable geotextile fabrics or aggregate material placed and compacted as specified in Section 31 3200.

3.2 DEWATERING

A. General:
   1. Provide dewatering systems as required for excavations.
   2. Design and provide dewatering system using accepted and professional methods consistent with current industry practice to eliminate water entering the excavation under hydrostatic head from the bottom or sides. Design system to prevent differential hydrostatic head, which would result in floating out soil particles in a manner, termed as a "quick" or "boiling" condition. System shall not be dependent solely upon sumps or pumping water from within the excavation where differential head would result in a quick condition, which would continue to worsen the integrity of the excavation's stability.
   3. Provide dewatering system of sufficient size and capacity to prevent ground and surface water flow into the excavation and to allow Work to be installed in a dry condition.
   4. Control, by acceptable means, all water regardless of source. Contractor shall be responsible for disposal of the water.
   5. Confine discharge piping or ditches to available easement or to additional easement obtained by Contractor. Provide necessary permits or easement.

6. Control groundwater in a manner that preserves strength of foundation soils, does not cause instability or raveling of excavation slopes, and does not result in damage to existing structures. Where necessary, lower water level in advance of excavation utilizing wells, wellpoints, jet educators, or similar positive methods. The water level as measured by piezometers shall be maintained a minimum of 3 feet below prevailing excavation level.
7. Commence dewatering prior to any appearance of water in excavation and continue until Work is complete to the extent that no damage results from hydrostatic pressure, flotation, or other causes.
8. Open pumping with sumps and ditches will be allowed provided it does not result in boils, loss of fines, softening of the ground, or instability of slopes.
9. Install wells or wellpoints, if required, with suitable screens and filters so that continuous pumping of fines does not occur. Arrange discharge to facilitate collection of samples by the Owner. During normal pumping and upon development of wells, levels of fine sand or silt in the discharge water shall not exceed 5 ppm. Install sand tester on discharge of each pump during testing to verify that levels are not exceeded.
10. Control grading around excavations to prevent surface water from flowing into excavation areas.
11. No additional payment will be made for any supplemental measures to control seepage, groundwater, or artesian head.

B. Design:
1. Designate and obtain the services of a qualified dewatering specialist to provide dewatering plan as may be necessary to complete the Work.
2. Contractor shall be responsible for the accuracy of the drawings, design data, and operational records required.
3. Contractor shall be responsible for the design, installation, operation, maintenance, and any failure of any component of the system.

C. Damages:
1. Contractor shall be responsible for and shall repair any damage to work in place, other contractor's equipment, utilities, residences, highways, roads, railroads, private and municipal well systems, adjacent structures, natural resources, habitat, existing wells, and the excavation. Contractor responsibility shall also include, damage to the bottom due to heave and including but not limited to, removal and pumping out of the excavated area that may result from Contractor's negligence, inadequate or improper design and operation of the dewatering system, and any mechanical or electrical failure of the dewatering system.
2. Remove subgrade materials rendered unsatisfactory by excessive wetting and replace with approved backfill material at no additional cost to the Owner.

D. Maintaining Excavation in Dewatering Condition:
1. Dewatering shall be a continuous operation. Interruptions due to power outages, or any other reason will not be permitted.
2. Continuously maintain excavation in a dry condition with positive dewatering methods during preparation of subgrade, installation of pipe, and construction of structures until the critical period of construction or backfill is completed to prevent damage of subgrade support, piping, structure, side slopes, or adjacent facilities from flotation or other hydrostatic pressure imbalance.
3. Provide standby equipment on site, installed, wired, and available for immediate operation if required to maintain dewatering on a continuous basis in the event any part of the system becomes inadequate or fails. If dewatering requirements are not satisfied due to inadequacy or failure of dewatering system, perform such work as may be required to restore damaged structures and foundation soils at no additional cost to Owner.
4. System maintenance shall include but not be limited to 24-hour supervision by personnel skilled in the operation, maintenance, and replacement of system components, and any other work required to maintain excavation in dewatered condition.

E. System Removal: Upon completion of the work, remove dewatering equipment from the site, including related temporary electrical service.

F. Wells shall be removed or cut off a minimum of 3 feet below final ground surface, capped, and abandoned in accordance with regulations by agencies having jurisdiction.

3.3 TOPSOIL EXCAVATION

A. Cut heavy growths of grass from areas before stripping and remove cuttings with remainder of cleared vegetative material.

B. Strip topsoil to a depth of not less than 6 inches from areas that are to be filled, excavated, landscaped, or re-graded to such depth that it prevents intermingling with underlying subsoil or questionable material.

C. Stockpile topsoil in storage piles in areas shown on The Drawings or where directed by Owner. Construct storage piles to freely drain surface water. Cover storage piles as required to prevent windblown dust. Dispose of unsuitable topsoil as specified for waste material, unless otherwise specified by Owner. Remove excess topsoil from site unless specifically noted otherwise on The Drawings.

3.4 GENERAL EXCAVATION

A. Classification of Excavation: The Contractor shall assure himself by site investigation or other necessary means that he is familiar with the type, quantity, quality, and character of excavation work to be performed. Excavation shall be considered unclassified excavation, except as indicated in the Contract Documents.

B. When performing grading operations during periods of wet weather, provide adequate dewatering, drainage and ground water management to control moisture of soils.

C. Shore, brace, and drain excavations as necessary to maintain excavation as safe, secure, and free of water at all times.

D. Excavate building areas to line and grade as shown on the Drawings being careful not to over excavate beyond elevations needed for building subgrades.

E. Place satisfactory excavated material into project fill areas.

F. Unsatisfactory excavated material shall be disposed of in manner and location that is acceptable to Owner and local governing agencies.

G. Perform excavation using capable, well-maintained equipment and methods acceptable to Owner and local governing agencies.

3.5 TRENCHING EXCAVATION FOR UTILITIES

A. Contact local utility companies before excavation begins. Dig trench at proper width and depth for laying pipe, conduit, or cable. Cut trench banks vertical, if possible, and remove stones from bottom of trench as necessary to avoid point-bearing. Over-excavate wet or unstable soil, if encountered, from trench bottom as necessary to provide suitable base for continuous and uniform bedding. Replace over-excavation with satisfactory material and dispose of unsatisfactory material.

B. Trench excavation sidewalls shall be sloped, shored, sheeted, braced, or otherwise supported by means of sufficient strength to protect workmen in accordance with applicable rules and regulations established for construction by the Department of Labor, Occupational Safety and Health Administration (OSHA), and by local ordinances. Lateral travel distance to exit ladder or steps shall not be greater than 25 feet in trenches 4 feet or deeper.

C. Perform trench excavation as indicated on the Drawings for specified depths. During excavation, stockpile materials suitable for backfilling in orderly manner far enough from bank of trench to avoid overloading, slides, or cave-ins.

D. Remove excavated materials not required or not satisfactory as backfill or embankments and waste off-site or at on-site locations approved by the Owner and in accordance with governing regulations. Dispose of structures discovered during excavation as specified in Section 31 1000.

E. Prevent surface water from flowing into trenches or other excavations by temporary grading or other methods, as required. Remove accumulated water in trenches and other excavations as specified.

F. Open cut excavation with trenching machine or backhoe. Where machines other than ladder or wheel-type trenching machines are used, do not use clods for backfill.

G. Accurately grade trench bottom to provide uniform bearing and support for each section of pipe on bedding material at every point along entire length except where necessary to excavate for bell holes, proper sealing of pipe joints, or other required connections. Dig bell holes and depressions for joints after trench bottom has been graded. Dig no deeper, longer, or wider than needed to make joint connection properly.

H. Trench width below top of pipe shall not be less than 12 inches nor more than 18 inches wider than outside surface of pipe or conduit that is to be installed to designated elevations and grades. Other trench width for pipe, conduit, or cable shall be least practical width that will allow for proper compaction of trench backfill.

I. Trench depth requirements measured from finished grade or paved surface shall meet the following requirements or applicable codes and ordinances, whichever is more stringent:
   1. Water Mains: 30 inches to top of pipe barrel or 6 inches below frost line, established by local building official, whichever is deeper.
   2. Sanitary Sewer: Elevations and grades as indicated on the drawings and as specified.
   3. Storm Sewer: Elevations and grades as indicated on the Drawings.
   4. Electrical Conduits: 24 inches minimum to top of conduit or as required by NEC 300-5, NEC 710-36 codes, or local utility company requirements, whichever is deeper.
   5. TV Conduits: 18 inches minimum to top of conduit or as required by local utility company, whichever is deeper.
   6. Telephone Conduits: 18 inches minimum to top of conduit, or as required by local utility company, whichever is deeper.
   7. Gas Mains and Service: 30 inches minimum to top of pipe, or as required by local utility company, whichever is deeper.

3.6 SUBGRADE PREPARATION

A. Scarification and Compaction: Areas exposed by excavation or stripping and on which subgrade preparations are to be performed shall be scarified to minimum depth of 8 inches and compacted as specified hereinafter.

B. Proofrolling: Subgrades shall be proofrolled to detect areas of insufficient compaction. Proofrolling shall be accomplished by making minimum of 2 complete passes with a vibratory roller compactor with a static weight of 12 tons and a dynamic impact of 20 tons, in each of 2 perpendicular directions while under the supervision and direction of the independent testing laboratory. Document and explain proofrolling inspection procedures and results in the laboratory inspection report. Areas of failure shall be excavated and recompacted as specified herein. Continual failure areas shall be stabilized in accordance with Section 31 3200 at no additional cost to Owner. Subgrade exposed longer than 48 hours or on which precipitation has occurred shall be re-proofrolled.

3.7 FILLING

A. Fill areas to contours and elevations shown on the Drawings with materials deemed satisfactory.

B. Place fills in continuous lifts specified herein.

C. Fill within proposed building subgrade, paving subgrade, and outparcel subgrades shall not contain rock or stone greater than 6 inches in any dimension.

D. Unless otherwise specified for rock fill, rock or stone less than 6-inches in largest dimension may be used in fill below structures, paving, outparcels, and graded areas, up to 24 inches below surface of proposed subgrade or finish grade of graded areas when mixed with satisfactory material. Rock or stone less than 2 inches in largest dimension may be used in fill within the upper 24 inches of proposed subgrade or finish grade of graded areas when mixed with satisfactory material.

E. Fill materials used in preparation of subgrade shall be placed in lifts or layers not to exceed 8 inches loose measure and compacted as specified hereinafter.

F. Material imported from off-site shall have CBR or LBR value equal to or above pavement design subgrade CBR or LBR value indicated on The Drawings.

G. Building area subgrade pad shall be that portion of site directly beneath and 10 feet beyond building and appurtenances, including limits of future building expansion areas as shown on the Drawings.

H. Prepare building area subgrade pad in strict accordance with the Drawings.

3.8 ROCK FILL

A. Rock fill shall include on-site excavated material classified as rock excavation. Rock fill may be utilized in fill up to 48 inches below top of subgrade or finish grade of graded areas unless otherwise permitted in higher elevations by the ITL. Rock fill shall consist of rock having a maximum dimension not greater than 12 inches in any dimension. Rock fill shall be placed in successive horizontal layers of loose material having a thickness of approximately the maximum size of the larger rock in the lift, but not greater than 12 inches. Each layer of material shall be spread uniformly, completely saturated, and compacted. Shot rock shall not be dumped into place, but shall be distributed in horizontal lifts by blading and dozing in such a manner as to ensure proper placement into final position in the embankment. Voids shall be filled with finer material including shot rock fines and limited soil fines during the spreading operation. Successive layers shall not be placed until all voids of the current lift are filled and the lift is compacted. Each successive layer of material shall adequately bond to the material on which it is placed. Compaction shall be accomplished with vibratory compactors, heavy rubber-tired rollers, or steel-wheeled rollers. Compaction shall be by uniform passes of compaction equipment in sufficient number of passes, but not less than two passes, such that no further consolidtion is evident as determined by the ITL.

3.9 PIPE BEDDING

A. Excavate trenches for pipe or conduit to 4 inches below bottom of pipe and to the width as specified herein. Place 4 inches of bedding material, compact in bottom of trench, and shape to conform to lower portion of pipe barrel.

B. Place geotextile fabric as specified on the Drawings and in accordance with Section 31 3200.

3.10 TRENCH BACKFILLING

A. Materials used for trench backfill shall comply with requirements as specified herein.

B. Backfill and compact trench backfill above specified pipe bedding materials with a material similar in gradation and density to that in the trench sidewalls to lessen the potential for differential settling and frost action between the trench and the adjacent materials..

C. Do not backfill trenches until required tests are performed and utility systems comply with and are accepted by applicable governing authorities.

D. Backfill trenches to contours and elevations shown on the Drawings.

E. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.

3.11 BORINGS AND CASINGS UNDER ROADS, HIGHWAYS, AND RAILROAD CROSSINGS

A. When indicated by the Drawings, street, road, highway, or railroad crossings for utility mains installed by jacking and boring method shall be in accordance with area specifications and governing authorities.

B. Excavation of approach pits and trenches within right-of-way of street, road, highway, or railroad shall be of sufficient distance from paving or railroad tracks to permit traffic to pass without interference. Tamp backfill for approach pits and trenches within right-of-way in layers not greater than 6-inches thick for entire length and depth of trench or pit. Compact backfill to 98 percent of maximum density in accordance with ASTM D698, (or 95 percent of maximum density, in accordance with ASTM D1557) obtained at optimum moisture as determined by AASHTO T 180. Mechanical tampers may be used after cover of 6 inches has been obtained over top of barrel of pipe.

C. Accomplish boring operation using commercial type boring rig. Bore hole to proper alignment and grade. Bore hole shall be within 2 inches of same diameter as largest outside joint diameter of pipe installed. Install pipe in hole immediately after bore has been made and in no instance shall hole be left unattended while open.

D. In event subsurface operations result in failure or damage to pavement or railroad tracks within 1 year of construction, make necessary repairs to pavement or railroad tracks. If paving cracks on either side of pipe line or is otherwise disturbed or broken due to construction operations, repair or replace disturbed or broken area.

E. Clean, prime, and line interior and exterior of casing pipe with two coats of asphalt coating in accordance with and governing authorities.

F. Butt weld steel casing. Welds shall be full penetration single butt-welds in accordance with AWWA C206.

G. Install casing and utility pipe with end seals, vent pipe, and other special equipment in accordance with area specifications and governing authorities.

3.12 COMPACTION

A. Compact as follows:

Location	Percent of Maximum Laboratory Density ASTM D698	ASTM D1557
Subgrade & Fill Below Structures and Pavement	98	95
Subgrade & Fill in All other Areas	95	92

B. Maintain moisture content of not less than 1 percent below and not more than 3 percent above optimum moisture content of fill materials to attain required compaction density.

C. Exercise proper caution when compacting immediately over top of pipes or conduits. Water jetting or flooding is not permitted as method of compaction.

D. Corrective Measures for Non-Complying Compaction: Remove and recompact deficient areas until proper compaction is obtained. Continual failure areas shall be stabilized in accordance with Section 31 3200 at no additional cost to Owner.

3.13 MAINTENANCE OF SUBGRADE

A. Verify finished subgrades to ensure proper elevation and conditions for construction above subgrade.

B. Protect subgrade from excessive wheel loading during construction, including concrete trucks, dump trucks, and other construction equipment.

C. Remove areas of finished subgrade found to have insufficient compaction density to depth necessary and replace in manner that will comply with compaction requirements by use of material with CBR or LBR equal to or better than that specified on the drawings. Surface of subgrade after compaction shall be firm, uniform, smooth, stable, and true to grade and cross-section.

D. Construct temporary ditches and perform such grading as necessary to maintain positive drainage away from subgrade at all times.

E. Should the subgrade become yielding or difficult to work, the subgrade should be over-excavated and backfilled with new compacted Structural Fill or Crushed Stone.

3.14 BORROW AND SPOIL SITES

A. Comply with NPDES and local erosion control permitting requirements for any and all on-site and off-site, disturbed spoil and borrow areas. Upon completion of spoil or borrow operations, clean up spoil or borrow areas in a neat and reasonable manner to the satisfaction of Owner or off-site property owner, if applicable.

3.15 FINISH GRADING

A. Check grading of building subgrades by string line from grade stakes (blue tops) set at not more than 50-foot centers. Allowable tolerance shall be plus or minus 0.10 feet from plan grade. Provide engineering and field staking as necessary for verification of lines, grades, and elevations.

B. Grade areas where finish grade elevations or contours are indicated on the Drawings, other than paved areas, outparcels, and buildings, including excavated areas, filled and transition areas, and landscaped areas. Graded areas shall be uniform and smooth, free from rock, debris, or irregular surface changes. Ground surfaces shall vary uniformly between indicated elevations. Grade finished ditches to allow for proper drainage without ponding and in manner that will minimize erosion potential. For topsoil, sodding, and seeding requirements refer to Section 32 9000.

C. Correct settled and eroded areas within 1 year after date of completion at no additional expense to Owner. Bring grades to proper elevation.

3.16 QUALITY ASSURANCE TESTING AND INSPECTION

A. Responsibilities: Unless otherwise specified, quality control tests and inspection specified below will be conducted by the Owner’s Independent Testing Laboratory (ITL) at no cost to the Contractor. The Contractor shall perform additional testing or inspection as considered necessary by the Contractor for assurance of quality control.

B. Field testing, frequency, and methods may vary as determined by and between the Owner and the ITL.

C. Work shall be preformed by a Special Inspector – Technical I unless specified otherwise. Report of testing and inspection results shall be made upon the completion of testing.

D. Classification of Materials: Perform test for classification of materials used and encountered during construction in accordance with ASTM D2488 and ASTM D2487.

E. Laboratory Testing Of Materials: Perform laboratory testing of materials (Proctor, Sieve Analysis, Atterberg Limits, Consolidation Test, etc.) as specified.

F. Field Density Tests.
   1. Building Subgrade Areas, Including 10'-0" Outside of Exterior Building Lines: In cut areas, not less than 1 compaction test for every 2,500 sq. ft. In fill areas, same rate of testing for each 8-inch lift, measured loose.
   2. Paving Areas and other Areas of Construction Exclusive of Building Subgrade: In cut areas, not less than 1 compaction test for every 10,000 sq. ft. In fill areas, same rate of testing for each 8-inch lift, measured loose.
   3. Utility Trench Backfill: Intervals not exceeding 200-feet of trench for first and every other 8-inch lift of compacted trench backfill.
   4. Test Method: In-place nuclear density, ASTM D 2922 (Method B-Direct Transmission).

G. Corrective Measures For Non-Complying Compaction: Remove and recompact deficient areas until proper compaction is obtained at no additional expense to Owner. Adjust moisture content as necessary to conform to the requirements of this section.

H. Observation and Inspection:
   1. Observe all subgrades/excavation bases below footings and slabs and verify design bearing capacity is achieved as required. Work shall be preformed by a Special Inspector – Technical II.
   2. Observe and document presence of groundwater within excavations.
   3. Verify cut and fill slopes as specified in the contract documents. Work shall be preformed by a Special Inspector – Technical III.

END OF SECTION

SECTION 312314 - STRUCTURAL EXCAVATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including the General and Supplementary Conditions, apply to the work specified in this Section.

1.2 SCOPE OF WORK

A. The work under this Section includes all labor, supervision, materials and equipment necessary for the completion of all building structure excavation within the building and excavation five (5') feet outside the building for structures and utility lines, as shown on the Drawings and as specified.

B. Work shall include, but not be limited to, the following:

1. Building excavation, including pits and trenches for utilities within the building
2. Protection of utilities
3. Stockpiling of reusable materials
4. Removal of unsuitable materials
5. Rock excavation

1.3 RELATED WORK

A. Section 315004 - Earthwork Protection
B. Section 312324 - Structural Fill

PART 2 - PRODUCTS - Not applicable

PART 3 - EXECUTION

3.1 EXCAVATION

A. Excavate all areas as required to perform work shown on Drawings and to conform to new finish grades. Excavations shall be to proper depth and width to allow for slabs, gravel bases and other subsequent construction.

B. Excavate to depth and lineal dimensions required to permit subsequent formwork and concrete operations to proceed without hindrance. Excavation for footings, walls, piers, grade beams, etc., must be sufficiently wide to compact all fill by mechanical means. In general, excavation shall be cut to a line eighteen (18") inches outside of the face of footings, with no undercutting permitted.

C. Surfaces of excavations shall be suitably dressed to grade noted to receive subsequent construction. Bottoms shall be substantially level, with no large projections, and free of loose material. Material

at bottoms of excavation shall be undisturbed. The Engineer shall be immediately notified if material unsatisfactory for foundation bearing is encountered, for further instructions, before proceeding with work.

D. Trenches and excavations shall be of sufficient width and depth at all points to allow all pipes to be laid, joints to be formed, and structures and appurtenant construction to be built in most thorough and workmanlike manner, and to allow for sheeting and shoring, pumping and draining. Trenches and excavations shall be at least eighteen (18") inches wider than outside dimension of structures they are to contain. Trenches for pipes must not be unnecessarily wide so as to materially increase load on pipe resulting from backfill. Bottoms of trenches and other excavations shall be carried to lines and shapes satisfactory to Engineer.

E. Completely remove all abandoned subsurface utilities, structures and existing foundations within the lines of the new building construction. Plug abandoned utility lines at least five (5') feet outside of new construction.

F. If footing bottoms are disturbed, allowed to freeze, or if excavations for footings are carried below indicated elevations shown on the Drawings, the Contractor shall notify the Engineer for instructions prior to proceeding.

3.2 PROTECTION OF UTILITIES

A. Protect existing utilities and relocate only as shown on Plans or in Specifications.

B. Notify utility companies to shut off services when required.

C. Any damage to existing drainage and utility structures to be retained shall be repaired at the Contractor's expense.

D. Maintain drainage of site and adjacent areas to prevent damage and erosion. When necessary to interrupt drainage of existing facilities, provide temporary facilities until permanent installations have been completed.

3.3 REMOVAL OF UNSUITABLE MATERIALS

A. Remove all debris subject to termite attack, rot or corrosion and all other deleterious materials from areas to be filled.

B. Remove from the interior of the building all unsuitable materials such as topsoil, loam or other organic materials.

C. Remove from site, all excavated materials not required for fill.

3.4 STOCKPILES

A. Approved excavated material suitable for fill or structural fill (i.e., clean granular material) shall be stockpiled.

3.5 ROCK EXCAVATION

A. Definition: Rock is defined as ledge, stone or hard shale, concrete, or masonry structures which require drilling or blasting for removal, and boulders larger than one (1 cy) cubic yard in volume within the building excavation and one-half (1/2 cy) cubic yard in volume encountered in trench excavations.

B. Measurement: Rock shall be stripped for measurement before proceeding, and no rock excavated or loosened before measurement will be allowed or paid for as rock. Measurement and payment therefore shall be by the number of cubic yards required to bring the excavation to the required surface or grade shown on the Drawings. In making rock excavation, eighteen (18") inches will be allowed outside the footing lines, in vertical planes; twenty-four (24") inches will be allowed outside walls without footings and outside footings where drains are required. Submit cross-sections and certification of quantities by a New York Registered Land Surveyor or Professional Engineer.

C. Blasting: When explosives are used, work shall be executed by experienced powdermen or persons who are licensed or otherwise authorized to use explosives. Explosives shall be stored, handled and used in accordance with local regulations and the "Manual of Accident Prevention in Construction" of the Associated General Contractors of America, Incorporated. Structural Engineer shall be notified of scheduled blasting. Any damage to existing or new construction caused by the use of explosives shall be corrected at the Contractor's expense.

D. Shelving: If rock surfaces supporting footings should be encountered, such surfaces shall be leveled off to a slope not exceeding one inch per foot (1"/ft) unless otherwise indicated on the plans.

E. Payment: It is anticipated that no rock, as above defined, will be encountered in the construction. However, if it should be encountered, payment will be made in accordance with the Unit Prices agreed upon before rock excavation commences.

END OF SECTION

SECTION 312324 - STRUCTURAL FILL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including the General and Supplementary Conditions, apply to the work specified in this Section.

1.2 SCOPE OF WORK

A. The work under this Section includes all labor, supervision, materials and equipment necessary for the completion of all structural fill.

B. Work shall include, but not be limited to the following:

1. Structural Fill
2. Compaction
3. Testing

1.3 RELATED WORK

A. Section 312314 - Structural Excavation
B. Section 315004 - Earthwork Protection

1.4 SUBMITTALS

A. The Contractor shall submit for approval to the Engineer prior to commencing operations a sieve analysis, a modified proctor density test of proposed structural fill material, and drainage filter material. The tests shall be prepared by an approved testing laboratory at the Contractor's expense.

B. A sample of each approved material shall be kept at the Construction Site Field Office for comparison purposes during this phase of work.

C. Any material which does not reasonably conform to the approved sieve analysis shall be subject to removal.

1.5 FIELD INSPECTION AND TESTING

A. The Owner shall retain and pay for an independent soils laboratory to perform inspection and/or testing of structural backfill. The laboratory will have an inspector on the site during backfilling operations and will make tests required for fill and backfill placed.

B. The following field tests shall be performed:

1. One modified Proctor Density Test for each source of fill material performed in accordance with ASTM D1557.

2. Standard field density tests, each of an accuracy of plus or minus one (1%) percent.

C. Field density tests shall be at the rate of one (1) per two hundred (200 cy) cubic yards of fill, or at the discretion of the inspector. The tests shall be made at a maximum height differential of sixteen (16") inches throughout the fill.

D. It shall be the Contractor's responsibility to notify the Engineer and Testing Laboratory when each layer of fill is to be in place and ready for testing. The Contractor shall allow ample time for testing. If any fill is placed in excess of sixteen (16") inches without testing, it shall be subject to removal.

E. All required compaction and retesting due to unsatisfactory compaction shall be at the Contractor's expense.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Structural fill shall be clean gravel, free from foreign substances, lumps of clay, silt, loam or vegetable matter. The gravel shall be sound, tough, durable and free from thin elongated pieces. The material shall meet the following gradation requirements:

1.	Sieve Size	3 1/2"	1/4"	No. 10	No. 40	No. 100
2.	Percent Passing	100	30-65	20-55	5-30	0-5

2.2 LOCATION OF MATERIALS

A. Structural fill shall be used for all backfill under all slabs on grade, under all footings required to achieve footing base elevations for all backfill against exterior basement and retaining walls, to extend a distance of five (5') feet beyond the face, including that backfill required for structural or utility excavation and trenches within the limits of the outermost foundation walls of the building.

PART 3 - EXECUTION

3.1 CONSTRUCTION METHODS

A. Structural fill shall be deposited in eight (8") inch layers and compacted to the following percent optimum density (ASTM D1557):

1. Ninety-five (95%) percent under footings and under all slabs on grade, trenches, sidewalks, driveways and paved areas, against interior face of foundation walls and retaining walls.

2. Ninety (90%) percent against exterior face of foundation walls and retaining walls.

B. No material shall be compacted when its moisture content is greater than optimum.

C. The excavation must be sufficiently dry to permit complete inspection of the excavation and to permit use of compaction machinery on the initial layers of fill. The excavation must be kept sufficiently dry to carry out placement of fill and compaction thereof as specified below.

D. It shall be the responsibility of the General Contractor to notify the laboratory when excavation is complete so that inspection of conditions before filling may be made.

E. Compacting equipment shall not be of a nature so as to cause unstable conditions in the underlying natural soil.

F. No backfilling will be permitted against foundation walls until floor slabs at both top and bottom of walls have been placed and cured, or unless walls have been adequately braced. Where backfill occurs on both sides of a wall, levels of backfill on each side shall be kept approximately equal at all times.

G. Do not place structural fill or backfill on frozen material. Do not place frozen fill material.

H. If grade freezes or excavation bottom freezes, remove frozen material to extent of freezing prior to placing new structural fill or backfill material.

END OF SECTION

31 2500 EROSION AND SEDIMENTATION CONTROLS

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes
   1. Installation of temporary and permanent erosion and sedimentation control systems.
   2. Installation of temporary and permanent slope protection systems.

B. Related Sections
   1. 31 1000 Site Clearing
   2. 31 2000 Earth Moving
   3. 31 3200 Soil Stabilization
   4. 33 4000 Storm Drainage Utilities
   5. 32 9000 Planting
   6. Construction Drawings

1.2 ENVIRONMENTAL REQUIREMENTS

A. Protect adjacent properties, any identified endangered or threatened species or critical habitat, any identified cultural or historic resources, and receiving water resources from erosion and sediment damage until final stabilization.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Seed, sod, and ground covers for the establishment of vegetation in accordance with Section 32 9000.

B. Sediment control devices as specified on the Construction Drawings.

C. Rolled erosion control products according to Erosion Control Technology Council (ECTC) standard specifications.

D. Temporary mulches such as loose straw, wood cellulose, or agricultural silage.

E. Rip-Rap as specified in Section 31 3200.

F. Temporary and permanent outfall structures as specified on the drawings.

PART 3 – EXECUTION

3.1 PREPARATION

A. Review the drawings and Storm Water Pollution Prevention Plan.

B. Revise SWPPP as necessary to address potential pollution from site identified after issuance of the SWPPP at no additional cost to owner.

C. Conduct storm water pre-construction meeting with Site Contractor, all ground-disturbing Sub-contractors, site engineer of record or someone from their office familiar with the site and SWPPP, and state or local agency personnel in accordance with requirements of the special conditions.

3.2 EROSION AND SEDIMENTATION CONTROL AND SLOPE PROTECTION IMPLEMENTATION

A. Place erosion and sediment control systems in accordance with the drawings and Storm Water Pollution Prevention Plan or as may be dictated by site conditions in order to maintain the intent of the specifications and permits.

B. Deficiencies or changes on the drawings or Storm Water Pollution Prevention Plan shall be corrected or implemented as site conditions change. Changes during construction shall be noted in the Storm Water Pollution Prevention Plan and posted on the drawings.

C. Owner has authority to limit surface area of erodible earth material exposed by clearing and grubbing, excavation, borrow and embankment operations and to direct Contractor to provide immediate permanent or temporary pollution control measures.

D. Maintain temporary erosion and sedimentation control systems as dictated by site conditions, indicated in the construction documents, or as directed by governing authorities or Owner to control sediment until final stabilization. Contractor shall respond to maintenance or additional work ordered by Owner or governing authorities immediately, but in no case, within not more than 48 hours if required at no additional cost to the Owner.

E. Contractor shall incorporate permanent erosion control features, paving, permanent slope stabilization, and vegetation into project at earliest practical time to minimize need for temporary controls.

F. Permanently seed and mulch cut slopes as excavation proceeds to extent considered desirable and practical.

G. Unless required within a shorter timeframe by the applicable General Permit for Storm Water Discharges Associated with Construction Activity, disturbed areas that will not be graded or actively worked for a period of 14 days or more, shall be temporarily stabilized as work progresses with vegetation or other acceptable means in accordance with Section 32 9000 unless otherwise specified in the Contract Documents. In the event it is not practical to seed areas, slopes must be stabilized with mulch and tackifier, bonded fiber matrix, netting, blankets or other means to reduce the erosive potential of the area.

END OF SECTION

SECTION 315004 - EARTHWORK PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including the General and Supplementary Conditions, apply to the work specified in this Section.

1.2 SCOPE OF WORK

A. The work under this Section includes all labor, supervision, materials and equipment necessary for the completion of earthwork protection as specified.

B. Work shall include, but not be limited to, the following:

1. Protection of work and property
2. Stability of sides
3. Shoring and bracing
4. Drainage and pumping

1.3 RELATED WORK

A. Section 312314 - Structural Excavation
B. Section 312324 - Structural Fill

PART 2 - PRODUCTS - Not applicable

PART 3 - EXECUTION

3.1 PROTECTION OF WORK AND PROPERTY

A. Protect structures, utilities, sidewalks, pavements and other facilities immediately adjacent to structure excavation from damage caused by settlement, lateral movement, undermining, washout and other hazards.

B. Take precautions and provide necessary bracing and shoring to guard against movement or settlement of existing improvements or new construction. The Contractor is solely responsible for the strength and adequacy of bracing and shoring; and for the safety and support of construction from damage or injury caused by the lack thereof, of movement and/or settlement.

C. Protect excavation, trenches and all items of subsurface construction from damage by rain, water from melted snow, surface water and subsurface water. Provide all pumps, equipment, and enclosures necessary to ensure such protection.

D. Protect exposed earth and foundations in excavation areas when the atmospheric temperature is less than 35 degrees F by covering with dry insulating materials of sufficient depth to prevent frost

penetration of soil.

3.2 STABILITY OF SLOPES

A. Slope the sides of excavations over five (5') feet to the angle of repose of the material excavated; otherwise, shore and brace where sloping is not possible either because of space restrictions or stability of material excavated. Maintain sides and slopes of excavations in a safe condition until completion of backfilling by benching, shelving or bracing.

B. Take precautions to prevent slides or cave-ins when excavations are made in locations adjacent to backfilled excavations, and when sides of excavations are subjected to vibrations from vehicular traffic or the operation of machinery or any other source.

3.3 SHORING, SHEETING AND BRACING

A. Contractor shall furnish, install in place, and maintain such sheeting, shoring, and bracing as may be required to support sides of excavations and to prevent any movement which could in anyway injure work, diminish necessary width of trench or other excavations, or otherwise delay work or endanger adjacent structures. Sheeting shall be driven and excavation work conducted in such a manner as to prevent material in back of sheeting from running under sheeting and into trench.

B. Provide steel or timber materials for sheeting, shoring and bracing, such as sheet piling, uprights, stringers, rangers and cross-braces, in good serviceable condition. Use timbers that are sound and free of large or loose knots. Maintain shoring and bracing in excavations, regardless of the time period excavations will be open. Carry down shoring and bracing as the excavation progresses.

C. Provide trench shoring and bracing to comply with the provisions of ANSI A10.2 "Safety Code for Building Construction", and with requirements of the local codes and authorities having jurisdiction.

D. The Contractor shall, prior to driving sheeting, determine the presence and extent of underground structures as may affect the driving of sheeting.

E. Care shall be taken to prevent voids outside of sheeting; but if voids are formed, they shall be immediately filled and well rammed. Sheeting shall not be carried to such depth at manholes that it will bear upon pipe. Special precautions, by using sheeting, shoring and bracing shall be taken to guard against any damage to or settlement of buildings, walls or other structures which are adjacent to work.

F. Sheeting shall not unnecessarily be driven below structures and thereby necessitate its being left permanently in place.

G. Bracing, rangers and sheeting shall be securely fastened in place so that they cannot loosen up and fall from position. Sheeting, shoring, bracing, etc., or parts thereof, shall be removed after completion of work.

3.4 DRAINAGE AND PUMPING

A. Perform excavation in a manner to prevent surface water from flowing into the excavations, and to prevent water from flooding the project site and surrounding area. Do not allow water to accumulate in excavations. Remove water from excavations using dewatering methods which will prevent softening of foundation bottoms, undercutting of footings, and soil changes detrimental to the stability of subgrades and foundations.

B. Provide and maintain pumps, sumps, suction and discharge lines and other dewatering system components necessary to convey the water away from excavations. Convey water removed from excavations and rain water to runoff areas. Provide and maintain temporary drainage ditches and other diversions outside the excavation limits for each structure. Do not use trench excavations for site utilities as temporary drainage ditches.

END OF SECTION

32 1000 BASES, BALLASTS AND PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes
   1. Aggregate Base and Subbase for asphaltic concrete and Portland cement concrete paving.

B. Related Sections
   1. Section 31 2000 – Earth Moving.

1.2 REFERENCES

A. Asphalt Institute

B. New York State Department of Transportation (NYSDOT) Standard Specifications (latest addition January 1, 2018).

1.3 QUALITY ASSURANCE

A. An Independent Testing Laboratory (ITL) selected and paid by Owner, will be retained to perform construction testing of in-place Base and Subbase course for compliance with requirements for thickness, compaction, and density. Paving Base and Subbase course tolerances shall be verified by the Contractor by rod and level readings on not more than 50-foot centers to be not more than 0.05-feet above design elevation which will allow for paving thickness as shown on Construction Drawings.

1.4 SUBMITTALS

A. Submit materials certificate to the independent testing laboratory that is signed by materials producer and Contractor, certifying that materials comply with, or exceed, requirements specified herein or on the Construction Drawings.

B. Submit certification of Base and Subbase course materials and placement as specified in Parts 2 and 3 hereinafter.

1.5 WEATHER LIMITATIONS

A. Do not place aggregate when Base and Subbase surface temperature is less than 40 degrees F, nor when air temperature is below 45 degrees F. Do not place aggregate when surface is wet or frozen. Do not place aggregate when weather conditions are unfavorable otherwise.

PART 2 - PRODUCTS

2.1 BASE COURSE MATERIAL

A. Aggregate Base and Subbase Course: Aggregate Base and Subbase course shall consist of a well graded, durable aggregate uniformly moistened and mechanically stabilized by compaction. Base and Subbase course may consist of a granular base (crushed slag, stone, or gravel, etc), or a hot-mix sand asphalt base.

B. Base and Subbase course shall be as shown on the drawings, or when not shown, shall be as specified herein.

C. Base material should meet the requirements of New York State Department of Transportation (NYSDOT) Standard Specifications (latest addition January 1, 2018).

D. Subbase material should meet the requirements of New York State Department of Transportation (NYSDOT) Standard Specifications (latest addition January 1, 2018).

2.2 EXAMINATION

A. Contractor shall verify to the Owner in writing that the subgrade has been inspected, tested, and gradients and elevations are correct, dry, and properly prepared in accordance with Section 31 2000.

2.3 CONSTRUCTION

A. Perform Base and Subbase course construction in accordance with the applicable State standard specifications or as shown or specified.

B. Perform Base and Subbase course construction in a manner that will drain the surface properly and prevent runoff from adjacent areas from draining onto Base and Subbase course construction.

C. Compact Base and Subbase material to not less than 98 percent of optimum density as determined by ASTM D 698 or 95 percent of optimum density, as determined by ASTM D 1557 unless otherwise indicated on the Drawings.

D. Construct to thickness indicated on Construction Drawings.
1. Granular Base and Subbase: Apply in lifts or layers not exceeding 8-inches, measured loose.
2. Sand/Shell Base: Apply in lifts or layers not exceeding 4-inches, measured loose.
3. Hot-mix Sand Asphalt Bases: Apply in lifts or layers not exceeding 3-inches, measured loose.

2.4 FIELD QUALITY CONTROL

A. Field testing specified below will be performed by the Owner's Independent Testing Laboratory at no cost to the Contractor.

B. Field testing, frequency, and methods may vary as determined by and between the Owner and the Owner's Testing Laboratory.

C. Field density tests for in-place materials will be performed in accordance with the following:
1. Nuclear Method: ASTM D 2922 (Method B-Direct Transmission)
2. Base and Subbase material thickness: One test for each 20,000 sq. ft. of in-place Base and Subbase material area.
3. Base and Subbase material compaction: One test in each lift for each 20,000 sq. ft. of in-place Base and Subbase material area.

D. The independent testing laboratory will prepare reports that indicate test location, elevation data, and test results. Owner and Contractor shall be provided with copies of the reports within 96 hours of the time the test was performed. In the event that the test results show failure to meet any of the Specifications; Owner and Contractor will be notified immediately by the independent testing laboratory.

E. The Contractor shall certify in writing to the Owner that Base and Subbase course placement is in accordance with specification requirements prior to subsequent work thereon.

F. The Contractor shall pay for retesting due to failures at no additional expense to Owner. Contractor shall provide free access to the site for testing activities.

END OF SECTION

32 1216 ASPHALT PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes
   1. Asphaltic concrete binder and surface course.

B. Related Sections
   1. Section 31 2000 - Earth Moving
   2. Section 32 1000 – Bases, Ballasts and Paving
   3. Section 32 1616 – Concrete Curbs and Gutters

1.2 REFERENCES

A. The Asphalt Institute (AI)
   1. MS 2 - Mix Design Methods/ Asphalt Concrete/ Hot Mix Types

B. New York State Department of Transportation (NYSDOT) Standard Specifications (latest addition January 1, 2018).

C. New York State Department of Transportation (NYSDOT) Standard Highway Specifications (latest addition February 1, 2009).

D. New York State Department of Transportation (NYSDOT) Standard Highway Design Manual (latest addition July 9, 2004).

E. C. New York State Department of Transportation (NYSDOT) Comprehensive Pavement Design Manual

F. ASTM International (ASTM)
   1. ASTM D1556 - Density and Unit Weight of Soil in Place by the Sand-Cone Method.
   2. ASTM D2950 - Density of Bituminous Concrete In Place by the Nuclear Methods
   3. ASTM D1188 - Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Coated Samples.
   4. ASTM D2726 - Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixture.
   5. ASTM D5444 - Mechanical Size Analysis of Extracted Aggregate.

G. American Association of State Highway and Transportation Officials (AASHTO)
   1. AASHTO M 17 - Mineral Filler for Bituminous Paving Mixtures.
   2. AASHTO M 140 - Emulsified Asphalt
   3. AASHTO M 208 - Cationic Emulsified Asphalt
   4. AASHTO M 226 - Viscosity Graded Asphalt Cement
   5. AASHTO T 245 - Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus
   6. AASHTO TP 53 - Asphalt Content of Hot Mix Asphalt by the Ignition Method

1.3 QUALITY ASSURANCE

A. An independent testing laboratory (ITL) selected and paid by Owner, will be retained to perform construction testing of in-place asphaltic concrete courses for compliance with requirements for thickness, compaction, and surface smoothness.

B. Failing test results shall be faxed within 24 hours to Construction Manager and Owner.

C. In-place compacted thickness shall not be less than thickness specified on Construction Drawings. Areas of deficient pavement thicknesses shall be removed and replaced to proper thickness, at discretion of Owner; at no additional expense to Owner.

D. Check surface areas at intervals necessary to eliminate ponding areas. Remove and replace unacceptable paving as directed by owner.

1.4 SUBMITTALS

A. Within 30 days prior to asphalt construction, submit actual design mix to Civil Engineering Consultant of Record and independent testing laboratory for review and approval. Design mix submittal shall follow a format as indicated in Asphalt Institute Manual MS-2, Marshall Stability Method; and shall include type/name of mix, gradation analysis, grade of asphalt cement used, Marshall Stability in pounds flow, effective asphalt content in percent, and direct references to state highway department specifications sections for each material. Design shall be for mixture listed in current edition of state highway department specifications. Mix designs over 3 years old will not be accepted by Owner. Submit certification that mix design conforms to specification requirements.

B. Submit materials certificate to the ITL that is signed by materials producer and Contractor, certifying that materials and mix design conform to requirements specified herein.

C. Submit certification of asphalt placement as required hereinafter.

D. The ITL shall submit all certificates furnished with the ITL Reports.

1.5 PROJECT CONDITIONS

A. Weather Limitations:
1. Apply prime and tack coats when ambient or base surface temperature is above 40 F, and when temperature has been above 35 F for 12 hours immediately prior to application. Do not apply when base is wet, contains excess moisture, during rain, or when frozen.
2. Construct asphaltic concrete paving when ambient temperature is above 40 F.

B. Maintain access for vehicular and pedestrian traffic as required for other construction activities. Utilize temporary striping, flagmen, barricades, warning signs, and warning lights as required.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aggregate Base and Subbase: See Drawings for material thickness for Standard Duty and Heavy Duty Pavement Section
1. Base: New York State Department of Transportation, Standard Specifications 2018, Sections 203 and 302 for Bituminous Stabilized Course, Page 295, Option C and Chapter 7 Engineered Granular Mixes
2. Subbase: New York State Department of Transportation, Standard Specifications 2018, Sections 203 and 304 for Bituminous Stabilized Course, Page 299, Option A and Chapter 7 Engineered Granular Mixesa

B. Asphalt Cement: Comply with AASHTO M 226; Table 2 AC-10, AC-20, or AC-40, viscosity grade, depending on local mean annual air temperature in accordance with the following chart:

Temperature Condition	Asphalt Grades
Cold: Mean annual air temperature 45 F or lower	AC-10 85/100 pen.
Warm: Mean annual air temperature between 45 F and 75 F	AC-20 60/70 pen.
Hot: Mean annual air temperature 75 F or higher	AC-40

C. Prime Coat: Medium curing cut-back asphalt or asphalt penetrating prime coat consisting of either MC-30 or SS-1h.

D. Tack Coat: Emulsified asphalt; AASHTO M 140 or AASHTO M 208, SS-1h, CSS-1, or CSS-1h, diluted with 1 part water to 1 part emulsified asphalt.

E. Mineral Filler: Rock or slag dust, hydraulic cement, or other inert material complying with AASHTO M 17, if recommended by state highway department specifications.

F. Asphalt-Aggregate Mixture: Unless otherwise noted on the Drawings, design mix shall have minimum stability based on 75-blow Marshall complying with AASHTO T 245 of 1000 pounds with flow between 0.08 and 0.16 inches. The design mix shall be within sieve analysis and bitumen ranges specified below unless approved otherwise by Owner prior to placement. . Materials shall meet New York State Department of Transportation, Standard Specifications.

SIEVE ANALYSIS OF MIX

	Binder Course	Top Course
Standard Sieve	Percent Passing By Weight	Percent Passing By Weight
3-inch	100	
2-inch	80 to 100	
1.5-inch		100
1-inch	55 to 75	95 to 100
3/4-inch		80 to 100
1/4-inch	28 to 50	50 to 76
No.40	5 to 15	10 to 21
No.200	0 to 5	2 to 7

2.2 EQUIPMENT

A. Equipment necessary for the paving of asphaltic concrete shall be on the project prior to beginning paving operations.

B. Maintain equipment in satisfactory operating condition and correct breakdowns in manner that will not delay or be detrimental to the schedule of paving operations.

PART 3 - EXECUTION

3.1 PREPARATION

A. Proof roll prepared base material surface to check for unstable areas in accordance with Section 31 2000 including documentation and re-proof rolling as required. Paving work shall begin only after unsuitable areas have been corrected and are ready to receive paving.

B. Remove loose material from compacted base material surface immediately before applying prime coat.

C. Establish and maintain required lines and elevations.

D. Cover the surfaces of curbs, gutters, manholes and other structures on which the asphaltic concrete mixture will be placed, with a thin, uniform coat of liquid asphalt. Where the asphaltic concrete mixture will be placed against the vertical face of an existing pavement, clean the vertical face to remove foreign substances and apply a coating of liquid asphalt at a rate of approximately 0.25 gallons per square yard.

3.2 ASPHALTIC CONCRETE PLACEMENT

A. Place asphaltic concrete mixture on completed compacted subgrade surface, spread, and strike off. Spread mixture at following minimum ambient temperatures:
1. Between 40 and 50 F: Mixture temperature: 285 F
2. Between 50 and 60 F: Mixture temperature: 280 F
3. Higher than 60 F: Mixture temperature: 275 F

B. Whenever possible, spread pavement by finishing machine; however, inaccessible or irregular areas may be placed by hand methods. Spread hot mixture uniformly to required depth with hot shovels and rakes. After spreading, carefully smooth hot mixture to remove segregated course aggregate and rake marks. Rakes and lutes used for hand spreading shall be type designed for use on asphalt mixtures. Do not dump loads faster that they can be properly spread. Workers shall not stand on loose mixture while spreading.

C. Paving Machine Placement: Apply successive lifts of asphaltic concrete in transverse directions with surface course placed parallel to flow of traffic. Place asphaltic paving in typical strips not less than 10'-0" wide. Asphaltic concrete pavement, including base and surface course, shall be placed in two or more equal lifts. Each lift shall be from 1 to 3 inches thick.

D. Joints: Make joints between old and new pavements, or between successive days and work in manner that will provide continuous bond between adjoining work. Construction joints shall have same texture, density, and smoothness as other sections of asphaltic concrete course. Clean contact surfaces of joints and apply tack coat.

3.3 ROLLING AND COMPACTION

A. After being spread, mixture shall be compacted by rolling as soon as it will bear the weight of rollers without undue displacement. Number, weight, types of rollers, and sequences of rolling operations shall be such that the required density and surface are consistently attained while the mixture is in workable condition.

B. Compact mixture with hot hand tampers or vibrating plate compactors in areas inaccessible to rollers.

C. Breakdown Rolling: Perform breakdown or initial rolling immediately following rolling of joints and outside edge. Check surface after breakdown rolling and repair displaced areas by loosening and filling with hot material.

D. Second Rolling: Follow breakdown rolling as soon as possible while mixture is hot. Continue second rolling until mixture has been thoroughly compacted as follows:
1. Average Density: 96 percent of reference laboratory density according ASTM D1556, but not less than 94 percent nor greater than 100 percent.

E. Finish Rolling: Perform finish rolling while mixture is still warm enough for removal of roller marks. Continue rolling until roller marks are eliminated and course has attained maximum density.

F. Patching: Remove and replace paving areas mixed with foreign materials and defective areas. Cut out such areas and fill with fresh, hot asphaltic concrete. Compact by rolling to maximum surface density and smoothness.

G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked. Any masked or marred finish surfaces shall be repaired or smoothed.

3.4 JOINTS

A. General
1. Place each asphaltic paving layer as continuous as possible to keep the number of joints to a minimum. Create joints between old and new pavement, between successive days work, and where the mixture has become cold (less than 140 degrees F). Make these joints in such a manner as to create a continuous bond between the old and new pavement construction courses.
2. Offset joint of successive courses by at least 6 inches.

B. Transverse Joints: If placing of material is discontinued or if material in place becomes cold, make a joint running perpendicular to the direction traveled by the paver. Before placement continues, trim the edge of the previously placed pavement to a straight line perpendicular to the paver and cut back to expose an even vertical surface for the full thickness of the course. When placement continues, position the paver on the transverse joint so that sufficient hot mixture will be spread in order to create a joint after rolling that conforms to the required smoothness. If the temperature of the previously placed pavement material drops below 140 degrees F before paving is resumed, give the exposed vertical face a thin coat of liquid asphalt just before paving is continued.

C. Longitudinal Joints: Coat longitudinal joints that are not completed before the previously laid mixture has cooled to a temperature below 140 degrees F, with liquid asphalt just before paving is continued.

3.5 FIELD QUALITY CONTROL

A. Field quality control tests specified herein will be conducted by the Owner's Independent Testing Laboratory (ITL) at no cost to the Contractor. The Contractor shall perform additional testing as considered necessary by the Contractor for assurance of quality control. Retesting required as a result of failed initial tests shall be at the Contractor's expense.

B. Field testing, frequency, and methods may vary as determined by and between the Owner and the Owner's Testing Laboratory.

C. Check surface areas as necessary to identify ponding areas. Remove and replace unacceptable paving as directed by Owner.

D. Areas of deficient paving, including compaction, smoothness, thickness, and asphalt mixture, shall be delineated, removed, and replaced in compliance with Specifications requirements unless corrected otherwise as directed and approved by the Construction Manager.

E. The Contractor shall certify in writing that asphalt placement is in accordance with specification requirements.

END OF SECTION

32 1313 CONCRETE PAVING

PART 1 - GENERAL

1.1 SUMMARY

1.2 Section Includes

1. Preparation and placement of Portland cement concrete parking areas.
2. Preparation and placement of Portland cement concrete roads and entrances.

1.3 Related Sections

1. Section 31 2000 – Earth Moving
2. Section 32 1000 – Bases, Ballasts and Paving

1.4 REFERENCS

A. American Concrete Institute (ACI)

1. ACI 301 -Structural Concrete for Buildings.
2. ACI 305R - Hot Weather Concreting
3. ACI 306R - Standard Specification for Cold Weather Concreting
4. ACI 308 - Standard Practice for Curing Concrete

B. American Society for Testing and Materials (ASTM)

1. ASTM A185 - Steel Welded Wire Fabric, Plain, for Concrete Reinforcement
2. ASTM A615 - Deformed and Plain Billet-Steel for Concrete Reinforcement
3. ASTM C 31 - Test Methods of Making and Curing Concrete Test Specimens in the Field.
4. ASTM C33 - Concrete Aggregates
5. ASTM C 39 - Test Method for Comprehensive Strength of Cylindrical Concrete Specimens.
6. ASTM C42 - Obtaining And Testing Drilled Cores And Sawed Beams Of Concrete
7. ASTM C94 - Ready-Mixed Concrete
8. ASTM C 138 - Test Method for Unit Weight, Yield, and Air Content (Gravemetric) of Concrete.
9. ASTM C143 - Method for Slump of Hydraulic Cement Concrete
10. ASTM C150 - Portland Cement
11. ASTM C 172 - Method of Sampling Freshly Mixed Concrete.
12. ASTM C231 - Air-Content of Freshly Mixed Concrete by the Pressure Method
13. ASTM C260 - Air-Entraining Admixtures for Concrete
14. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete
15. ASTM C618 - Fly Ash and Raw or Calcined Natural Pozzolan for use as a Mineral Admixture in Portland Cement Concrete.
16. ASTM C920 - Standard Specification for Elastomeric Joint Sealants
17. ASTM C989 - Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars
18. ASTM C1064 - Temperature Of Freshly Mixed Portland Concrete Cement
19. ASTM D994 - Preformed Expansion Joint Filler for Concrete (Bituminous)
20. ASTM D1751 - Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types)
21. ASTM D2628 - Preformed Polychloroprene Elastomeric Joint Seals for Concrete Pavements

C. Federal Specifications (FS)

1. FS HH-F-341 - Fillers, Expansion Joint: Bituminous (Asphalt & Tar)

D. New York State Department of Transportation (NYSDOT) Standard Specifications (latest addition January 1, 2018).

1.5 QUALITY ASSURANCE

A. Establish and maintain required lines and elevations.

B. Check surface areas at intervals necessary to eliminate ponding areas. Remove and replace unacceptable paving as directed by Owner.

1.6 SUBMITTALS

A. Submit certified laboratory test data or manufacturer's certificates and data for the items listed below certifying that materials are in conformance requirements specified herein. Submit to the Engineering Consultant of Record and the Independent Testing Laboratory for review and approval and within 7 calendar days after receipt of Notice-to-Proceed.
1. Portland cement concrete mix
2. Aggregate gradations
3. Preformed expansion joint filler
4. Field molded/poured sealant
5. Dowel bars
6. Expansion sleeves
7. Tie bars
8. Reinforcing steel bars
9. Welded wire fabric
10. Air entraining admixtures
11. Water-reducing and set-retarding admixtures (if used)

B. Submit certification that joint sealant has been installed in accordance with the manufacturer's instructions. Include copy of written instructions.

1.7 PROJECT CONDITIONS

A. Maintain access for vehicular and pedestrian traffic as required for other construction activities. Utilize temporary striping, flagmen, barricades, warning signs, and warning lights as required.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Forms: Steel, wood, or other suitable material of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use straight forms, free of distortion and defects. Use flexible spring steel forms or laminated boards to form radius bends as required. Coat forms with nonstaining type of coating that will not discolor or deface surface of concrete.

B. Welded Wire Mesh: Welded plain cold-drawn steel wire fabric, ASTM A185. Furnish in flat sheets.

C. Reinforcing Bars: Deformed steel bars, ASTM A615, Grade 60.

D. Portland Cement: ASTM C150, Type I

E. Fly Ash: ASTM C 618, Class C or F, except loss on ignition (LOI) shall not exceed 3 %.

F. Slag: ASTM C989, Grade 100 or 120.

G. Exterior Pavement Joint Materials
1. Joint Back-up Material: Polyethylene foam, 60% closed cell
2. Sealant:
   a. Dow 888, by Dow Corning.
   b. 301 NS by Pecora.
   c. Spectrum 800 or 900 by Tremco.

H. Aggregate: ASTM C33.

I. Water: Clean and potable

J. Dowel Bars: ASTM A615, grade 60, and plain steel bars.

K. Air Entrainment: ASTM C260. .
1. Air-Mix or AEA-92, by Euclid.
2. MB-VR MB-AE 90, or Micro-Air, by Master Builders.
3. Daravair or Darex Series, by W.R. Grace.
4. Equivalent approved products.

L. Liquid Membrane Curing and Sealing Compound: ASTM C 1315, Type I, Class A or B, 25% minimum solids content, clear non-yellowing with no styrene-butadiene.
1. Water Based, VOC less than 350 g/l:
   a. Super Aqua Cure, by Euclid Chemical Corp.
   b. Kure 1315 by Degussa.
2. Solvent Based VOC less than 350 g/l.]
   a. Super Rez-Seal, by Euclid Chemical Corp.
   b. Kure-N-Seal 30 by Degussa.

M. Dissipating Curing Compound: ASTM C 309 Type 1, Class A or B.
1. Solvent base, VOC less than 350 g/l: Cetri Vex EnvioCure 100 by Vexcon.

2.2 CONCRETE MIXING

A. Mix concrete and deliver in accordance with ASTM C94. Design mix shall produce 1½" Aggregate, normal weight concrete consisting of Portland cement, aggregate, water-reducing admixture, air-entraining admixture, and water to produce following:
1. Compressive Strength: 4,500 psi minimum at 28 days unless otherwise indicated on the Drawings.
2. Flexural Strength: 500 psi minimum at 28 days
3. Slump Range: 2"-4" for hand placed concrete, 1-1/4" to 3" for machine placed (slipform) concrete.
4. Air Entrainment: 6 ±1 percent.

B. Supplementary Cementitous Materials (SCM):
1. Fly ash or slag may used as SCM in addition to Portland cement.
2. Fly Ash: If used, provide 15% minimum to 25% maximum of total cementitious content. If required to mitigate potential sulfate exposure or aggregate reactivity, up to 30% may be allowed. If used to mitigate potential aggregate reactivity, only Type F fly ash may be used and shall have the following maximum properties: 1.5% available alkali and 8.0% CaO. Up to 10.0% CaO will be permitted when the maximum replacement of 30% fly ash is allowed.

3. Ground Granulated Blast Furnace Slag (GGBF): If used, provide 20% minimum to 30% maximum of total cementitious content. If required to mitigate potential sulfate exposure or aggregate reactivity, up to 50% may be allowed.
4. When a ternary mix (combination of fly ash, GGBF, and Portland cement) is used, a maximum of 40% of SCM may be used, or when approved, up to 55% SCM may be used.
5. Maintain air-entrainment at specified levels.
6. In cold weather, provide adequate concrete strength gain so concrete will not be damaged from traffic and loads of use.

PART 3 - EXECUTION

3.1 PREPARATION

A. Proofroll prepared base material surface to check for unstable areas in accordance with Section 31 2000 including documentation and re-proof rolling as required. Paving work shall begin only after unsuitable areas have been corrected and are ready to receive paving.

B. Remove loose material from compacted base material surface to produce firm, smooth surface immediately before placing concrete.

3.2 INSTALLATION

A. Form Construction
1. Set forms to required grades and lines, rigidly braced and secured.
2. Install sufficient quantity of forms to allow continuance of work and so that forms remain in place minimum of 24 hours after concrete placement.
3. Check completed formwork for grade and alignment to following tolerances:
   a. Top of forms not more than 1/8-inch in 10'-0".
   b. Vertical face on longitudinal axis, not more than1/4-inch in 10'-0".
4. Clean forms after each use and coat with form release agent as often as required to ensure separation from concrete without damage.

B. Reinforcement: Fasten reinforcing bars or welded wire fabric (if required) accurately and securely in place with suitable supports and ties. Remove from reinforcement all dirt, oil, loose mill scale, rust, and other substances that will prevent proper bonding of the concrete to the reinforcement.

C. Concrete Placement
1. Concrete may be mixed and placed when the air temperature in the shade and away from artificial heat is a minimum of 35 degrees F and rising. Hot and cold weather concreting shall be in accordance with ACI 305R and 306R, respectively.
2. Do not place concrete until base material and forms have been checked for line and grade. Moisten base material if required to provide uniform dampened condition at time concrete is placed. Concrete shall not be placed around manholes or other structures until they are at required finish elevation and alignment.
3. Place concrete using methods that prevent segregation of mix. Consolidate concrete along face of forms and adjacent to transverse joints with internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Consolidate with care to prevent dislocation of reinforcing, dowels, and joint devices.
4. Deposit and spread concrete in continuous operation between transverse joints, as far as possible. If interrupted for more than 1/2 hour, place construction joint.

D. Joint Construction: Construct expansion, weakened-plane control (contraction), and construction joints straight with face perpendicular to concrete surface. Construct transverse joints perpendicular to centerline, unless otherwise detailed.
   1. Weakened-Plane Control or Contraction Joints: Provide joints at spacing of 15'-0" on centers, maximum each way. Construct control joints for depth equal to at least 1/4 of the concrete thickness, as follows:
      a. Form tooled joints in fresh concrete by grooving top with recommended tool and finishing edge with jointer.
      b. Form sawed joints using powered saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut joints into hardened concrete as soon as surface will not be torn, abraded, or otherwise damaged by cutting action.
   2. Construction Joints: Place construction joints at end of placements and at locations where placement operations are stopped for period of more than 1/2 hour, except where such placements terminate at expansion joints. Construct joints in accordance with standard details.
   3. Transverse Expansion Joints: Locate expansion joints at maximum of 180'-0" on centers, maximum each way unless otherwise shown on the Construction Drawings. Provide premolded joint filler for expansion joints abutting concrete curbs, catch basins, manholes, inlets, structures, sidewalks, and other fixed objects.
   4. Butt Joints: For joints against existing pavement, place 16” long dowels eight inches into holes drilled into center of existing slab. Epoxy dowels into holes with approved epoxy compound. Place dowels prior to concrete placement for new concrete. Dowel spacing to be 24” on center unless otherwise shown on Construction Drawings. Saw joint and fill with joint sealer.

E. Joint Fillers: Extend joint fillers full-width and depth of joint, and not less than 1/2-inch or more than 1-inch below finished surface where joint sealer is indicated. Furnish joint fillers in 1-piece lengths for full width being placed, wherever possible. Where more than 1 length is required, lace or clip joint filler sections together.

F. Joint Sealants: Joints shall be sealed with approved exterior pavement joint sealants and shall be installed in accordance with manufacturer's recommendations.

3.3 CONCRETE FINISHING

A. After striking off and consolidating concrete, smooth surface by screeding and floating. Adjust floating to compact surface and produce uniform texture. After floating, test surface for trueness with 10'-0" straightedge. Distribute concrete as required to remove surface irregularities and refloat repaired areas to provide continuous smooth finish.

B. Work edges of slabs and formed joints with edging tool, rounding edge to 1/2-inch radius. Eliminate tool marks on concrete surface. After completion of floating and troweling, when excess moisture or surface sheen has disappeared, complete surface finishing, as follows:
   1. Inclined Slab Surfaces: Provide coarse, nonslip finish by scoring surface with stiff-bristled broom perpendicular to flow of traffic so as to produce regular corrugations not over 1/16 of an inch deep.
   2. Paving: Provide coarse, nonslip finish by scoring surface with stiff-bristled broom perpendicular to flow of traffic so as to produce regular corrugations not over 1/16 of an inch deep.

C. Do not remove forms for 24 hours after concrete has been placed. After form removal, clean ends of joints and point up minor honeycombed areas. Remove and replace areas or sections with major defects, as directed by Owner.

3.4 CURING AND PROTECTION

A. Protect and cure finished concrete paving using with curing compound or with acceptable moist-curing methods in accordance with "water-curing" section of ACI 308. Cure for a period not less than 7 days.

B. Use solvent based curing compound when compound is applied below 40 F.

3.5 CLEANING AND ADJUSTING

A. The Contractor shall certify in writing that placement is in accordance with specification requirements.

B. Sweep concrete pavement and wash free of stains, discolorations, dirt, and other foreign material just prior to final inspection.

C. Protect concrete from damage until acceptance of work. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials.

3.6 FIELD QUALITY CONTROL

A. Field quality control tests specified herein will be conducted by the Owner's Independent Testing Laboratory at no cost to the Contractor. The Contractor shall perform additional testing as considered necessary by the Contractor for assurance of quality control. Retesting required as a result of failed initial tests shall be at the Contractor's expense.

B. Field testing, frequency, and methods may vary as determined by and between the Owner and the Owner's Testing Laboratory.

C. Review the Contractor's proposed materials and mix design for conformance with specifications.

D. Perform testing in accordance with ACI 301 and testing standards listed herein.

E. Strength Tests:
1. Secure composite samples in accordance with ASTM C 172. Sample at regularly spaced intervals from middle portion of the batch. Sampling time shall not exceed 15 minutes.
2. Mold and cure specimens in accordance with ASTM C 31.
    a. A minimum of four concrete test cylinders shall be taken for every 100 cubic yards or less of each class of concrete placed each day and not less than once for each 5000 square feet of paved area.
    b. During the initial 24 hours (plus or minus 8 hours) after molding, the temperature immediately adjacent to the specimens shall be maintained in the range of 60 to 80 degrees F. Control loss of moisture from the specimens by shielding from the direct rays of the sun and from radiant heating devices.
    c. Specimens transported prior to 48 hours after molding shall not be demolded, but shall continue initial curing at 60 to 80 degrees F until time for transporting.
    d. Specimens transported after 48 hours age shall be demolded in 24 hours (plus or minus 8 hours). Curing shall then be continued but in saturated limewater at 73.4 degrees (plus or minus 3 degrees F) until the time of transporting.
    e. Wet cure cylinders under controlled temperature until testing.
3. Test cylinders in accordance with ASTM C 39.
    a. Date test cylinders and number consecutively. Give each cylinder of each set an identifying letter (i.e. A, B, C, D). Prepare a sketch of the building plan for each test set identifying location of placed concrete.
    b. Test one cylinder (A) at 7 days for information. If the compressive strength of the concrete sample is equal to or above the 28 day specified strength, test another cylinder (B) at 7 days. The average of the breaks shall constitute the compressive strength of the concrete sample.
    c. Test two cylinders (B and C) at 28 days and the average of the breaks shall constitute the compressive strength of the concrete sample.

d. Retain fourth cylinder (D) for further testing if needed, but do not retain cylinder more than 60 days.

4. Evaluation and Acceptance:
   a. Strength level of concrete will be considered satisfactory if the average of all sets of three consecutive strength tests equal or exceed specified strength and no individual strength test (average of two cylinders) results are below specified compressive strength by more than 500 psi.
   b. Complete concrete work will not be accepted unless requirements of ACI 301, have been met, including dimensional tolerances, appearance, and strength of structure.
   c. Where average strength of cylinders, as shown by tests is not satisfactory, the Construction Manager and Owner reserves the right to require Contractor to provide improved curing conditions of temperature and moisture to secure required strength. If average strength of laboratory control cylinders should fall so low as to cause portions of structure to be in question by the Construction Manager and Owner, follow core procedure set forth in ASTM C42. If results of core test indicate, in opinion of the Construction Manager and Owner, that strength of structure is inadequate, provide without additional cost to the Construction Manager and Owner, replacement, load testing, or strengthening as may be ordered by the Construction Manager and Owner. If core tests are so ordered and results of such tests disclose that strength of structure is as required, cost of test will be paid by the Construction Manager and Owner.

F. Slump Test: Conduct slump test for each cylinder set taken in accordance with ASTM C 143. Make additional slump tests for every other load from a stationary mixer or truck to test consistency. Sampling shall be in accordance with ASTM C 172.

G. Air Content: Conduct air content test for each cylinder set for concrete exposed to freeze-thaw in accordance with ASTM C 231, ASTM C 173, or ASTM C 138. Indicate test method on report. Make test at same time as slump test.

H. Unit Weight: ASTM C 138.

I. Temperature Test: Conduct temperature test for each cylinder set taken in accordance with ASTM C 1064. Test hourly when air temperature is 40 F and below or 80 F and above. Determine temperature of concrete sample and ambient air for each strength test.

J. In addition to required information noted previously in this Section, record the following information on concrete compression reports:
   1. Test cylinder number and letter.
   2. Specific foundations or structures covered by this test.
   3. Proportions of concrete mix or mix identification.
   4. Maximum size coarse aggregate.
   5. Specified compressive strength.
   6. Tested compressive strength.
   7. Slump, air-content (when applicable) and concrete temperature.
   8. Concrete plastic unit weight.
   9. Concrete Temperature.
   10. Elapsed time from batching at plant to discharge from delivery truck at project.
   11. Date and time concrete was placed.
   12. Ambient temperature, wind speed, and relative humidity during concrete placement.
   13. Name of technician securing samples.
   14. Curing conditions for concrete strength test specimens (field and laboratory).
   15. Date strength specimens transported to laboratory.
   16. Age of strength specimens when tested.
   17. Type of fracture during test.

K. At the start of each day's mixing, report any significant deviations from approved mix design including temperature, moisture and condition of aggregate.

L. Certify each delivery ticket of concrete. Report type of concrete delivered, amount of water added and time at which cement and aggregate were loaded into truck, and time at which concrete was discharged from truck

M. In Place Pavement Testing: The Owner’s Independent Testing Laboratory will randomly core pavement at minimum rate of 1 core per 20,000 sq. ft of pavement, with minimum of 3 cores from heavy-duty areas and 3 cores from light duty areas. Cores will be sampled and tested in accordance with ASTM C 42. Core will be tested for thickness and quality of aggregate distribution. Core holes shall be patched by the Contractor immediately with Portland cement concrete and shall be finished to provide level surface as specified herein.

N. Additional Tests: Additional in-place tests shall be conducted as directed by the Construction Manager when specified concrete strengths and other characteristics have not been attained in the structures.

END OF SECTION

32 1613 CONCRETE CURBS AND GUTTERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes
   1. Portland cement concrete curbs, gutters, and sidewalks except sidewalks adjacent to building.

B. Related Sections
   1. Section 31 2000 – Earth Moving

1.2 REFERENCS

A. American Concrete Institute (ACI)
   1. ACI 305R - Hot Weather Concreting
   2. ACI 306R - Standard Specification for Cold Weather Concreting
   3. ACI 308 - Standard Practice for Curing Concrete

B. ASTM International (ASTM)
   1. ASTM A185 - Steel Welded Wire Fabric, Plain, for Concrete Reinforcement
   2. ASTM A615 - Deformed and Plain Billet-Steel for Concrete Reinforcement
   3. ASTM C31 - Test Methods of Making and Curing Concrete Test Specimens in the Field
   4. ASTM C39 - Method for Comprehensive Strength of Cylindrical Concrete Specimens
   5. ASTM C42 - Obtaining and Testing Drilled Cores and Sawed Beams Of Concrete
   6. ASTM C94 - Ready-Mixed Concrete
   7. ASTM C138 - Test Method for Unit Weight, Yield, and Air Content (Gravemetric) of Concrete
   8. ASTM C143 - Method for Slump of Hydraulic Cement Concrete
   9. ASTM C231 - Air-Content of Freshly Mixed Concrete by the Pressure Method
   10. ASTM C172 - Standard Practice for Sampling Freshly Mixed Concrete
   11. ASTM C173 – Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
   12. ASTM C260 - Air-Entraining Admixtures for Concrete
   13. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete
   14. ASTM C618 - Fly Ash and Raw or Calcined Natural Pozzolan for use as a Mineral Admixture in Portland Cement Concrete.
   15. ASTM C 1064 - Temperature Of Freshly Mixed Portland Concrete Cement
   16. ASTM D994 - Preformed Expansion Joint Filler for Concrete (Bituminous)
   17. ASTM C989 - Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars
   18. ASTM D1190 - Concrete Joint Sealer, Hot Poured, Elastic Type
   19. ASTM D1751 - Performed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types)
   20. ASTM D2628 - Preformed Polychloroprene Elastomeric Joint Seals for Concrete Pavements

C. Federal Specifications (FS)
   1. FS HH-F-341 - Fillers,Expansion Joint: Bituminous (Asphalt & Tar)

D. New York State Department of Transportation (NYSDOT) Standard Specifications (latest addition January 1, 2018).

1.3 SUBMITTALS

A. Certificates: Submit materials certificate from materials producer and Contractor, certifying that materials comply with, or exceed requirements specified herein to the Engineering Consultant of Record and the Independent Testing Laboratory for review and approval and within 7 calendar days after receipt of Notice-to-Proceed, submit for approval, certified laboratory test data or manufacturers certificates and data for the following items:
1. Portland cement concrete mix
2. Aggregate gradations
3. Preformed expansion joint filler
4. Field molded/poured sealant
5. Dowel bars
6. Expansion sleeves
7. Tie bars
8. Reinforcing steel bars
9. Welded wire fabric
10. Air entraining admixtures
11. Water-reducing and set-retarding admixtures (if used)

B. Test Reports: Submit field quality control test reports.

1.4 QUALITY ASSURANCE

A. Establish and maintain required lines and elevations.

B. Check surface areas at intervals necessary to eliminate ponding areas. Remove and replace unacceptable work as directed by Owner.

1.5 PROJECT CONDITIONS

A. Maintain access for vehicular and pedestrian traffic as required for other construction activities. Utilize temporary striping, flagmen, barricades, warning signs, and warning lights as required.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Forms: Steel, wood, or other suitable material of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use straight forms, free of distortion and defects. Use flexible spring steel forms or laminated boards to form radius bends as required. Forms shall be of depth equal to depth of curbing or sidewalk, and so designed as to permit secure fastening together at tops. Coat forms with nonstaining type of coating that will not discolor or deface surface of concrete.

B. Welded Wire Mesh: Welded plain cold-drawn steel wire fabric, ASTM A 185. Furnish in flat sheets.

C. Reinforcing Steel: Deformed steel bars, ASTM A 615, Grade 60.

D. Portland Cement: Shall conform to ASTM C150, Type I

E. Fly Ash: ASTM C 618, Class C or F, except loss on ignition (LOI) shall not exceed 3 %.

F. Slag: ASTM C989, Grade 100 or 120.

G. Exterior Pavement Joint Materials
   1. Joint Back-up Material: Polyethylene foam, 60% closed cell
   2. Sealant:
      a. Dow 888, by Dow Corning.
      b. 301 NS by Pecora.
      c. Spectrum 800 or 900 by Tremco.

H. Aggregate: ASTM C33.

I. Water: Clean and potable

J. Dowel Bars: ASTM A615, grade 60, and plain steel bars.

K. Air Entrainment: ASTM C260. .
   1. Air-Mix or AEA-92, by Euclid.
   2. MB-VR MB-AE 90, or Micro-Air, by Master Builders.
   3. Daravair or Darex Series, by W.R. Grace.
   4. Equivalent approved products.

L. Liquid Membrane Curing and Sealing Compound: ASTM C 1315, Type I, Class A or B, 25% minimum solids content, clear non-yellowing with no styrene-butadiene.
   1. Water Based, VOC less than 350 g/l:
      a. Super Aqua Cure, by Euclid Chemical Corp.
      b. Kure 1315 by Degussa.
   2. Solvent Based
      a. Super Rez-Seal, by Euclid Chemical Corp.
      b. Kure-N-Seal 30 by Degussa.

M. Dissipating Curing Compound: ASTM C 309 Type 1, Class A or B.
   1. Solvent base, VOC less than 350 g/l: Cetri Vex EnvioCure 100 by Vexcon.

2.2 CONCRETE MIXING

A. Mix concrete and deliver in accordance with ASTM C94. Design mix shall produce normal weight concrete consisting of Portland cement, aggregate, water-reducing admixture, air-entraining admixture, and water to produce following:
   1. Compressive Strength: 3,500 psi minimum at 28 days unless otherwise indicated on the Drawings.
   2. Slump Range: 2”-4” for hand placed concrete, 1-1/4” to 3” for machine placed (slipform) concrete.
   3. Air Entrainment: 5 to 8 percent.

B. Supplementary Cementitous Materials (SCM):
   1. Fly ash or slag may used as SCM in addition to Portland cement.
   2. Fly Ash: If used, provide 15% minimum to 25% maximum of total cementitious content. If required to mitigate potential sulfate exposure or aggregate reactivity, up to 30% may be allowed. If used to mitigate potential aggregate reactivity, only Type F fly ash may be used and shall have the following maximum properties: 1.5% available alkali and 8.0% CaO. Up to 10.0% CaO will be permitted when the maximum replacement of 30% fly ash is allowed.
   3. Ground Granulated Blast Furnace Slag (GGBF): If used, provide 20% minimum to 30% maximum of total cementitious content. If required to mitigate potential sulfate exposure or aggregate reactivity, up to 50% may be allowed.
   4. When a ternary mix (combination of fly ash, GGBF, and Portland cement) is used, a maximum of 40% of SCM may be used, or when approved, up to 55% SCM may be used.

5. Maintain air-entrainment at specified levels.
6. In cold weather, provide adequate concrete strength gain so concrete will not be damaged from traffic and loads of use.

PART 3 - EXECUTION

3.1 PREPARATION

A. Begin paving work only after unsuitable areas have been corrected and are ready to receive paving.

B. Remove loose material from compacted base material surface to produce firm, smooth surface immediately before placing concrete.

3.2 INSTALLATION

A. Form Construction
1. Set forms to required grades and lines, rigidly braced and secured.
2. Install sufficient quantity of forms to allow continuance of work and so that forms remain in place minimum of 24 hours after concrete placement.
3. Check completed formwork for grade and alignment to following tolerances:
   a. Top of forms not more than 1/8-inch in 10'-0".
   b. Vertical face on longitudinal axis, not more than 1/4-inch in 10'-0".
4. Clean forms after each use and coat with form release agent as often as required to ensure separation from concrete without damage.

B. Reinforcement: Fasten reinforcing bars or welded wire fabric (if required) accurately and securely in place with suitable supports and ties. Remove from reinforcement all dirt, oil, loose mill scale, rust, and other substances that will prevent proper bonding of the concrete to the reinforcement.

C. Concrete Placement
1. Concrete shall be mixed and placed when the air temperature in the shade and away from artificial heat is a minimum of 35 degrees F and rising. Hot and cold weather concreting shall be in accordance with ACI 305R and 306R, respectively.
2. Do not place concrete until base material and forms have been checked for line and grade. Moisten base material if required to provide uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until set at required finish elevation and alignment.
3. Place concrete using methods that prevent segregation of mix. Consolidate concrete along face of forms and adjacent to transverse joints with internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Consolidate with care to prevent dislocation of reinforcing, dowels, and joint devices.
4. Deposit and spread concrete in continuous operation between transverse joints, as far as possible. If interrupted for more than 1/2 hour, place construction joint.

D. Joint Construction
1. Contraction Joints: Construct concrete curb, where specified on Construction Drawings, in uniform sections of length specified on Construction Drawings. Form joints between sections either by steel templates, 1/8-inch in thickness, of length equal to width of curb and gutter, and with depth which will penetrate at least 2-inches below surface of curb and gutter; or with 3/4-inch thick performed expansion joint filler cut to exact cross section of curb and gutter; or by sawing to depth of at least 2-inches while concrete is between 4 and 24 hours old. If steel templates are used, they shall be left in place until concrete has set enough to hold it's shape, but shall be removed while forms are still in place.

2. Longitudinal Construction Joints: Tie concrete curb, where specified on Construction Drawings, to concrete pavement with 1/2-inch round deformed reinforcement bars of length and spacing shown on Construction Drawings.
3. Transverse Expansion Joints: Concrete curb or concrete sidewalk shall have filler cut to exact cross section of curb or sidewalk. Joints shall be similar to type of expansion joint used in adjacent pavement.

E. Joint Fillers: Extend joint fillers full-width and depth of joint, and not less than 1/2-inch or more than 1-inch below finished surface where joint sealer is indicated. Furnish joint fillers in 1-piece lengths for full width being placed, wherever possible. Where more than 1 length is required, lace or clip joint filler sections together.

F. Joint Sealants: Install in accordance with manufacturer's recommendations.

3.3 CONCRETE FINISHING

A. After striking off and consolidating concrete, smooth surface by screeding and floating. Adjust floating to compact surface and produce uniform texture. After floating, test surface for trueness with 10'-0" straightedge. Distribute concrete as required to remove surface irregularities, and refloat repaired areas to provide continuous smooth finish.

B. Work edges of sidewalks, back top edge of curb, and formed joints with edging tool, rounding edge to 1/2-inch radius. Eliminate tool marks on concrete surface. After completion of floating and trowelling, when excess moisture or surface sheen has disappeared, complete surface finishing, as follows:
1. Curbs and sidewalks: Broom finish by drawing fine-hair broom across surface perpendicular to flow of traffic. Repeat operation as necessary to produce fine line texture.

C. Do not remove forms for 24 hours after concrete has been placed. After form removal, clean ends of joints and point up minor honeycombed areas. Remove and replace areas or sections with major defects as directed Owner.

3.4 CURING AND PROTECTION

A. Protect and cure finished concrete paving using with curing compound or with acceptable moist-curing methods in accordance with "water-curing" section of ACI 308. Cure for a period not less than 7 days.

B. Use solvent based curing compound when compound is applied below 40 F.

3.5 BACKFILL

A. After concrete has set sufficiently, spaces on either side of concrete curb or concrete sidewalk shall be refilled to required elevation with suitable material compacted in accordance with Section 31 2000.

3.6 CLEANING AND PROTECTION

A. Sweep concrete pavement and wash free of stains, discolorations, dirt, and other foreign material just prior to final inspection.

B. Protect concrete from damage until acceptance of work. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials.

3.7 FIELD QUALITY CONTROL

A. Field quality control tests specified herein will be conducted by the Owner's Independent Testing Laboratory at no cost to the Contractor. The Contractor shall perform additional testing as considered necessary by the Contractor for assurance of quality control. Retesting required as a result of failed initial tests shall be at the Contractor's expense.

B. Field testing, frequency, and methods may vary as determined by and between the Owner and the Owner's Testing Laboratory.

C. Review the Contractor's proposed materials and mix design for conformance with specifications.

D. Perform sampling testing and evaluation in accordance with ASTM C94 and as follows.

E. Strength Tests:
   1. Secure composite samples in accordance with ASTM C 172. Sample at regularly spaced intervals from middle portion of the batch. Sampling time shall not exceed 15 minutes.
   2. Mold and cure specimens in accordance with ASTM C 31.
      a. A minimum of four concrete test cylinders shall be taken for every 50 cubic yards or less of concrete placed each day.
      b. The Construction Manager may choose to waive testing requirements on concrete placements less than 9 cubic yards.
   3. Test cylinders in accordance with ASTM C 39.

F. Slump Test: Conduct slump test for each cylinder set taken in accordance with ASTM C 143.

G. Air Content: Conduct air content test for each cylinder set for concrete exposed to freeze-thaw in accordance with ASTM C 231, ASTM C 173, or ASTM C 138.

END OF SECTION

32 1723 - PAVEMENT MARKINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Painting and marking of pavements, curbs, guard posts, and light pole bases.

1.2 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by the basic designation only.

B. American Association of State Highway and Transportation (AASHTO):
   1. AASHTO M247 - Glass Beads Used in Traffic Paints
   2. AASHTO M248 - Ready-Mixed White and Yellow Traffic Paints

C. ASTM International (ASTM):
   1. ASTM D4414 - Standard Practice for Measurement of Wet Film Thickness by Notched Gauges.

D. Federal Specifications (FS):
   1. FS A-A-2886 - Paint, Traffic, Solvent Based (supersedes FS TT-P-85 and FS TT-P-115, Type I)
   2. FS TT-B-1325 - Beads (Glass Spheres) Retro-Reflective
   3. FS TT-P-1952 - Paint, Traffic And Airfield Marking, Waterborne

1.3 PROJECT CONDITIONS

A. Maintain access for vehicular and pedestrian traffic as required for other construction activities. Utilize flagmen, barricades, warning signs, and warning lights as required.

1.4 QUALITY ASSURANCE

A. Use trained and experienced personnel in applying the products and operating the equipment required for properly performed work.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Paint shall be waterborne or solvent borne, colors as shown or specified herein. Pavement marking paints shall comply with applicable state and local laws enacted to ensure compliance with Federal Clean Air Standards. Paint materials shall conform to the restrictions of the local Air Pollution Control District.

B. Waterborne Paint: Paints shall conform to FS TT-P-1952.

C. Solvent Borne Paint: Paint shall conform to FS A-A-2886 or AASHTO M248. Paint shall be non-bleeding, quick-drying, and alkyd petroleum base paint suitable for traffic-bearing surface and be mixed in accordance with manufacturer's instructions before application for colors White, Yellow, Blue, and Red.

D. Glass Beads: AASHTO M 247, Type 1 or FS TT-B-1325, Type 1, Gradation A.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the work area and correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

3.2 PREPARATION

A. Sweep and clean surface to eliminate loose material and dust.

B. Where existing pavement markings are indicated on Construction Drawings to be removed or would interfere with adhesion of new paint, a motorized abrasive device shall be used to remove the markings. Equipment employed shall not damage existing paving or create surfaces hazardous to vehicle or pedestrian traffic. Within public rights-of-way, appropriate governing authority shall approve method of marking removal.

C. New pavement surfaces shall be allowed to cure for not less than 30 days before application of marking materials.

3.3 CLEANING EXISTING PAVEMENT MARKINGS

A. Remove existing pavement markings which are in good condition but interfere or conflict with the newly applied marking patterns. Deteriorated or obscured markings that are not misleading or confusing or do not interfere with the adhesion of the new marking material do not require removal. Conduct grinding, scraping, sandblasting or other operations in such a manner that the finished pavement surface is not damaged or left in a pattern that is misleading or confusing. Use dust collection system when pavement preparation includes grinding, scraping or sandblasting of existing pavement markings.

3.4 APPLICATION

A. Apply two coats of same color of paint as specified below, at manufacturer's recommended rate, without addition of thinner, with maximum of 100 square feet per gallon or as required to provide a minimum wet film thickness of 15 mils and dry film thickness of 7 ½ mils per coat. Paint shall be applied for a total dry film thickness of 15 mils. Apply with mechanical equipment to produce uniform straight edges. At sidewalk curbs and crosswalks, use straightedge to ensure uniform, clean, and straight stripe.

B. Install pavement markings according to manufacturer's recommended procedures for the specified material.

C. Following items shall be painted with colors noted below:
1. Pedestrian Crosswalks: White
2. Exterior Sidewalk Curbs, Light Pole Bases, and Guard posts: Yellow
3. Fire Lanes: Red or per local code
4. Lane Striping where separating traffic moving in opposite directions: Yellow
5. Lane Striping where separating traffic moving in the same direction: White
6. ADA Symbols: Blue or per local code
7. ADA parking space markings as shown on the drawings.
8. Parking Stall Striping: Yellow, unless otherwise noted on Construction Drawings

D. Apply glass beads at pedestrian crosswalk striping and at lane striping and arrows at driveways connecting to public streets. Broadcast glass beads uniformly into wet markings at a rate of 6 lb/gal.

3.5 FIELD QUALITY CONTROL

A. Responsibilities: Unless otherwise specified, the quality control tests and inspections specified below will be conducted by the Owner's Construction Testing Laboratory (CTL) at no cost to the Contractor. The Contractor shall perform additional testing or inspection as considered necessary by the Contractor for assurance of quality control. Field testing, frequency, and methods may vary as determined by and between the Owner and CTL.

B. Inspection: After the paint has thoroughly dried, visually inspect the entire application and touch up as required to provide clean, straight lines and surfaces throughout.

C. Testing: Testing of wet film thickness shall be performed a minimum of two times on each parking row (including striped islands) and pedestrian cross walks, and a minimum of one test on each lane/alignment striping. At least one test shall be performed after refilling paint striping machine, changing operators of striping machine, and changing paint types, brands, etc. This shall be performed in addition to the testing stated above. These tests shall be performed on each coat applied. Testing shall be performed in accordance with ASTM D4414.

3.6 CLEANING

A. Waste materials shall be removed at the end of each workday. Upon completion of the work, all containers and debris shall be removed from the site. Paint spots upon adjacent surfaces shall be carefully removed by approved procedures that will not damage the surfaces and the entire job left clean and acceptable.

END OF SECTION

32 9000 - PLANTING

PART 1 - GENERAL

1.1 SUMMARY

1.2 Section Includes

1. Preparation and excavation of planting beds.
2. Planting of trees, shrubs, sod, seed, groundcover and associated materials.

1.3 Related Sections

1. Section 31 2000 – Earth Moving
2. Section 31 2500 – Erosion and Sedimentation Control

1.4 REFERENCES

A. American National Standards Institute (ANSI)
   1. ANSI Z60.1 - American Standard for Nursery Stock
B. American Sod Producer Association (ASPA)
C. American Nursery and Landscape Association (ANLA)
D. Erosion Control Technology Council (ECTC)
   1. Standard Specification for Rolled Erosion Control Products.

1.5 SUBMITTALS

A. Before ordering or purchasing materials, provide samples upon request.
B. Submit certification tags from trees, shrubs, sod, and seed verifying type and purity.
C. Unless otherwise authorized by Owner, notify Owner at least 48 hours in advance of anticipated delivery date of plant materials. Legible copy of invoice, showing kinds and sizes of materials included for each shipment, shall be furnished to Owner.
D. Inform Owner of date when planting shall commence.

1.6 QUALITY ASSURANCE

A. Condition of plants shall be approved by the Owner. Owner may inspect reject plants at any time.
B. Measure plants when branches are in their normal position.
C. Trees and shrubs shall meet requirements for spread, height, or container size stated in the Drawings.
   1. Measurements shall be taken from ground level to average height of shrub and not to longest branch.
   2. Height and spread dimensions specified herein refer to main body of trees measured from crown of roots to tip of top branch.

D. Caliper measurements shall be taken at point on tree trunk 6 inches above natural ground line for trees up to 4 inches in caliper, and at point 12 inches above natural ground line for trees exceeding 4 inches in caliper.
E. If range of sizes is given, no plant shall be less than minimum size, and at least 50 percent of plants shall be as large as upper half of range specified.
F. Measurements specified are minimum size acceptable and, where pruning is required, are measurements after pruning.

1.7 PROJECT CONDITIONS

A. Perform work only during weather conditions favorable to landscape construction and to health and welfare of plants. Owner shall determine suitability of such weather conditions.

1.8 GUARANTEE

A. Guarantee plant material for a period of 12-17 months.

1. A limit of one replacement of each plant shall be required, except for losses or replacements due to failure to comply with requirements.
2. Remove from site any plant that is dead or unsatisfactory to Owner. Replace plants during normal planting season.

PART 2 - PRODUCT

2.1 WOODY PLANT MATERIALS

A. Furnish nursery-grown trees and shrubs complying with ANSI Z60.1 and the following requirements:
1. Provide plants with healthy root systems developed by transplanting or root pruning.
2. Provide well-shaped, fully branched, healthy, vigorous stock free of disease, insects, eggs, larvae, and defects such as disfiguring knots, sun scald, injuries, abrasions, and disfigurement.
3. Provide selected specimen quality plants being exceptionally heavy, symmetrical, tight knit, so trained or favored in their development and appearance as to be superior in form, number of branches, compactness and symmetry.
4. Do not prune plants before delivery.
5. Trees with fresh cuts of limbs over 1 1/4-inch, which have not completely calloused, shall be rejected.
6. Provide plants typical of their species or variety and exhibiting a normal habit of growth and be legibly tagged with proper name. Provide plants grown under climatic conditions similar to those of site or have been acclimated to such condition for at least 2 years.
7. Root system of each plant shall be well-provided with fibrous roots. Parts shall be sound, healthy, vigorous, well-branched, and densely foliated when in leaf.
8. Plants designated ball and burlap shall be moved with root systems as solid units with balls of earth firmly wrapped with burlap and comply with the following:
   a. Diameter and depth of balls of earth shall be sufficient to encompass fibrous root feeding systems necessary for healthy development of plant.
   b. No plant shall be accepted when ball of earth surrounding its roots has been cracked or broken preparatory to or during process of planting. Balls shall remain intact during all operations.
   c. Heel-in plants that cannot be planted immediately by setting in ground and covering balls with soil or mulch and then watering.
   d. Hemp burlap and twine is preferable to treated. If treated burlap is used, twine shall be cut from around trunk and burlap shall be removed.
9. Provide single trunk trees growing from single unmutilated crown of roots. No part of trunk shall be conspicuously crooked as compared with normal trees of same variety.
10. Provide shrubs with thickness corresponding to trade classification "No.1". Single-stemmed or thin plants shall not be accepted. Side branches shall be generous, well-twigged, and plant as whole well-branched to ground. Plants shall be in moist condition, free from dead wood, bruises, or other root or branch injuries.

2.2 LAWN SEED

A. Provide fresh, clean, new crop lawn seed mixture. Furnish to Owner dealers guaranteed statement of composition of mixture and percentage of purity and germination of each variety.

B. Seed Mixture: Provide seed of grass species and varieties, proportions by weight and minimum percentages of purity, germination, and maximum percentage of weed seed. Seed mixtures vary by region and season and shall comply with State DOT and Local Soil Conservation Service Standards for lawn turf.

2.3 SOD

A. Provide ASPA certified sod species suitable as lawn turf for the region. Sod shall be strongly rooted, weed, disease, pest free and uniform in thickness.

2.4 GROUNDCOVER

A. Provide groundcover established and well rooted in pots or similar containers and comply with ANSI Z60.1.

2.5 TOPSOIL

A. Natural, friable, fertile, fine loamy soil possessing characteristics of representative topsoil in the vicinity that produces heavy growth. Topsoil shall have a pH range of 5.5 to 7.4 percent, free from subsoil, objectionable weeds, litter, sods, stiff clay, stones larger than 1-inch in diameter, stumps, roots, trash, toxic substances, or any other material which may be harmful to plant growth or hinder planting operations. Top soil shall contain a minimum of three percent organic material.

B. Verify amount stockpiled if any, and supply additional as needed from naturally well-drained sites where topsoil occurs at least 4 inches deep. Do not obtain topsoil from bogs or marshes.

2.6 PLANTING SOIL MIX

A. Mix “Back to Earth” soil conditioner or Peat Moss with topsoil at a ratio of 1:4.

2.7 FERTILIZER

A. Deliver fertilizer, mixed as specified, in original unopened standard size bags showing weight, analysis and name of manufacturer. Containers shall bear manufacturer's guaranteed statement of analysis, or manufacturer's certificate of compliance covering analysis shall be furnished to Owner. Store fertilizer in such manner that it shall be kept dry.

1. Commercial Fertilizer: Base percentages of nitrogen, phosphorus, and potash on laboratory test recommendations as approved by Owner. For bidding assume 10 percent nitrogen, 6 percent phosphorus, and 4 percent potash by weight. At least 50 percent of total nitrogen shall contain no less than 3 percent water-insoluble nitrogen. At least 60 percent of nitrogen content shall be derived from super-phosphate containing not less than 18 percent phosphoric acid or bone meal containing 25 - 30 percent phosphoric acid and 2 - 3 percent nitrogen. Potash shall be derived from muriate of potash containing 55 - 60 percent potash.
2. Slow-Release Fertilizer: Ozmocote Granular fertilizer or approved equal composed of 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.

2.8 STAKING MATERIAL

A. Provide 8-ft steel tee posts stakes. Use three stakes for each tree unless otherwise shown on the drawings.

B. Wire used for tree staking shall be pliable No. 12 galvanized soft steel wire unless shown otherwise on the drawings.

C. Hose shall be 2-ply fibred-bearing rubber garden hose, not less than 1/2-inch inside diameter, black or green, and of suitable length unless shown otherwise on the drawings.

2.9 WATER

A. Furnish potable water, hose, and other watering equipment.

2.10 EROSION CONTROL BLANKET

A. Erosion control blankets shall be the type and material composition as applicable in accordance with ECTC Standard Specification for Rolled Erosion Control Products.

PART 3 - EXECUTION

3.1 PREPARATION

A. If project completion date prohibits in-season planting, prepare for out-of-season seeding or sodding so that lawns shall be completed and ready for acceptance at time of project completion.

B. Locations containing unsuitable subsoil shall be treated by one or more of the following:

1. Where unsuitability is deemed by Owner to be due to excessive compaction caused by heavy equipment and where natural subsoil is other than AASHTO classification of A6 or A7, loosen such areas with spikes, discing, or other means to loosen soil to condition acceptable to Owner. Loosen soil to minimum depth of 12 inches with additional loosening as required to obtain adequate drainage. Contractor may introduce peat moss, sand, or organic matter into the subsoil to obtain adequate drainage. Such remedial measures shall be considered as incidental, without additional cost to Owner.

2. Where unsuitability is deemed by Owner to be due to presence of boards, mortar, concrete, or other construction materials in sub-grade and where natural subsoil is other than AASHTO classification of A6 or A7, remove debris and objectionable material. Such remedial measures shall be considered as incidental, without additional cost to Owner.
3. Where unsuitability is deemed by Owner to be because natural subsoil falls into AASHTO classification of A6 or A7 and contains moisture in excess of 30 percent, then installation of sub-drainage system or other means described elsewhere in Specifications shall be used. Where such conditions have not been known or revealed prior to planting time and they have not been recognized in preparation of The Drawings and Specifications, then Owner shall issue pricing order to install proper remedial measures.

C. Perform planting operations at steady rate of work unless weather conditions make it impossible to work. No plant material shall be planted in frozen ground.

D. Disk, drag, harrow, or hand rake subgrade to depth of 4 inches and remove stones larger than 1-1/2 inches to provide bond for topsoil. Topsoil, which must be transported across finished sidewalks, shall be delivered in such manner that no damage will be done to sidewalks.

E. Do not place topsoil until subgrade has been approved in accordance with Section 31 2000. Before placing topsoil, rake subsoil surface clear of stones, debris, and roots. Compact topsoil to form layer with minimum depth of 4 inches in lawn areas and 12 inches in shrub beds. Place topsoil so that after final settlement there will be positive drainage conforming to elevations shown on the Drawings.

F. Tree and Shrub Preparation
1. Dig bare-rooted shrubs with adequate fibrous roots. Cover roots with uniformly thick coating of mud by being puddled immediately after they are dug, or packed in moist straw or moss.
2. Dig ball and burlap plants with firm natural balls of earth of diameter and depth to include fibrous roots.
3. Protect roots or balls of plants at all times from sun and drying winds.
4. Ball and burlap plants which cannot be planted immediately upon delivery shall be set on ground and protected with soil, wet moss, or other acceptable material. Heel-in bare rooted plants that cannot be planted immediately upon delivery. All shall be kept moist.
5. Open and separate bundles of plants before roots are covered. Prevent air pockets among roots. During planting operations, cover bare roots with canvas, hay, or other suitable material. Plants shall not be bound with wire or rope which will result in damage to bark or branches.

G. Seed Bed Preparation
1. Grade areas to finish grades, filling as needed or removing surplus dirt. Float areas to smooth, uniform grade as indicated on the Drawings. Lawn areas shall slope to drain.
2. Where no grades are shown, areas shall have smooth and continual grade between existing or fixed controls, such as walks, curbs, catch basin, steps, or building, and elevations shown on The Drawings. Roll, scarify, rake, and level as necessary to obtain true, even lawn surfaces. Finish grades shall meet approval of Owner before grass seed is sown.
3. Loosen soil to depth of 6 inches in lawn areas by approved method of scarification and grade to remove ridges and depressions. Remove stones or foreign matter over 2 inches in diameter from top 2 inches of soil. Float lawn areas to finish grades.
4. Seed beds shall be permitted to settle or shall be firmed by rolling before seeding begins.

H. Sod Bed Preparation: Grade areas to finish grade, filling as needed or removing surplus dirt, stones, debris, etc. and floating areas to smooth, uniform grade as indicated on the Drawings. Lawn areas shall be graded to drain.

I. Groundcover Bed Preparation:
1. Set out and space groundcover 12 inches apart maximum.
2. Dig holes large enough to allow spreading of roots, and backfill with planting soil.
3. Remove groundcover from pots.
4. Work soil around roots to eliminate air pockets and leave a slight saucer indention around plants to hold water.
5. Water thoroughly after planting taking care not to cover plant crowns with wet soil.
6. Protect plants from hot sun and wind; remove protection when plants show evidence of recovery from transplanting shock.

J. Fertilizer Application: Apply Commercial grade fertilizer in two applications and water immediately following each application. The first application shall be one week prior to seeding /sodding at the rate of 25 pounds per

1000 square feet and barrowed into the top two inches of topsoil. The second application shall be at the rate of 10 pounds per 1000 square feet immediately following the second mowing.

3.2 PROTECTION

A. Before commencing work, trees and shrubs that are to be saved shall be protected from damage by placement of fencing flagged for visibility or some other suitable protective procedure approved by Owner.

B. Trucks or other equipment shall not be driven or parked within drip line of any tree unless tree overspreads paved area.

C. Use precautionary measures when performing work around trees, sidewalks, pavements, utilities, and other features either existing or previously installed.

D. Adjust depth of earthwork and topsoil when working immediately adjacent to aforementioned features in order to prevent disturbing tree roots, undermining sidewalks and pavements, and damage in general to other features either existing or previously installed.

E. Cover plants transported to project in open vehicles with tarpaulins or other suitable covers securely fastened to body of vehicle to prevent injury to plants. Closed vehicles shall be adequately ventilated to prevent overheating of plants. Evidence of inadequate protection following digging, carelessness while in transit, or improper handling or storage shall be cause for rejection. Plants shall be kept moist, fresh, and protected. Such protection shall encompass entire period during which plants are in transit, being handled, or are in temporary storage.

F. Plants shall not be delivered to the site more than seven days prior to planting. Plants not planted within 48 hours of delivery, shall be healed in (covered with sawdust, soil or mulch), and the containers or balls protected from wind and temperature and kept moist until planting.

G. Where excavating, fill, or grading is required within drip line of trees that are to remain, work shall be performed as follows:

1. Trenching: When trenching occurs around trees to remain, tree roots shall not be cut but trench shall be tunneled under or around roots by careful hand digging without injury to roots.
2. Raising Grades:
    a. Where fill not exceeding 16 inches is required, clean, washed gravel graded from 1 inch to 2 inches in size shall be placed directly around tree trunk. Extend gravel out from trunk on all sides minimum of 18 inches and finish approximately 2 inches above finished grade at tree. Install gravel before any earth fill is placed. New earth fill shall not be left in contact with trunks of trees requiring fill.
    b. Where fill exceeding 16 inches is required, construct dry-laid tree well around trunk of tree. Tree well shall extend out from trunk on all sides minimum of 3 feet and to 3 inches above finish grade. Place coarse-graded rock directly around tree well extending out to drip line of tree. Place clean, washed gravel graded from 1 inch to 2 inches in size directly over coarse rock to depth of 3 inches. Place approved backfill material directly over washed gravel to desired finish grade.
3. Lowering Grades: Existing trees in areas where new finish grade is to be lowered shall have regrading work done by hand to elevation indicated on The Drawings. Roots as required shall be cut cleanly 3 inches below finished grade and scars covered with tree paint.
4. Trees marked for preservation that are more than 6 inches above proposed grades shall stand on broad rounded mounds and graded smoothly into lower level. Trees located more than 16 inches above proposed grades shall have dry-laid stone wall or other retaining structure as detailed on The Drawings constructed minimum of 5 feet from trunk. Exposed or broken roots shall be cut clean and covered with topsoil.

3.3 TREE AND SHRUB PLANTING

A. Plants too large for 2 persons to lift in and out of holes shall be placed with sling. Do not rock trees in holes to raise.

B. If rock or other underground obstruction is encountered, Owner may require plant pits to be relocated, pits enlarged, or plants deleted from project.

C. Make adjustments in locations as directed. In event that pits or areas for planting are prepared and backfilled with topsoil to grade prior to commencement of lawn operations, they shall be so marked that when planting proceeds, they can be readily located. In case underground obstructions such as ledges or utilities are encountered, change location under direction of Owner without charge.

D. Holes for trees shall be at least 2 feet greater in diameter than spread of root system and at least 6 inches deeper than root ball. Holes for shrubs shall be at least 2 feet greater in diameter than spread of root system and at least 2 feet deep. Holes for vines shall be at least 12 inches greater in diameter than the spread of rootball at least 12 inches deep.

E. Backfill tree holes and shrub beds with planting soil mix. Apply Ozmocote fertilizer at a rate of one and one half pounds (1 1/2#) per 100 square feet for beds and one quarter pound (1/4#) per caliper inch for trees. Incorporate fertilizer into the top 6" of the plant soil mix in the bed areas and into the backfill placed in tree pits.

F. Plants shall be planted in center of holes and at same depth as they had previously grown. Backfill planting soil mix in layers of not more than 8 inches and each layer watered sufficiently to settle before next layer is placed. Tamp planting soil mix under edges of balled plants. Use enough planting soil mix to bring surfaces to finish grade when settled.
   1. Provide saucer around each plant as shown on The Drawings.
   2. Soak plants with water twice within first 24 hours after time of planting. Apply water with low pressure so as to soak in thoroughly without dislodging topsoil.

3.4 SEEDING

A. Do not perform seeding in windy conditions.

B. Seeding shall be dispersed in 2 directions at right angles to each other.

C. Seed lawn areas by sowing evenly with approved mechanical seeder at rate of minimum of 3 pounds per 1,000 square feet. Culti-packer or approved similar equipment may be used to cover seed and to form seedbed in 1 operation. In areas inaccessible to culti-packer, lightly rake seeded ground with flexible rakes and roll with water ballast roller. After rolling, seeded areas shall be lightly mulched with wheat straw.

D. Surface layer of soil for seeded areas shall be kept moist during germination period. Water seeded areas twice first week to minimum depth of 6 inches with fine spray and once per week thereafter as necessary to supplement natural rain to equivalent of 6 inches depth.

3.5 SODDING

A. A 1'-6" wide strip shall be sodded along sidewalks, roadways, and parking areas to prevent washing and erosion.

B. Cut and lay sod on same day. Only healthy vigorous growing sod shall be laid.

C. Lay sod across slope and tightly together to result in solid coverage free of gaps.

D. Roll or firmly but lightly tamp new sod with suitable wooden or metal tamper sufficiently to set or press sod into underlying soil.

E. After sodding has been completed, clean up and thoroughly water newly-sodded areas.

3.6 MAINTENANCE DURING CONSTRUCTION

A. Begin maintenance operations immediately after each plant is planted and continue as required until acceptance. Water, mulch, weed, prune, spray, fertilize, cultivate, and otherwise maintain and protect plants. Reset settled plants to proper grade and position, restore planting saucers, and remove dead, diseased, or unhealthy plant material. Tighten and repair stakes and wires. Correct defective work as soon as possible after it becomes apparent and weather and season permit.

B. Upon completion of the planting operations, clean up landscaped areas to be free of stones, containers, trash, and other waste and debris to leave area in a neat and well groomed appearance.

C. Supplement rainfall as required to provide an equivalent of 1 inch of water per week until the plants have rooted and are established.

D. Maintain all plant material in a healthy, vigorous growing condition.

E. Make weekly inspections to determine moisture content of soil and adjust watering schedule established by irrigation system installer to fit conditions.

F. After grass growth has started, reseed areas that fail to show uniform stand of grass in accordance with The Drawings and as specified herein. Reseed such areas repeatedly until areas are covered with satisfactory growth of grass. Perform removal and replacement or topsoil conditioning if required to facilitate establishment of grass.

G. Water in such manner and as frequently as is deemed necessary by Owner to assure continued growth of healthy grass. Water areas of site in such a manner as to prevent erosion due to excessive quantities applied over small areas and to avoid damage to finished surface due to watering equipment.

H. Provide water for execution and maintenance at no expense to Owner. Furnish portable tanks, pumps, hose, pipe, connections, nozzles, and any other equipment required to transport water from available outlets and apply it to seeded areas in approved manner.

I. Initiate mowing of turf areas when grass has attained height of 3 inches and roots are firmly established. Maintain grass height at 2 1/2 to 3 inches at subsequent cuttings depending on time of year. Remove no more than 1/3 of grass leaf at any cutting and cutting shall not occur more than 10 days apart.

J. Remove heavy cuttings to prevent destruction of underlying turf. If weeds or other undesirable vegetation threaten to smother planted species, such vegetation shall be mowed or, in case of rank growths, shall be uprooted, raked and removed from area by methods approved by Owner.

K. Remove weeds and other undesirable vegetation by applying herbicides as recommended by the manufacturer or by uprooting. Rake and remove uprooted vegetation from area by methods approved by Owner.

L. Protect seeded area from pedestrian or vehicular trespassing while grass is germinating. Provide fences, signs, barriers, or other necessary temporary protective devices. Repair damage resulting from trespass, erosion, washout, settlement, or other causes.

M. Remove fences, signs, barriers, or other temporary protective devices after final acceptance.

N. Remove and replace diseased, distressed, dead, or rejected plants prior to Substantial Completion Date.

O. Replacements shall be plants of same variety and size specified on The Drawings. Furnish and plant as specified herein. Replacements resulting from removal, loss, or damage due to occupancy of project in any part, vandalism, physical damage by animals, vehicles, etc., and losses due to curtailment of water by local authorities will be approved and paid for by Owner.

P. Grassed areas damaged during process of work shall be restored or repaired to condition satisfactory to the Owner. Fill, grade, refertilize, replant, or mulch as required to restore to contract requirements.

END OF SECTION

33 1000 - WATER DISTRIBUTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Site water piping and fittings including domestic potable waterline and fire protection system supply waterline, valves, and fire hydrants. All work shall be in accordance with the City of Springfield DPW and Springfield Water & Sewer Commission Rules and Regulations and these site work specifications. In the event of a discrepancy between the two documents. The more stringent shall apply.

B. Related Requirements:
1. Section 31 2000 – Earth Moving

1.2 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by the basic designation only.

B. American Society of Mechanical Engineers (ASME):
1. ASME B 16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

C. ASTM International (ASTM):
1. ASTM B88 - Seamless Copper Water Tube.
2. ASTM F477 - Elastomeric Gaskets And Lubricant.

D. American Water Works Association (AWWA):
1. AWWA C104 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
2. AWWA C105 - Polyethylene Encasement for Ductile Iron Piping for Water and other Liquids.
3. AWWA C111 - Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
4. AWWA C116 - Protective Fusion-Bonded Epoxy Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Fittings for Watersupply Service.
5. AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast, for Water or Other Liquids.
6. AWWA C153 - Ductile-Iron Compact Fittings for Water Service.
7. AWWA C504 - Rubber-Seated Butterfly Valves.
8. AWWA C509 - Resilient-Seated Gate Valves for Water Supply Service.
9. AWWA C550 - Protective Interior Coatings for Valves And Hydrants.
10. AWWA C600 - Installation of Ductile-Iron Water Mains and Appurtenances.
11. AWWA C651 - Disinfecting Water Mains.

E. American National Standards Institute Standards (ANSI):
1. ANSI A21.4 CementMortar Lining for CastIron and DuctileIron Pipe and Fittings for Water
2. ANSI A21.11 RubberGasket Joints for CastIron and DuctileIron Pressure Pipe and Fittings
3. ANSI A21.51 DuctileIron Pipe, Centrifugally Cast in Metal Molds or SandLined Molds, for Water or Other Liquids
4. ANSI A21.53 DuctileIron Compact Fittings, 3in. through 16in. for Water and Other Liquids

F. The New York Bureau of Water & Sewer Operations, Standard Water Main Specifications (latest issue)

G. Westchester Joint Water Works Rule and Regulations

1.3 QUALITY ASSURANCE

A. Products, where marked for compliance with code or test standards, shall also mark specific standard as required in the Contract Documents.

B. Perform installation in accordance with utility company or municipality requirements.

C. Valves: Mark manufacturer's name and pressure rating on valve body.

D. Perform disinfection of potable lines in accordance with AWWA C651.

1.4 SUBMITTALS

A. Furnish 1 copy of results of meter test and hydrostatic pressure test to Owner, Owners Civil Engineering Consultant (CEC), and utility company upon completion of water distribution backfilling operations.

B. Project Record Documents:

1. Disinfection report: Record the following:
   a. Type and form of disinfectant used.
   b. Date and time disinfectant injection start and time of completion.
   c. Test locations.
   d. Initial and 24 hour disinfectant residuals (quantity in treated water) in ppm for each outlet tested.
   e. Date and time of flushing start and completion.
   f. Disinfectant residual after flushing in ppm for each outlet tested.
2. Bacteriological report: Record the following:
   a. Date issued, project name, testing laboratory name, address, and telephone number.
   b. Time and date of water sample collection.
   c. Name of person collecting samples.
   d. Test locations.
   e. Initial and 24 hour disinfectant residuals in ppm for each outlet tested.
   f. Coliform bacteria test results for each outlet tested.
   g. Certification that water conforms, or fails to conform, to bacterial standards.
   h. Bacteriologist’s signature and authority.
3. Accurately record actual locations of piping mains, valves, connections, and top of pipe elevations.
4. Identify and describe unexpected variations to subsoil conditions and location of uncharted utilities.

PART 2 - PRODUCTS

2.1 PIPE

A. Pipe sizes 3-inches and smaller for installation below grade and outside building shall comply with the following:
   1. Seamless Copper Tubing: Type "K" soft copper, ASTM B88.
      a. Fittings: Wrought copper (95-5 Tin Antimony solder joint), ASME B 16.22.

B. Pipe sizes 4 to 16 inches for installation below grade and outside building shall comply with the following:
   1. Ductile Iron Water Pipe: Class 52 (in accordance with AWWA C151), (4-12”), double cement mortar-lined, double bituminous seal coated inside (in accordance with AWWA C104) and polyethylene encased (in accordance with AWWA C105)

a. Fittings: Either mechanical joint or push-on joint, AWWA C153, and shall be coated with a 6-8 mil nominal thickness fusion bonded epoxy conforming to the requirements of AWWA C550 and C116, or cement mortar lined in accordance with AWWA C104.
b. All pipe joints shall be Tyton push-on type, unless otherwise specified, employing ringtype rubber gasket to affect the joint seal (in accordance with AWWA C111).
c. All mechanical-joints shall be formed using a restrained mechanical gland.
d. Restrained mechanical gland shall be EBAA Iron's Mega-Lug retainer gland or other non-set-screw type retainer gland that will not void the warrantee of the pipe manufacturer.
e. Couplings shall be HYMAX with high strength, low alloy, corrosion resistant bolts and nuts.
f. Elastomeric gaskets and lubricant: ASTM F477.

2.2 VALVES

A. Gate Valves, 2-Inches and Larger:
1. Manufacturer and Model: M&H, Clow or U.S. Pipe Resilient Seated Wedge Gate Valves.
2. Gate valves shall open right.
3. AWWA C509, iron body, non-rising stem with square nut, single wedge, resilient seat, flanged or mechanical joint ends, control rod, post indicator where indicated on Construction Drawings, extension box and valve key.

B. Ball Valves, 2-Inches and Smaller:
1. Manufacturer and Model: Ford with compression grip ring.
2. Brass body, teflon coated brass ball, rubber seats and stem seals, Tee stem pre-drilled for control rod, AWWA compression inlet end, compression outlet with electrical ground connector, with control rod, extension box and valve key.

C. Butterfly Valves, From 2-Inch to 24-Inch: AWWA C504, Iron body, bronze disc, resilient replaceable seat, water or lug ends, infinite position lever handle.

D. Check Valves, Post Indicator Valves, And Backflow Preventors
1. Refer to Section 13900 - Fire Suppression in Architectural/Building Specifications

2.3 FIRE HYDRANTS

A. Fire Hydrants: M&H Dresser 929.

1. Main Valve Opening: 5.25 inches
2. Operating Nut Size: Pentagon 1.50 inches point to flat
3. Direction of Opening: Clockwise (OPEN RIGHT)
4. Bury Length: 5.5 feet
5. Sub-Seat Material: Bronze
6. Model: Traffic (breakaway design)

B. Hydrant Extensions: Fabricate in multiples of 6-inches with rod and coupling to increase barrel length.

C. Hose and Steamer Connections: National Standard Thread; 2 – 2.50 inch hose connections and 1 – 4.50 inch steamer connection

D. FDC Connection: 4" Storz Connection

E. Finish: Apply primer and 2 coats of enamel or special coating to color; match service zone fire hydrant standards.

2.4 ACCESSORIES

A. Thrust Blocking: Place 2500 psi concrete to provide sufficient bearing area to transmit unbalanced thrust from bends, tees, caps, or plugs to undisturbed soil without loading undisturbed soil in excess of 2,500 pounds per square foot when water main pressure is 100 psi.

MINIMUM THRUST BLOCKING BEARING AREAS

Pipe Diameter	Tees Sq. Ft	90° Bend Sq. Ft	45° Bend Sq. Ft	22½° Bend Sq. Ft.	11¼° Bend Sq. Ft.	5 5/8 Bend Sq. Ft.	Cap/Plug Sq. Ft.
3"	1.0	1.0	1.0	1.0	1.0	1.0	1.5
4"	1.0	1.0	1.0	1.0	1.0	1.0	2.0
6"	1.5	2.0	1.0	1.0	1.0	1.0	3.0
8"	2.5	3.5	1.8	1.0	1.0	1.0	4.0
10"	4.0	5.5	2.8	1.5	1.0	1.0	6.0
12"	6.0	8.0	4.0	2.0	1.5	1.0	8.5
14"	8.0	11.0	5.5	3.0	2.0	1.5	12.0
16"	10.0	14.2	7.0	4.0	3.0	2.5	15.0
18"	21.0	21.0	12.0	6.0	4.0	3.5	24.0

B. Locked mechanical joint fittings shall be installed where vertical changes in direction are required and, if approved by Owner and governing authority, can be installed in lieu of above thrust blocking requirements.

C. Polyethylene Encasement: Single layer of two ply cross-laminated high density polyethylene encasement per AWWA C105, Section 4.1.2, Type III, Class C (Black), Grade 33, tensile strength 5,000 psi minimum, elongation 100 percent, thickness nominal 0.004 inch (4 mil).

D. Trace Wire: Magnetic detectable conductor, (#12 Copper) brightly colored plastic covering imprinted with “Water Service” in large letters.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that building service connection and municipal utility water main size, location, and depth are as indicated on Construction Drawings.

3.2 PREPARATION

A. Ream pipe and tube ends and remove burrs.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare pipe for connections to equipment with flanges or unions.

D. Protect benchmarks, property corners, and other survey monuments from damage or displacement. If marker needs to be removed it shall be referenced by licensed land surveyor and replaced, as necessary, by same.

3.3 TRENCHING AND BEDDING

A. Excavate pipe trench and place bedding material in accordance with Section 31 2000 Earth Moving.

3.4 INSTALLATION - PIPE AND FITTINGS

A. Maintain separation of water main from sanitary and storm sewer piping in accordance with state or local codes.

B. Install ductile iron pipe and fittings in accordance with AWWA C600.

C. Ductile iron pipe and fittings shall be installed with polyethylene encasement around the pipe for the entire length of the project except where water main is within steel casing or is concrete encased. Install polyethylene encasement in accordance with AWWA C105, Method A.

D. Install pipe to allow for expansion and contraction without stressing pipe or joints or as specified by pipe manufacturer.

E. Install access fittings in accordance with local codes to permit disinfection of water system performed under this Section.

F. Connections with Existing Pipelines: Where connections are made between new work and existing piping, make connection using suitable fittings for conditions encountered. Make each connection with existing pipe at time and under conditions with least interference with operation of existing pipeline and in compliance with local utility company.

G. Form and place concrete for thrust blocks or other specified methods of retainage at each change of direction or end of pipe main.

H. Place pipe to depth in accordance with Section 31 2000 Earth Moving.

I. Backfill trench in accordance with Section 31 2000 Earth Moving.

J. Install trace wire continuous over top of non-metal pipe. Bury a minimum of 6 inches below finish grade, and above pipeline.

3.5 INSTALLATION - VALVES AND HYDRANTS

A. Install gate valves as indicated on Construction Drawings. Support valve on concrete pads with valve stem vertical and plumb. Install valve boxes in manner that will not transmit loads, stress, or shock to valve body. Center valve box over operating nut of valve vertical and plumb. Securely fit valve box together leaving cover flush with finished surface.

B. Install fire hydrant assemblies as indicated on Construction Drawings in vertical and plumb position with steamer/pumper nozzle pointed perpendicular to traffic where hydrant is adjacent to street, roadway, or parking lot drive or toward protected building unless otherwise directed by local authorities. Support hydrant assembly on concrete pad and firmly brace on side opposite inlet pipe against undisturbed soil and concrete blocking. Place minimum of 6-cubic feet of crushed stone or gravel around hydrant base and barrel after thrust blocking has cured at least 24 hours. Maintain vertical position of hydrant backfilling and compacting.

3.6 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Disinfect distribution system with chlorine before acceptance for domestic operation. Chlorine dosage shall be not less than 50 parts per million. Flush lines before introduction of chlorinating materials and after contact period of not less than 24 hours. Flush with clean water after contact period until residual chlorine content is not greater than 1.0 part per million. Flush water discharged from water supply lines or hydrants shall not be allowed to discharge directly onto exposed soil or turf which could result in erosion of soil. If potential for erosion exists at discharge point, measures shall be taken to prevent erosion. Open and close valves in lines being disinfected several times

during contact period. After disinfection, take water sample and bacteriological test in accordance with AWWA C651. Do not place distribution system in service until approval is obtained from local governing authorities.

B. Contractor shall provide a means of neutralizing the super-chlorinated water before releasing into the environment. This may be accomplished by either a method of dechlorinization, direct release into a detention area approved by the Municipality, or any method acceptable to federal, state, and local codes. Direct release to open ground shall not be allowed, unless contained within an on site detention facility with 6" permanent storage. In this case, the Contractor shall time the release to assure that no rainstorms are imminent. The intent of this condition is to allow the majority of the chlorine to evaporate into the atmosphere before a rainstorm has the opportunity to wash the residual downstream. Contractor shall not release super-chlorinated water directly into the sanitary sewer system, private or public, nor any storm drain system not directly discharging into the detention facility.

3.7 SERVICE CONNECTIONS

A. Provide water service connection in compliance with utility company requirements including reduced pressure backflow preventor (if required) and water meter with by-pass valves and sand strainer.

3.8 FIELD QUALITY CONTROL

A. Test water distribution system pipe installed below grade and outside building in accordance with the following procedures:
   1. Perform testing of pipe materials, joints, and other materials incorporated into construction of water mains and force mains to determine leakage and water tightness. In the event state or local code requires more stringent test, more stringent test shall take precedence.
   2. 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. Test at not less than one-and-one-half times working pressure for two hours. Increase pressure in 50-psig increments and inspect each joint between increments. Hold at test pressure for 1 hour; decrease to 0 psig. Slowly increase again to test pressure and hold for 1 more hour. Maximum allowable leakage shall be 2 quarts per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within allowed limits.

B. Prepare reports of testing activities.

33 3000 Sanitary Sewage Systems

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Sanitary sewer drainage piping, fittings, accessories, cleanouts, and bedding.
2. Connection of site sanitary sewer system to municipal sanitary sewer systems.

B. Related Requirements:
1. Section 31 2000 – Earth Moving
2. Section 33 3913 – Sewer Manholes, Frames and Covers

1.2 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by the basic designation only.

B. ASTM International (ASTM):
1. ASTM A74 - Cast Iron Soil Pipe and Fittings
2. ASTM A746 - Ductile Iron Gravity Sewer Pipe
3. ASTM C425 - Compression Joints for Vitrified Clay Pipe and Fittings
4. ASTM C564 - Rubber Gaskets for Cast Iron Soil Pipe and Fittings
5. ASTM D2241 - Poly (vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)
6. ASTM D2657 - Heat-Joining Polyolefin pipe and Fittings
7. ASTM D3034 - Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
8. ASTM D3035 - Polyethylene (PE) Plastic Pipe Using Flexible Elastomeric Seals
9. ASTM D3139 - Joints for Plastic Pressure Pipe Using Flexible Elastomeric Seals
10. ASTM D3261 - Butt Heat Fussion Polyethylene (PE) Plastic Fittings For Polyethylene Plastic Pipe And Tubing
11. ASTM F477 - Elastomeric Seals (Gaskets) for Joining Plastic Pipe
12. ASTM F1417 - Standard Test Method for Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air.

C. American Water Works Association (AWWA):
1. AWWA C111 - Rubber-Gasket Joints for Ductile Iron Pressure Pipe and Fittings
2. AWWA C600 - Ductile-Iron Water Mains And Their Appurtenances
3. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4 In. Through 12 In, For Water Distribution
4. AWWA C901 - Polyethylene (PE) Pressure Pipe, Tubing And Fittings 1/2 Inch Through 3 Inches, For Water Distribution
5. AWWA C906 - Polyethylene (PE) Pressure Pipe And Fittings, 4 Inch Through 63 Inch, For Water Distribution

1.3 SUBMITTALS

A. Project Record Documents:
1. Accurately record actual locations of pipe runs, connections, cleanouts, and invert elevations.
2. Identify and describe unexpected variations to subsoil conditions and location of uncharted utilities.

1.4 PROJECT CONDITIONS

A. Coordinate work with termination of sanitary sewer connection outside building and connection to municipal sewer utility service.

PART 2 - PRODUCTS

2.1 SEWER PIPE, FITTINGS, AND JOINTS

A. Polyvinyl Chloride Pipe (PVC): ASTM D 3034, rated SDR 35 unless otherwise specified by the utility company. Pipe shall be continually marked with manufacturer's name, pipe size, cell classification, SDR rating, and ASTM D 3034 classification.
   1. Pipe joints: Integrally molded bell ends, ASTM D 3034, Table 2, with factory supplied elastomeric gaskets and lubricant.

B. Force Main:
   1. High-Density Polyethylene Pipe (HDPE): AWWA C901 and C906, ASTM D3035, SDR 11 for 150 psi pressure rating.
      a. Fittings: Molded, AWWA C901 or C906.
      b. Joints: Butt fusion, ASTM D2657, flanged gasket joints at interface
   2. Polyvinyl Chloride Pipe (PVC): For less than 4 inches in diameter, ASTM D2241 for push-on or solvent weld joints, and for pipe 4 inches in diameter and larger, AWWA C900, Class 150 with push-on joints.
      a. Joints/Fittings: Push-on, ASTM D3139 with ASTM F477 gaskets.
      b. Solvent Cement: ASTM D2564.
   3. Ductile Iron Pipe (DIP): ASTM A746, Class 50, inside nominal diameter as shown on the drawings, bell and spigot end.
      a. Ductile Iron Pipe Joint Device: AWWA C111, rubber gasket joint devices.

2.2 PIPE ACCESSORIES

A. Pipe Joints: Mechanical clamp ring type, stainless steel expanding and contracting sleeve, neoprene-ribbed gasket for positive seal.

B. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps, etc.

2.3 CLEANOUTS AND MANHOLES

A. Manholes shall conform to Section 33 3913 Sewer Manholes, Frames and Covers.

B. Lid and Frame: Provide in accordance with Section 33 3913 Sewer Manholes, Frames and Covers. Provide traffic grade and rated covers and frames where cleanouts and manholes are within pavement, with the letters “SSCO” or “SANITARY SEWER” respectively cast into the cover.

C. Shaft Construction: Cast iron shaft of internal diameter as specified on Construction Drawings with 2500 psi concrete collar for cleanouts.

2.4 APPURTENANCES

A. Trace Wire: Magnetic detectable conductor (#12 copper), brightly colored plastic covering, imprinted with “Sanitary Sewer Service” in large letters.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that trench cut and excavation is ready to receive work and excavations, dimensions, and elevations are as indicated on Construction Drawings.

3.2 PREPARATION

A. Hand trim excavations to required elevations. Correct over excavation with bedding material.

B. Remove large stones or other hard matter that could damage pipe or impede consistent backfilling or compaction.

3.3 BEDDING

A. Excavate trench and place bedding material in accordance with Section 31 2000 Earth Moving.

3.4 INSTALLATION - PIPE

A. Install type and class of pipe as shown on the drawings. Pipes shall be laid and maintained to the required line and grade with necessary fittings, bends, manhole risers, cleanouts and other appurtenances placed at the required locations. The pipe shall be installed with uniform bearing under the full length of the barrel of the pipe. The pipe shall be inspected for defects and cracks before being lowered into the trench. Defective, damaged or unsound pipe, or pipe that has had its grade disturbed after laying shall be taken up and replaced. Commence installation at lowest point with the bell end upgrade.

B. No pipe shall be laid in water or when trench conditions are unsuitable for work.

C. Pipe connecting to manholes or other structures shall terminate flush inside of the structure wall.

D. Joints for PVC and CISP shall be thoroughly lubricated with an approved lubricant before pipe sections are slipped together. Open ends shall be fully protected with a stopper to prevent earth or other material from entering the pipe during construction. Carefully free interior of the pipe from dirt, cement and other deleterious material as the work progresses.

E. Maintain separation of potable water main from sewer piping at crossings a minimum of 10 feet horizontal and 18 inches vertical.

F. Install HDPE piping and fittings to AWWA C901 and C906. Butt fusion welded per ASTM D3261.

G. Route pipe in straight line parallel to roads, buildings and adjacent utilities and as shown on the drawings.

H. Establish elevations of buried piping with sufficient cover as recommended by pipe manufacturer to ensure not less than 3 feet of cover, except as noted on drawings.

I. Form and place concrete for thrust blocks at each elbow of pipe force main. See construction drawing for details of construction.

J. Backfill trench in accordance with Section 31 2000 Earth Moving.

K. Install trace wire continuous over top of non-metal pipe. Bury 6 inches minimum below finish grade, above pipeline.

3.5 INSTALLATION – CLEANOUTS AND MANHOLES

A. Form bottom of excavation clean and smooth to correct elevation.

B. For cleanouts, form and place cast-in-place concrete base pad with provision for sanitary sewer pipe to be installed to proper elevations.

C. For manholes, construct inverts according to the following guidelines:
   1. Invert channel shall be smooth and accurately shaped to a semicircular bottom to match with the inside of the adjacent sewer section.
   2. Invert channels and structure bottoms shall be shaped with mortar and lean concrete.
   3. Changes in size and grade of invert shall be made gradually and evenly.
   4. Changes in the direction of the sewer entering branch or branches shall have a true curve of as large a radius as the manhole will permit.

D. For manholes, provide manhole rings, frame, and cover as shown on the construction drawings.

3.6 FIELD QUALITY CONTROL

A. Field quality control shall be conducted by the Contractor in accordance with Section 31 2000.

B. Pipes and joints shall not be completely backfilled until after inspection, testing, and approval by the Owner and local jurisdiction.

C. Prior to testing for leakage, the pipe trench shall be backfilled to at least the spring line of the pipe. If required to prevent pipe movement during testing, additional backfill shall be added leaving the pipe joints uncovered to permit inspection.

D. Exfiltration Test
   1. Each section of sewer line between successive manholes shall be tested by closing the lower end of the sewer to be tested and the inlet sewer of the upper manhole, using stoppers.
   2. Fill the manhole and pipe with water to a point which produces a maximum of 3 feet of head above the invert of the sewer at the center of the upper manhole; or if groundwater is present, 3 feet of head above the average adjacent groundwater level.
   3. The allowable leakage shall be 200 gal/inch of pipe diameter/mile/day

E. Infiltration Test
   1. If excessive ground water is encountered in the construction of a section of the sewer, the exfiltration test shall not be used.
   2. The upper and lower ends of the sewer to be tested shall be closed sufficiently to prevent the entrance of water.
   3. Pumping of ground water shall be discontinued for at least 3 days; then infiltration shall be tested.
   4. Infiltration into each section of sewer between adjoining manholes shall not exceed that allowed for the exfiltration test, except that head conditions shall be a maximum of 6 feet.

F. The Exfiltration Test may be limited to the manholes only when the authority having jurisdiction does not require the test and the construction manager waives the test. The Infiltration Test will always be required when excessive ground water is encountered in addition to the air test.

G. Air Test: Gravity systems shall be air tested between manholes at 3.5 psi for 5 minutes per ASTM F1417 for plastic pipes.

H. Deflection Test:
   1. Deflection tests shall be conducted on all plastic pipe using a mandrel with a diameter equal to 95 percent of the inside diameter of the pipe. The test shall be performed without mechanical pulling devices.

2. Allowable Deflection: Maximum allowable pipe deflection shall not exceed 5 percent of nominal inside diameter.
3. Mandrel: Mandrel, go/no-go, device shall be cylindrical in shape and constructed with either 9 or 16 evenly spaced arms or prongs. Mandrels with fewer arms will be rejected as not sufficiently accurate. Contact length of mandrel's arms shall equal or exceed nominal inside diameter of sewer to be inspected. Critical mandrel dimensions shall carry tolerance of 0.01-inch maximum. Contractor shall provide mandrel and necessary equipment for mandrel test.
4. Procedure: Mandrel shall be hand-pulled through flexible pipe sewer lines no earlier than 30 days after trench has been completely backfilled. Sections of sewer not passing mandrel shall be uncovered and rebedded, rerounded, or replaced to satisfaction of Owner or governing agency. Repaired section shall be retested.

I. Hydrostatic Test: Force main piping shall be hydrostatically tested at 150 psi in accordance with AWWA C 600.

J. Provide measuring devices, meters, water, materials, and labor for making the required tests.

K. Tests shall be conducted in the presence of the Construction Manager or his designee. Test data shall be submitted to the Engineer for review and approval.

END OF SECTION

SECTION 02536 (33 3913) - SEWER MANHOLES, FRAMES, AND COVERS

PART 1 - GENERAL

1.1 SUMMARY

1.2 Section Includes:

1. Monolithic concrete, modular precast concrete, masonry, and precast polyethylene manhole assemblies.

1.3 Related Requirements:

1. Section 31 2000 – Earth Moving
2. Section 33 3000 – Sanitary Sewage Systems
3. Section 33 4000 – Storm Drainage Utilities

1.4 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by the basic designation only.

B. ASTM International (ASTM):

1. ASTM A48 - Gray Iron Castings.
2. ASTM C55 - Concrete Building Brick.
3. ASTM C94 - Ready Mixed Concrete.
4. ASTM C478 - Precast Reinforced Concrete Manhole Sections.
5. ASTM C990 - Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants
6. ASTM D1248 - Polyethylene Plastics Molding and Extrusion Materials.
7. ASTM D2412 - Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading.

C. International Masonry Industry All-Weather Council (IMIAC):

1. Recommended Practices and Guide Specification for Cold Weather Masonry Construction.

D. Westchester County Sanitary Code

1.5 SUBMITTALS

A. Shop Drawings: Indicate reference to Construction Drawings of manhole locations, elevations, piping with sizes, locations, and elevations of penetrations.

PART 2 - PRODUCTS

2.1 MANHOLES

A. Cast-In-Place Concrete: Nonreinforced cast in place concrete barrel.

1. Concrete: 3500 psi concrete conforming to ASTM C94.
2. Forms: Steel sheet accurately shaped and fabricated of sufficient strength to form dense watertight walls to true dimensions.

B. Precast Concrete: Reinforced precast concrete barrel.

1. Manhole Sections: ASTM C478.

2. Joints and Joint Sealant: Joint between manhole barrel sections shall conform to ASTM C990 using pre-formed flexible joint sealant.
3. Pipe Connection Sealant: Joint material between manhole barrel and adjoining pipe shall be as shown on the drawings.
4. Construct manholes of precast concrete sections as required by Construction Drawings to size, shape, and depth indicated.

C. Mortar and Grout: Mortar for finishing and sealing shall be Class "C". Honeycombing less than 2-inches deep shall be repaired using Class "D" mortar.

D. Brick Transition Reinforcement: Formed steel 8-gauge wire with galvanized finish.

E. Configuration:
1. Barrel Construction: Concentric with eccentric cone top section.
2. Shape: Cylindrical.
3. Clear Inside Dimensions: 48-inches diameter minimum or as indicated on Construction Drawings.
4. Design Depth: As indicated on Construction Drawings.
5. Clear Lid Opening: 24-inches minimum.
6. Pipe Entry: Provide openings as indicated on Construction Drawings.
7. Main and Lateral Pipes: Neatly cut off main and lateral pipes flush with inside of manhole or inlet where they enter structure walls. Point up irregularities and rough edges with nonshrinking grout.

F. Inverts: Shape inverts for smooth flow across structure floor as indicated on Construction Drawings. Use concrete and mortar to obtain proper grade and contour. Finish surface with fine textured wood float.

2.2 COMPONENTS

A. Lid and Frame:
1. Manufacturer: One of the following or approved equal:
a. Bass & Hays Foundry.
b. Deeter Foundry, Inc.
c. East Jordan Iron Works.
d. Neenah Foundry.
e. U.S. Foundry & Manufacturing
2. ASTM A48, Class 30B minimum, heavy duty cast iron construction, machined flat bearing surface.
3. Removable lid, closed or open as indicated on Construction Drawings, with sealing gasket.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify items specified by other Sections are properly sized and located.

B. Verify that built-in items are in proper location and ready for roughing into work.

C. Verify that the excavation for manholes is correct.

3.2 PREPARATION

A. Coordinate placement of inlet and outlet pipe or duct sleeves as indicated on Construction Drawings.

3.3 PRECAST MANHOLE CONSTRUCTION

A. Place base pad to proper elevation and location and trowel top surface level for placement of manhole barrel.

B. Place manhole barrel plumb and level to correct elevations and anchor to base pad.
   1. After completion of slab foundation, lower first joint of manhole barrel into position, grooved end first, and set level and plumb on concrete base. Align and adjust to proper grade prior to placing and forming invert. Pour invert immediately after setting of first section of manhole barrel.
   2. Prior to setting subsequent manhole barrel sections, apply primer to tongue and groove ends and allow to set in accordance with manufacturer's recommendations. Place joint sealant on tongue end. Lower next section into position, and remove excess material from interior of structure. Add additional material on exterior of joint, if necessary, for completely watertight joint.

C. Set cover frames and lids level without tipping, to correct elevations. Utilize pre-cast rings or brick and mortar to achieve final rim elevation. Maximum limit, 4 courses.

3.4 CAST-IN-PLACE MANHOLE CONSTRUCTION

A. Cast-in-place concrete shall conform to the applicable requirements of concrete in Division 3. Utilize steel forms.

B. Place base pad to proper elevation and location and pour monolithically with invert. Base shall support pipe to first joint.

C. Deposit concrete in evenly distributed layers of about 18 inches, with each layer vibrated to bond to preceding layer.

D. Place gasket between all joints and paint exterior of manhole within 5 inches of the joint with mastic waterproofing.

E. Place precast concrete cone.

F. Set section cover frames and lids level without tipping, to correct elevations. Utilize pre-cast rings or brick and mortar to achieve final rim elevation. Maximum limit, 4 courses.

END OF SECTION

33 4000 STORM DRAINAGE UTILITIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes
1. Storm sewer drainage piping, fittings, and accessories.
2. Storm drainage structures.

1.2 Related Requirements
1. Section 31 2000 – Earth Moving
2. Section 31 2500 – Erosion and Sedimentation Control
3. Section 33 3913 – Sewer Manholes, Frames and Covers

1.3 REFERENCES

A. American Association of State Highway and Transportation Officials (AASHTO)
1. AASHTO M252 - Corrugated Polyethylene Drainage Tubing, 3 to 10 Inch Diameter
2. AASHTO M294 - Corrugated Polyethylene Drainage Tubing, 12 to 60 Inch Diameter
3. AASHTO M198 - Joints for Circular Sewer and Culvert Pipe Using Flexible Watertight Gaskets
4. AASHTO H170 – Reinforced Concrete Culvert, Storm Drain and Sewer Pipe

B. ASTM International (ASTM)
1. ASTM A74 - Cast Iron Soil Pipe and Fittings
2. ASTM A185 - Steel welded Wire Fabric, Plain, for Concrete Reinforcement
3. ASTM A615 - Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
4. .
5. ASTM A796 - Structural Design Of Corrugated Steel Pipe, Pipe-Arches, And Arches For Storm And Sanitary Sewers And Other Buried Applications.
6. ASTM A798 - Factory-Made Corrugated Steel Pipe For Sewers And Other Applications.
7. ASTM C76 - Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
8. ASTM C150 - Portland Cement
9. ASTM C206 - Finished Hydrated Lime
10. ASTM C443 - Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets
11. ASTM C564 - Rubber Gasket for Cast Iron Soil Pipe and Fittings
12. ASTM C969 - Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines
13. ASTM D3034 - Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings
14. ASTM D3212 - Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
15. ASTM F477 - Elastomeric Seals (Gaskets) for Joining Plastic Pipe
16. ASTM F949 – Poly (Vinyl Chloride)(PVC) Corrugated Sewer Pipe with Smooth Interior and Fittings

C. American Concrete Institute (ACI)
1. ACI 301 - Structural Concrete for Buildings

1.4 SUBMITTALS

A. Product Data: Provide data on pipe materials, pipe fittings, and accessories. Provide shop drawings for precast inlets, catch basins, and junction boxes.

B. Manufacturer's Certificate: Certify that products meet or exceed specified local requirements.

C. Project Record Documents:
1. Accurately record actual locations of pipe runs, connections, catch basins, cleanouts, and invert elevations.
2. Identify and describe unexpected variations to subsoil conditions and location of uncharted utilities.

1.5 PROJECT CONDITIONS

A. Coordinate work with termination of storm sewer connection outside building including connection to municipal storm sewer system.

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS

A. Reinforced Concrete Pipe (RCP): ASTM C76, Class III unless noted otherwise on Drawings, installed with flexible plastic, bitumen gaskets at joints.
1. Gaskets: AASHTO M198, Type B or ASTM C443, installed in accordance with manufacturer's recommendations.
2. Flared End Sections: ASTM C76 or, for sections with toe wall, AASHTO H170.

B. High Density Polyethylene Pipe (HDPE): AASHTO M252 Type S and M294 Type S, smooth interior/annular exterior. Use only where specifically indicated on Drawings.
1. Pipe Joints and fittings shall conform to AASHTO M252 and M294. Maximum deflection of pipe joints with ceramic tolerance rings shall be 3%.
2. Acceptable manufacturers: Provide the following or approved equal:
a. ADS 65-WT by Advanced Drainage Systems, Inc.
b. Blueseal by Hancor, Inc.

C. Polyvinyl Chloride (PVC) Pipe: ASTM D3034, rated SDR 35, or ASTM F949 for Profile Pipe, continually marked with manufacturer's name, pipe size, cell classification, SDR rating, and ASTM D3034 classification. Only permitted when specifically indicated on Drawings.
1. Pipe joints: ASTM D3212 using restrained gasket conforming to ASTM F477.

2.2 DRAINAGE STRUCTURES

A. Manholes: Cast-In-Place Concrete: Nonreinforced cast in place concrete barrel.
1. Concrete: 3500 psi concrete conforming to Section 03300.
2. Forms: Steel sheet accurately shaped and fabricated of sufficient strength to form dense watertight walls to true dimensions.

B. Precast Concrete: Reinforced precast concrete barrel.
1. Manhole sections conforming to ASTM C 478 with gaskets in accordance with ASTM C 923.
2. Construct manholes of precast concrete sections as required by Construction Drawings to size, shape, and depth indicated.
3.

C. Mortar and Grout: Mortar for finishing and sealing shall be Class "C". Honeycombing less than 2-inches deep shall be repaired using Class "D" mortar.

D. Brick Transition Reinforcement: Formed steel 8-gauge wire with galvanized finish.

E. Configuration:
1. Barrel Construction: Concentric with eccentric cone top section.
2. Shape: Cylindrical
3. Clear Inside Dimensions: 48-inches diameter minimum or as indicated on Construction Drawings.

4. Design Depth: As indicated on Construction Drawings.
5. Clear Lid Opening: 22-inches minimum
6. Pipe Entry: Provide openings as indicated on Construction Drawings
7. Main and Lateral Pipes: Neatly cut off main and lateral pipes flush with inside of manhole or inlet where they enter structure walls. Point up irregularities and rough edges with nonshrinking grout.

F. Inverts: Shape inverts for smooth flow across structure floor as indicated on Construction Drawings. Use concrete and mortar to obtain proper grade and contour. Finish surface with fine textured wood float

G. Grates and Frame: Provide in accordance with details shown on Drawings.
1. Provide heavy duty grates, with maximum slot width of 1-1/8”
2. Acceptable Manufacturers:
   a. Neenah Foundry.
   b. East Jordan Iron Works.
   c. Bass & Hays Foundry.

H. Cast-In-Place concrete for drainage structures including manholes, inlets, catch basins, collars, support blocks, headwalls and paved ditches shall conform to ACI 301.
1. Compressive Strength: 3500 psi at 28 days.
2. Reinforcement: ASTM A615, grade 40 or 60 deformed reinforcing bars, and ASTM A185 for wire fabric

I. Cement Mortar used for paving inverts, filling lift holes, joints, patching and anchoring castings shall consist of one part Portland cement, type I, ASTM C150, 1/4 part hydrated lime, ASTM C206 and 2-1/2 parts clean, well-graded sand and water free of suspended matter, alkali, and containing no industrial or domestic waste.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that trench cut and excavation is ready to receive work and excavations, dimensions, and elevations are as indicated on Drawings.

3.2 PREPARATION

A. Hand trim excavations to required elevations. Correct over-excavation with bedding material.

B. Remove large stones or other hard matter that could damage piping or impede consistent backfilling or compaction.

C. Protect benchmarks, property corners, and other survey monuments from damage or displacement. If marker needs to be removed it shall be referenced by licensed land surveyor and replaced, as necessary, by same.

3.3 INSTALLATION - PIPE

A. The pipe shall be inspected for defects and cracks before being lowered into the trench, piece by piece. Any defective, damaged or unsound pipe or any pipe that has had its grade disturbed after laying shall be taken up and replaced. Open ends shall be protected with a stopper to prevent earth or other material from entering the pipe during construction. The interior of the pipe shall be free from dirt, excess water and other foreign materials as the pipe laying progresses and left clean at the completion of the installation.

B. Excavate pipe trench and place bedding material in accordance with Section 31 2000.

C. Install pipe in accordance with manufacturer;s written recommendations.

D. HDPE Pipe: Pipe shall be installed in accordance with pipe manufacturer's installation Guidelines for Culvert Storm Drainage Applications.

E. Installation shall commence at the lowest point for each segment of the route. RCP shall be laid with the groove or bell end upstream.

F. Lay pipe to the required line and slope gradients with the necessary fittings, bends, manhole, risers and other appurtenances placed at the required location as noted on Drawings.

G. Do not displace or damage pipe when compacting.

H. No pipe shall be laid in water or when trench conditions are unsuitable for such work.

I. Joints:
1. Joints shall be constructed as described herein and in accordance with manufacturer's installation instructions for soiltight joints.
2. For RCP, the joint surface shall be cleaned and washed with water, if necessary, before the joints are made. For tongue and groove joints in smaller sizes, make joints butting the inside of the bell with a cement mortar before joining. The inside joint shall be wiped clean of excess mortar by brush or a squeegee drawn through the pipe as the laying operations progress. In the lager diameters, which permit the entry of a man, annular space between pipe sections shall be completely filled with mortar and finished off smooth with the inside surface of the pipe.
3. PVC fittings shall be attached to the pipe by solvent welding according to the manufacturer's recommendations.

3.4 INSTALLATION – MANHOLES, CATCH BASINS, INLETS, AND JUNCTION BOXES

A. Drainage structures shall be constructed in accordance with details shown on Drawings.

B. Precast Sections:
1. Precast section with bases shall be installed in accordance with Section 31 2000 or as shown on drawings.
2. Pipe openings shall be aligned to that of the pipe entering and leaving the manhole, etc. Pipe shall be properly aligned with connections to manholes, etc. as shown on the drawings.

C. Cast-In-Place sections shall be as shown on the drawings.
1. Form bottom of excavation clean and smooth to correct elevation.
2. Form and place cast-in-place concrete base pad, with provision for storm sewer pipe to be placed at proper elevation.
3. Form and place cast-in-place concrete walls, sleeved at proper elevation to receive storm sewer pipe in accordance with details shown on Drawings.

D. Invert channels shall be smooth and accurately shaped to a semicircular bottom conforming to the inside of the adjacent sewer section. Invert channels and structure bottoms shall be shaped with cement mortar. Changes in size and grade of invert shall be made gradually and evenly. Changes in direction of the sewer entering branch or branches shall have a true curve of as large a radius as the manhole will permit.

E. Frames and Covers:
1. Frames and covers shall be set to the proper elevation. The frames shall be firmly embedded in mortar approximately 1 inch thick and aligned to fit the top section of the structure.
2. Bricks set in mortar used to adjust the frame to finished grade shall be limited to no more than four courses.
3. Adjustment rings used to make adjustments in grade shall be made with the initial ring embedded in mortar and the exterior of the rings parged with mortar not less than 1/2 inch thick. No adjustment made in this manner shall exceed 8 inches.

F. Concrete cradles shall be constructed as shown on the drawings and as needed when crossing over and under sewer pipe or utility lines. Concrete shall be 3000 psi mix with a minimum thickness of 6 inches.

3.5 INSPECTION AND TESTING

A. General:
1. Strom sewer systems and culverts, upon completion or at such time as directed, shall be cleaned, inspected and tested. The system or culvert shall have a true grade and line. Actual elevations shall be within 0.08 feet of the elevations given on the drawings.
2. After completion of the Work, or any part thereof, the job shall be tested to determine that it has been installed in accordance with the drawings and specifications. In general, the Work shall prove to be in good condition, installed in accordance with the drawings and specifications and ready for use.

B. Cleaning and Testing: Visibly inspect and remove all debris and obstructions from storm pipe. Test for infiltration and exfiltration by hydrostatic testing per ASTM C969. Manholes and pipe shall conform to ASTM C969 leakage criteria.

C. Alignment Test: After backfill has been placed and compacted to a depth not less than one foot above top of pipe, a visual inspection shall be made by flashing a light between manholes. Any displacement or misalignment of invert shall be corrected.

END OF SECTION

33 5000 - NATURAL AND PROPANE GAS DISTRIBUTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Pipe and fittings for site utility natural or propane gas distribution.
2. Propane storage tanks and appurtenances. All work shall be in accordance with Weber Energy Fuels specifications and these site work specifications. In the event of a discrepancy between the two documents. The more stringent shall apply.

B. Related Requirements:
1. Section 31 2000 – Earth Moving

1.2 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by the basic designation only.

B. American Society of Mechanical Engineers (ASME):
1. ASME B16.3 - Malleable Iron Threaded Fittings
2. ASME B16.11 -Forged Steel Fittings, Socket Welding and Threaded
3. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings
4. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
5. ASME B31.8 - Gas Transmission and Distribution Piping Systems
6. ASME S00081 – Boiler and Pressure Vessel Code, Sec VIII: Pressure Vessels
7. ASME Q00090 - Boiler and Pressure Vessel Code, Sec. IX: Welding and Brazing Qualifications
8. ASME Boiler and Pressure Code

C. ASTM International (ASTM):
1. ASTM A53 - Pipe, Steel, Black and Hot-Dipped, Zinc Coated (Galvanized) Welded and Seamless
2. ASTM A234 - Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperature
3. ASTM B32 - Solder Metal
4. ASTM B88 - Seamless Copper Water Tube
5. ASTM D2513 - Thermoplastic Gas Pressure Pipe, Tubing, and Fittings
6. ASTM D2517 - Reinforced Epoxy Resin Gas Pressure Pipe and Fittings
7. ASTM D2683 - Socket-Type Polyethylene Fittings For Outside Diameter-Controlled Polyethylene Pipe and Tubing
8. ASTM D 3261 - Butt Heat Fusion Polyethylene (PE) Plastic Polyethylene (PE) Plastic Pipe And Tubing

D. American Welding Society (AWS):
1. AWS A5.8 - Brazing Filler Metal

E. American Water Works Association (AWWA):
1. AWWA C105 - Polyethylene Encasement for Ductile-Iron Piping for Water and Other Liquids

F. American National Standards Institute (ANSI):
1. ANSI B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes
2. ANSI B31.2 - Fuel Gas Piping

G. National Fire Protection Agency (NFPA):
1. NFPA 54 - National Fuel Gas Code

H. Weber Energy Fuels specifications.

1.3 QUALITY ASSURANCE

A. Perform installation in accordance with utility company requirements.

B. Gas Cock: Manufacturer's name and pressure rating marked on valve body.

C. Welding Materials and Procedures: Conform to ASME Boiler and Pressure Vessel Code and applicable state regulations.

D. Welders Certification: In accordance with ASME Q00090, Sec IX.

E. Conform to NFPA 54, ANSI B31.2, or ASME B31.8.

1.4 SUBMITTALS

A. Project Record Documents:
1. Accurately record actual locations of pipe mains, valves, connections, and top of pipe elevations.
2. Identify and describe unexpected variations to subsoil conditions and location of uncharted utilities.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect, and handle products to be included.

B. Deliver and store valves in shipping containers with labeling in place.

PART 2 - PRODUCTS

2.1 PIPE

A. Steel Pipe:
1. Below Ground: ASTM A53, Schedule 40, type E or S, grade B, black:
a. Fittings: ASME B16.11, forged steel, or ASTM A234 forged steel welding type.
b. Joints: Welded and seamless.
c. Jackets: AWWA C105 polyethylene jacket, double layer, half lapped, 10-mil polyethylene tape.
2. Above Ground: ASTM A53, Schedule 40, type E or S, grade B, black:
a. Fittings: ASME B16.3, malleable iron, ASME B16.11, forged steel, or ASTM A234, forged steel welding type.
b. Joints: Threaded.

B. Copper Tubing (Propane Piping):
1. Below ground: ASTM B88, Type K, internally tinned:
a. Fittings: ASME B16.18, cast copper, or ASME B16.22, wrought copper; internally tinned.
b. Joint: AWS A5.8 BCuP silver brazed.
2. Above ground: ASTM B88, Type K, L or ASTM B75, Type GP; internally tinned:
a. Fittings: ASME B16.18 cast copper, ASME B 16.22, wrought copper, or ANSI B16.26, cast copper, internally tinned.
b. Joint: ASTM B32, Solder, Grade 95TA or AWS A5.8, Bcup silver brazed.

C. Polyethylene Pipe (below ground only): ASTM D-2513, SDR 11.5.
   1. PE Fittings: ASTM D 2683, socket type or ASTM D 3261, butt type with dimensions matching ASTM D 2513, SDR 11, PE pipe.
   2. Joints: Mechanical or Compression fit.

D. Reinforced Epoxy Resin Piping: ASTM D2517.
   1. Fittings: ASTM D2517.
   2. Joints: Bell and spigot with epoxy resin.

2.2 GAS COCKS

A. 2 Inches and Smaller: 150 psig WOG, bronze body, bronze tapered plug, non-lubricated, Teflon packing, threaded ends with cast iron curb box, cover, and key.

B. Larger than 2 inches: 125 psig WOG, Steel or Cast iron body and tapered plug, non-lubricated, Teflon packing, threaded ends, with cast iron curb box, cover, and key.

C. For Applications with Line Pressure Greater than 60 psig: Over 2 Inches: Cast iron body and plug, pressure lubricated, Teflon packing, flanged ends, with cast iron curb box, cover, and key.

2.3 PRESSURE REGULATING VALVES

A. Single stage, malleable iron body, corrosion-resistant, pressure regulator with atmospheric vent, elevation compensator; with threaded ends for 2 inches and smaller or flanged ends for larger than 2 inches. Install earthquake actuated automatic shutoff valve, if required by local code or utility.

B. Capacity: For inlet and outlet gas pressures, specific gravity, and flow rate indicated.

2.4 PROPANE STORAGE TANKS

A. Construction: Closed, welded steel, tested and stamped in accordance with ASME S00081, Sec VIII; minimum 250 psig rating; cleaned, prime coated, and painted with 2 coats of silver anti-rust paint, and supplied with steel support saddles, pressure gage, tapping for installation of piping and accessories.

B. Vaporizer: 1,000 watts, heating cable bedded in 1-inch of glass fiber insulation and covered by flexible stainless steel plate, with thermostat in weatherproof box set to turn on at -13 degrees Fahrenheit with manual off-on switch.

C. Capacity: Diameter and length as shown on Construction Drawings.

2.5 TRACE WIRE

A. Magnetic detectable conductor, brightly colored plastic covering, imprinted with "Natural Gas Service" in large letters.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify existing conditions.

B. Verify that building service connection and utility gas main size, location, and depth are as indicated on Construction Drawings.

3.2 PREPARATION

A. Ream pipe ends and remove burrs. Bevel plain end ferrous pipe over 2-inches diameter or thread ferrous pipe 2-inches diameter and under.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections with flanges or threading and unions.

D. Comply with NFPA 54 on installation of gas lines.

3.3 BEDDING

A. Excavate pipe trench and place bedding material in accordance with Section 31 2000 Earth Moving.

3.4 INSTALLATION - PIPING

A. Maintain a minimum of 12 inches separation of gas line from sewer, water, or storm water piping in accordance with state or local code.

B. Install piping to conserve space and not interfere with use of site space.

C. Install piping to allow for expansion and contraction without stressing pipe or joints.

D. Install cocks and other fittings as required.

E. Establish elevations of buried piping in accordance with Section 31 2000 Earth Moving.

F. Wrap couplings and fittings of steel pipe with polyethylene tape and heat shrink over pipe in accordance with AWWA C105.

G. Install trace wire continuous over top of pipe for nonmetallic pipe.

H. Backfill trench in accordance with Section 31 2000 Earth Moving.

I. Center and plumb valve box over valve. Set box cover flush with finished ground surface. Prevent shock or stress from being transmitted through valve box to valve.

J. Wrap valve and valve box with polyethylene tape and heat shrink or paint valves and valve boxes with red anti-rust primer and 1 coat of epoxy paint.

3.5 SERVICE CONNECTIONS

A. Provide sleeve in foundation wall for gas service main. Caulk enlarged sleeve watertight.

B. Anchor service main to interior surface of foundation wall.

C. Install service regulator adjacent to building wall in specified location.

D. Install service regulator and riser pipe to prevent undue stress on service pipe. For plastic service pipe, use steel pipe riser from below ground to regulator.

E. Provide regulator vent with rain and insect proof opening, terminating not less than 5 feet away from building openings.

3.6 PROPANE TANK INSTALLATION

A. Place tank legs on concrete pad, level within tolerance of 2 inches maximum.

B. Prepare and grade an area outside the tank perimeter, for distance of 6 feet. Grade, place, and compact gravel fill to compacted depth of 3 inches minimum. Compact in accordance with Section 31 2000 Earth Moving.

C. Provide tank with relief valve, shutoff valve, pressure regulator, pressure gauge, and removable protection cover. Install piping, shutoff valve, and pressure gauge to underground piping.

D. Set tank regulator to outlet pressure as indicated on Construction Drawings.

E. Install vaporizer to underside of tank and secure to tank with aluminum tray and two stainless steel straps.

F. Install weatherproof control box for vaporizer 40-inches above ground surface. Install on 4-inch x 4-inch cedar post, driven into ground 40 inches.

G. Install control wire from vaporizer to control box 20 inches below ground surface. Install service wiring 24 inches below ground from control box to building.

END OF SECTION

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-031918,** titled **Café Addition and Renovation**. in strict accordance with the Contract Documents; (b) complete all work necessary for substantial completion within **89** 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 words).

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) Specifications SU-031918.

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:	To the Director of Purchasing at the campus where the project is located.
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 it 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

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 uncontemplated 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 Vice President for Administration 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 www.osc.state.ny.us/epay/index.htm, 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 Vice President or designee 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 Contactor’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) S*uspension 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.

Section on Purchase College Policies

All Purchase College policies must be followed by Contractor while on the Purchase College grounds and in providing the goods and/or services of this contract to Purchase College.

The Purchase College policies include:
(1) Domestic Violence in the Workplace policy
(2) Nondiscrimination policy
(3) Policy on Sexual Harassment
(4) Regulations for a Drug Free Environment and Information on Counseling and Treatment
(5) Tobacco Free Policy
(6) Title IX of the Education Amendments

The full text of the above listed Purchase College policies can be accessed at:
https://www.purchase.edu/offices/purchasing/policies/

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 if 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

The parties to the attached contract, license, lease, amendment or other agreement of any kind (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 exami-

nation, 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 subcontactor, 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.newnycontracts.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.ogs.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, Dominican, 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 Con- tractor 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 _____ percent (_____%) for Certified Minority-Owned Business Enterprises and _____ percent (_____%) 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.

SCHEDULE I

The following Unit Prices shall apply for additional work authorized by Change Order:

UNIT PRICES

Description of Unit Price	Amount of Unit Price
NONE	

ALLOWANCES

NONE

APPENDIX

FOOD SERVICE EQUIPMENT CUT SHEETS

12/20/2017

FINAL
12/20/2017

Project:
CW-0205.4 - SUNY PURCHASE - NORTH CAMPUS

From:

To:

Table of Contents

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

9.09

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 (in.)	Width (mm)	Length (in.)	Length (mm)	Height (in.)	Height (mm)	Approx. Pkg. Wt. (lb.)	Approx. Pkg. Wt. (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

Metro Bow Tie™ Dunnage Racks

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

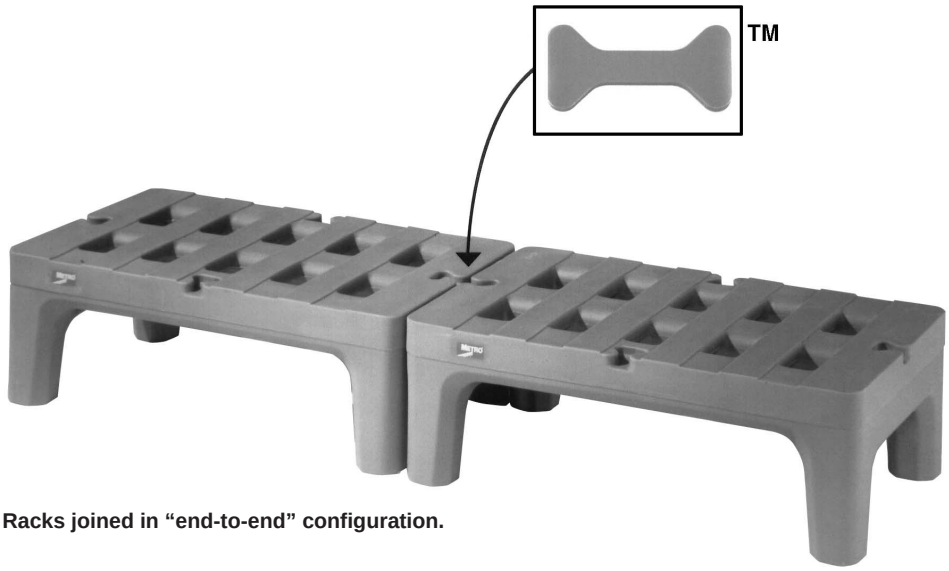
L03-105
Rev. 5/99
Printed in U.S.A.

Item# _____

Job _____

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
www.metro.com

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.

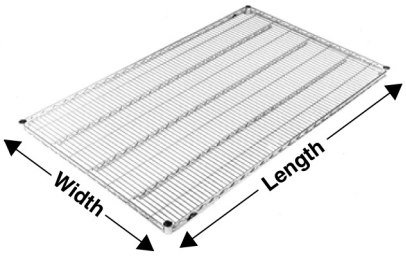
NSF

*MICROBAN® and the MICROBAN® symbol are registered trademarks of the Microban Products Company, Huntersville, NC.

InterMetro Industries Corporation
North Washington Street
Wilkes-Barre, PA 18705
www.metro.com

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	9 1/2	4.3
1448BR	1448NC	1448NK3	1448NS	14x48	355x1219	10 1/2	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	9 1/2	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	14 1/2	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 (in.)	Height (mm)	Approx. Pkd. Wt. (lbs.)	Approx. Pkd. Wt. (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 (in.)	Height (mm)	Approx. Pkd. Wt. (lbs.)	Approx. Pkd. Wt. (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 (in.)	Height (mm)	Approx. Pkd. Wt. (lbs.)	Approx. Pkd. Wt. (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 (in.)	Height (mm)	Approx. Pkd. Wt. (lbs.)	Approx. Pkd. Wt. (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.

10.01

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
North Washington Street, Wilkes-Barre, PA 18705
Phone: 570-825-2741
Fax: 570-825-2852

L02-006
Printed in U.S.A. Rev. 11/08

For Product Information:
U.S. and Canada: 1.800.433.2232
Latin America: 1.561.333.3824
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.**

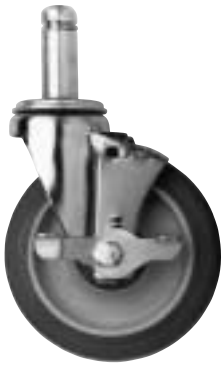
Note: SPECIAL WHEELS — V-groove, Conductive, Steel and Phenolic — are available on request. For additional information, contact InterMetro Industries Corporation or your InterMetro representative.

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

InterMetro Industries Corporation
North Washington Street
Wilkes-Barre, PA 18705
www.metro.com

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 3/32" ± 1/16" (155 ± 1.5mm).
NOTE 4: Load Height for 4LD caster — 4 5/8" ± 1/16" (118 ± 1.5mm).
NOTE 5: Load Height for 5LD caster — 5 5/8" ± 1/16" (143 ± 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 3/32" ± 1/16" (155 ± 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

L02-041
Rev. 9/00
Printed in U.S.A.

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

Item No.: _____
Project No.: _____
S.I.S. No.: _____

Worktables with Flat Top and Stainless Steel Base with Undershelf—Spec-Master® Series

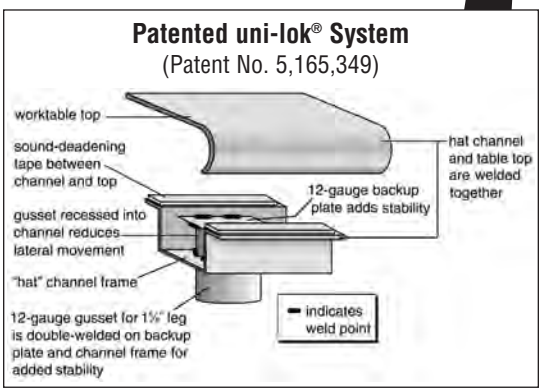
Short Form Specifications

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 1⅝″ O.D., stainless steel, with stainless steel gussets and 1″ stainless steel adjustable bullet feet.

MODELS:

❑ *T2424SE*	❑ *T24144SE*	❑ *T30132SE*	❑ *T36144SE*
❑ *T2430SE*	❑ *T3030SE*	❑ *T30144SE*	❑ *T4848SE*
❑ *T2436SE*	❑ *T3036SE*	❑ *T3648SE*	❑ *T4860SE*
❑ *T2448SE*	❑ *T3048SE*	❑ *T3660SE*	❑ *T4872SE*
❑ *T2460SE*	❑ *T3060SE*	❑ *T3672SE*	❑ *T4884SE*
❑ *T2472SE*	❑ *T3072SE*	❑ *T3684SE*	❑ *T4896SE*
❑ *T2484SE*	❑ *T3084SE*	❑ *T3696SE*	❑ *T48108SE*
❑ *T2496SE*	❑ *T3096SE*	❑ *T36108SE*	❑ *T48120SE*
❑ *T24108SE*	❑ *T30108SE*	❑ *T36120SE*	❑ *T48132SE*
❑ *T24120SE*	❑ *T30120SE*	❑ *T36132SE*	❑ *T48144SE*
❑ *T24132SE*			

worktable with flat top and undershelf



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.
- Guesset welded to each corner.
- Heavy duty marine edge design.

Legs—1⅝″ (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

❑ Drawer
❑ Lock
❑ Casters
❑ Stainless steel bullet feet
❑ Overshelves
❑ Duplex receptacles
❑ Pot rack
❑ Sink
❑ Additional undershelf
❑ Stabilizer Bar (for 30″- and 36″-wide tables)

Certifications / Approvals

NSF

AUTOQUOTES

KCL

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For custom configuration or fabrication needs, contact our **SpecFAB® Division.**
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EG10.41C Rev. 09/15

Spec sheets available for viewing, printing or downloading from our online literature library at *www.eaglegrp.com*

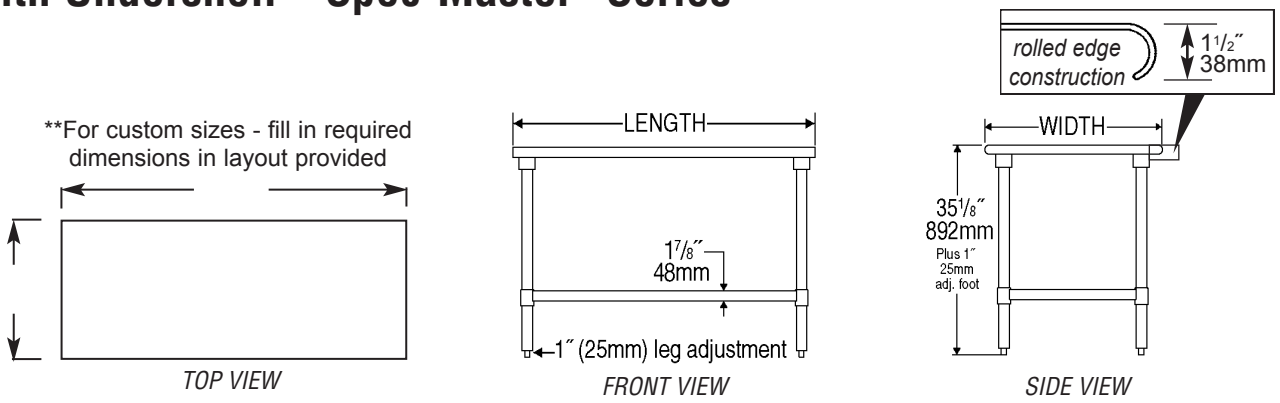
EG10.41C Catalog Specification Sheet No.

Spec-Master® Series Worktables with Flat Top and Stainless Steel Base with Undershelf

EAGLE GROUP®
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 in.	width mm	length in.	length mm	weight lbs.	weight 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	617
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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Rev. 09/15

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Profit from the Eagle Advantage®

Specification Sheet

Item No.: _____
Project No.: _____
S.I.S. No.: _____

Table Accessories

MODELS:

- ❑ *24*GADJUS*
- ❑ *24*SADJUS**
- ❑ *30*GADJUS*
- ❑ *30*SADJUS**
- ❑ *CA*-SB*
- ❑ *PS**
- ❑ *SB-1*
- ❑ *WTSA30*

** See charts for complete model numbers.*

spice bin

stabilizer bars

power strip

zinc casters

worktable with extra undershelf

Spice Bin

- Designed for either overshelf or wall shelf applications.
- 22 gauge stainless steel with fully coved deep-drawn construction.
- Complete with label holders.

	width		length		height*		weight	
model #	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.

	length		number
model #	in.	mm	of outlets
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): *WTSA30*

Casters (NSF) — *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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EG10.59 Rev. 05/11

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EAGLE GROUP®
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Item No.: _____
Project No.: _____
S.I.S. No.: _____

Table Accessories

Casters

set of	caster diameter in.	mm	ZINC WITH RESILIENT TREAD model #	wt. cap. per caster lbs.	kg	ZINC WITH POLY TREAD model #	wt. cap. per caster lbs.	kg	POLY CART WASHABLE WITH POLY TREAD 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 model #	STAINLESS STEEL model #	model #	for table size * width in.	mm	length in.	mm	weight lbs.	kg
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.

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

Rev. 05/11

Spec sheets available for viewing, printing or downloading from our online literature library at *www.eaglegrp.com*

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

BPA FREE

MADE IN THE U.S.A.

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

NSF ETL Intertek AQ 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*

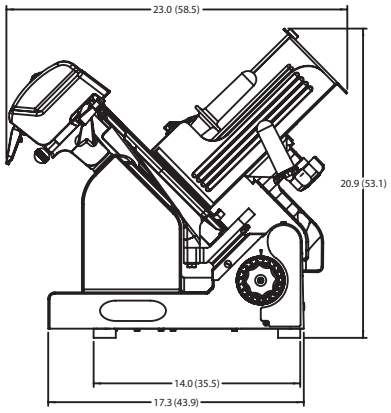
Approved by: _____ Date: _____

GLOBE FOOD EQUIPMENT COMPANY | Globe® Premium Manual Slicers | 3600N / 22060 / 22050

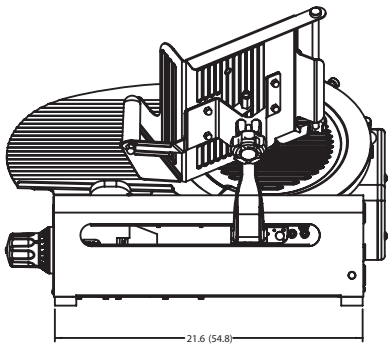
2153 Dryden Rd., Dayton, OH 45439 | 937-299-5493 | 800-347-5423 | Fax: 937-299-4147 | www.globefoodequip.com

Premium Manual Slicers 3600N / 3600N-22060 / 3600N-22050

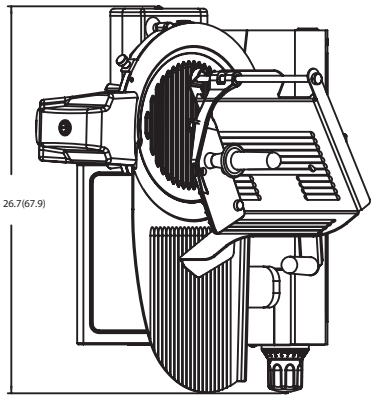
Elevation / Front View



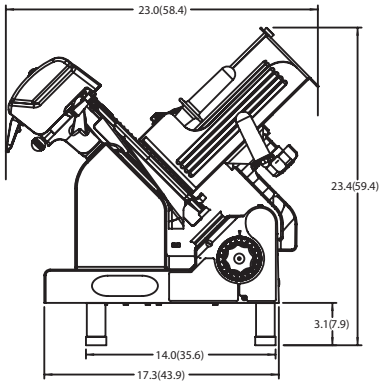
Side View



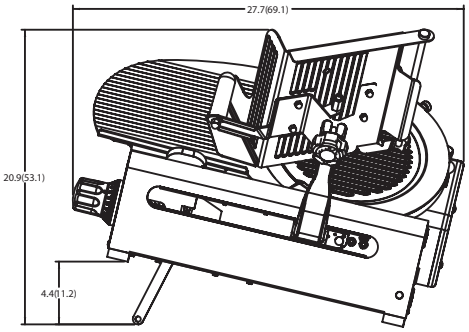
Plan / Top View



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	0 100% Time	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	0 100% Time	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	0 100% Time	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 1⅜" 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

2153 Dryden Rd., Dayton, OH 45439 | 937-299-5493 | 800-347-5423 | Fax: 937-299-4147 | www.globefoodequip.com

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)

EAGLE GROUP
Profit from the Eagle Advantage®
Foodservice Division: (800) 441-8440
MHC/Retail Display Divisions: (800) 637-5100
FAX: (302) 653-2065

Product Announcement

Item #: _____
Model #: _____
Project #: _____
SIS #: _____

EG8127 Rev. 11/12

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.

Slicer **Tables**

with removable pan slides

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

Stationary

width in.	width mm	length in.	length mm	height in.	height mm	weight lbs.	weight kg	model #
31⅛″	791	27⅛″	689	34″	864	95	43.1	***T3030SEM-ST***

Mobile

width in.	width mm	length in.	length mm	height in.	height mm	weight lbs.	weight kg	description of casters	model #
31⅛″	791	27⅛″	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.

For custom configuration or fabrication needs, contact our **SpecFAB® Division.**
Phone: (302) 653-3000. FAX: (302) 653-3091.
E-mail: specfab@eaglegrp.com

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

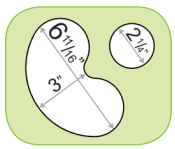
	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1	**120**	**60**	**1**	**Cord & Plug**		**5-15P**	**12**		**1-1/2**		

VEGETABLE PREPARATION MACHINE

robot coupe

CL 50

9 Dicing
3 French Fry Kits



52 DISCS

D	
Number of meals per service	**50 to 400**
Theoretical output per hour*	1100 lbs

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

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 gastronorm 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)

ETL LISTED 9900098 Conforms to UL NSF/ANSI Std 763 Std 8 Certified to CAN/CSA Std C22.2 No.195

* Results may differ depending on the type of the hopper used, the choice of the cut and the setup of the workstation.

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''x 1/4'') 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

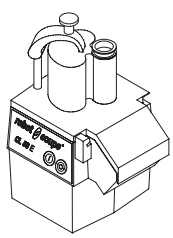
JULIENNE	
1x8 mm tagliatelle (1/32″x5/16″)	28172
1x26 onion/cabbage (1/32″x1 1/4″)	28153
2x2 mm (5/64″ x 5/64″)	28051
2x4 mm (5/64″ x 5/32″)	27072
2x6 mm (5/64″ x 1/4″)	27066
2x8 mm (5/64″ x 5/16″)	27067
2x10 tagliatelle (5/64″x3/8″)	28173
2.5x2.5 mm (1/10″ x 1/10″)	28195
3x3 mm (1/8″ x 1/8″)	28101
4x4 mm (5/32″ x 5/32″)	28052
6x6 mm (1/4″ x 1/4″)	28053
8x8 mm (5/16″ x 5/16″)	28054

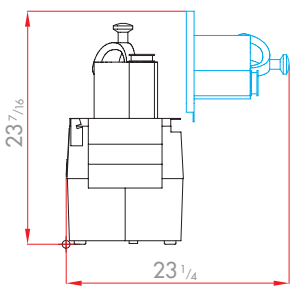
DICING EQUIPMENT	
5x5 mm (3/16″)	28110
8x8 mm (5/16″)	28111
10x10 mm (3/8″)	28112
12x12 mm (15/32″)	28197
14x14x5 mm Mozzarella (9/16''x9/16''x3/16'')	28181
14x14x10mm (9/16''x9/16''x3/8'')	28179
14x14 mm (9/16″)	28113
20x20 mm (25/32″)	28114
25x25 mm (1″)	28115
2″ Lettuce Cut	28180

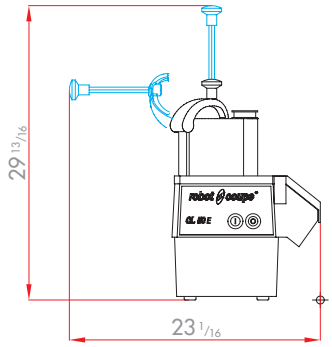
FRENCH FRY EQUIPMENT	
8x8 mm (5/16″ x 5/16″)	28134
8x16 mm (5/16″″x 5/8″)	28159
10x10 mm (3/8″x 3/8″)	28135
10x16 mm (3/8″ x 5/8″)	28158

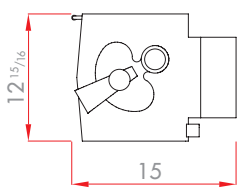
G ELECTRICAL DATA

120V/60/1 - delivered with cord and plug.









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®

Item No.: _____
Project No.: _____
S.I.S. No.: _____

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 ⅝″ radius, and shall have a 14″ water level. Drainboards, when required, shall be "V" creased for positive drainage. 9½″ high backsplash with 1″ upturn and tile edge. Legs to be 1⅝″ O.D., stainless steel, with stainless steel gussets, stainless steel crossbracing and adjustable stainless steel bullet feet.

Spec-Master® FN Series Coved Corner One-Compartment Sinks

MODELS:

❑ ***FN2016-1-**** ❑ ***FN2424-1-****
❑ ***FN2018-1-**** ❑ ***FN2820-1-****
❑ ***FN2020-1-****

** See chart on back for complete model numbers.*

one-compartment FN sink

Options / Accessories

❑ Lever drain
❑ Lever drain with overflow
❑ Twist handle drains
❑ Overflow hole
❑ Sink kits
❑ Faucets
❑ Polyboard sink covers
❑ 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 ½″ (13mm) IPS for hot and cold lines.

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.
- 9½″ high backsplash with 1″ upturn and tile edge.
- 1⅛″ (29mm) faucet holes punched on 8″ (203mm) centers.

Base:

- Legs: 1⅝″ (41mm)-diameter stainless steel tubing with stainless steel gussets and fully adjustable stainless steel bullet feet.
- Crossbracing: Adjustable, 1¼″ (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 ⅝″ (41mm) radius and constructed using state-of-the-art seamless welding techniques.
- Basket-type waste drain fits sink bowl's 3½″ (89mm) opening and features 1½″ (38mm) outlet.

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Certifications / Approvals

NSF

AUTOQUOTES

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For custom configuration or fabrication needs, contact our **SpecFAB® Division.**
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EG20.32 Rev. 04/10

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Item No.: _____
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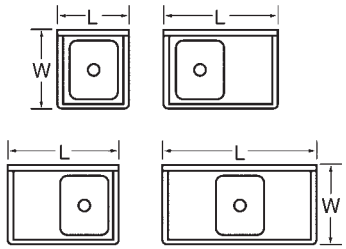
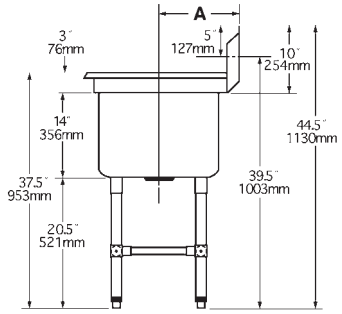
Spec-Master® FN Series Coved Corner One-Compartment Sinks



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 width in.	mm	length in.	mm	DRAINBOARD quantity	length in.	mm	OVERALL DIMENSIONS width in.	mm	length in.	mm	weight 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	37½″	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	43½″	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	49½″	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	55½″	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	39½″	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	45½″	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	51½″	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	57½″	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″	610	27″	686	41½″	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″	457	27″	686	47½″	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	53½″	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	59½″	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	45½″	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	51½″	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	57½″	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	63½″	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	41½″	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	47½″	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	53½″	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	59½″	1511	114	51.7
FN2820-1-36-14/3	28″	711	20″	508	2	36″	914	35″	889	94″	2388	149	67.6

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Specification Sheet

Item No.: _____
Project No.: _____
S.I.S. No.: _____

Sink Accessories/Replacements —Faucets and Prerinse Units

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

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

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Certifications / Approvals
NSF
(fabricated to NSF-applicable standards)

AUTOQUOTES
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Item No.: _____
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S.I.S. No.: _____

Sink Accessories/Replacements—Faucets and Prerinse Units

splash mounted prerinse spray unit

prerinse spray valve assembly

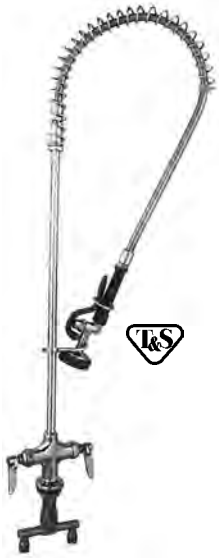
deck mounted prerinse spray unit

wall bracket

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 splash mounted prerinse spray unit



T&S deck mounted prerinse spray unit

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

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Specification Sheet

Item No.: _____
Project No.: _____
S.I.S. No.: _____

Sink Accessories/Replacements —Sink Kits, Miscellaneous

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 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 model #	STAINLESS 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
NSF
(fabricated to NSF-applicable standards)

AUTOQUOTES
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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	anit-siphon vacuum breaker
313834	backflow preventer

lever drain

twist handle drain

Drains

model #	description	MAX. f LOw 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.

control bracket

Control Bracket

Requires custom mounting.

model #	description
309796	3″ x 5″ (76 x 127mm), extra heavy duty

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Rev. 02/13

Submittal Sheet

12/20/2017

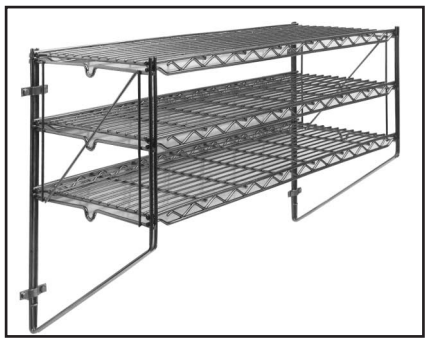
ITEM# 22 - SHELVING, WALL-MOUNTED (2 EA REQ'D)

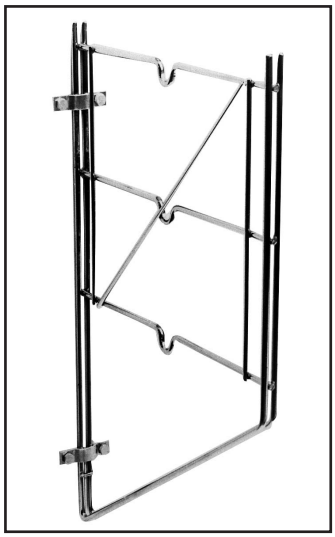
Metro 12WS52C

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

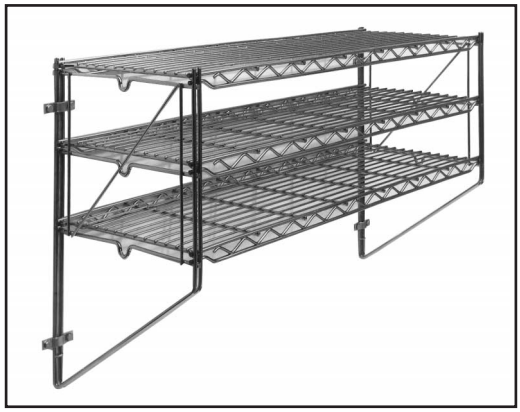
- **Wall Mounts:** Used to create wall-mounted shelving units with 12" or 18" (305 or 460mm) regular Erecta Shelf® shelves of any length. Models are available to accommodate from one to five shelves. Each mount consists of shelf support and mounting brackets. Wall bolts or screws not included; they must be selected according to type of wall. Order shelves from sheet #10.50.

DIMENSIONS:

Width (in.)	Width (mm)	Height (in.)	Height (mm)	Capacity	Cat. No. Chrome	Approx. Pkd. Wt. (Pr.) (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**



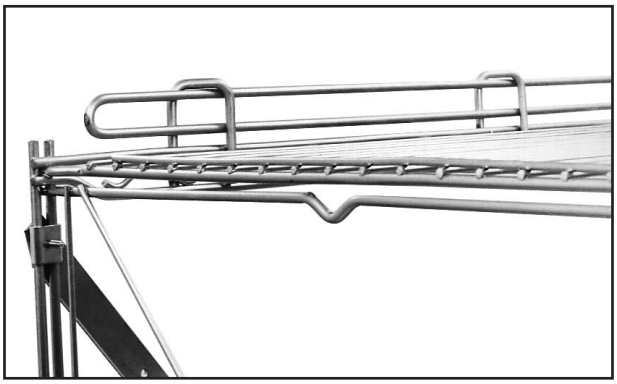
- **Wall Kit:** Kit includes two shelves, shelf supports, and mounting brackets. Wall bolts and screws not included; they must be selected according to type of wall.

Cat. No.	Shelf Length (in.)	Shelf Length (mm)	Overall Length (in.)	Overall Length (mm)	Shelf Width (in.)	Shelf Width (mm)	Overall Width (in.)	Overall Width (mm)	Overall Height (in.)	Overall Height (mm)	Approx. Pkd. Wt (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.

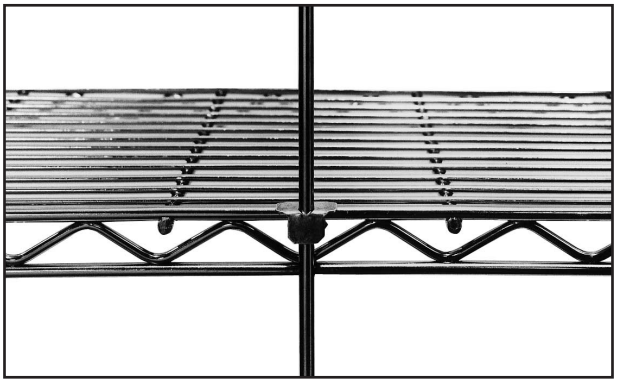
  In many cases a one-inch (25mm) ledge will serve the purpose, while allowing access to the shelf from all sides. When a higher ledge is needed, the four-inch (100mm) size can be used on the back or front of the shelf.

  For enclosure of the entire back of a shelving unit, rods and tabs (below) can be attached.

DIMENSIONS:

1" (25mm) Back Ledges

Length (in.)	Length (mm)	Cat. No. Chrome	Approx. Pkd. Wt Per 1/2 Doz. (lbs.)	Approx. Pkd. Wt Per 1/2 Doz. (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 (in.)	Upright Height (mm)	Rod Length (in.)	Rod Length (mm)	Cat. No.	Approx. Pkd. Wt (lbs.)	Approx. Pkd. Wt (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

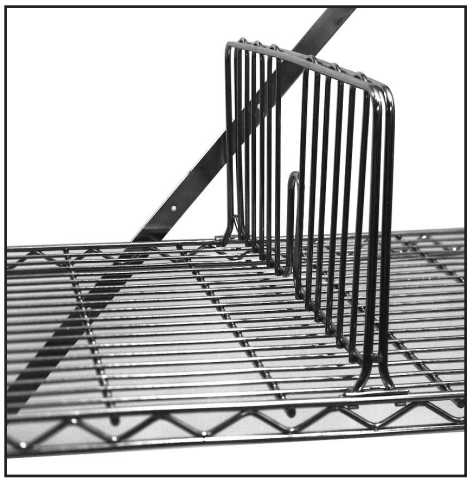
Tabs

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.

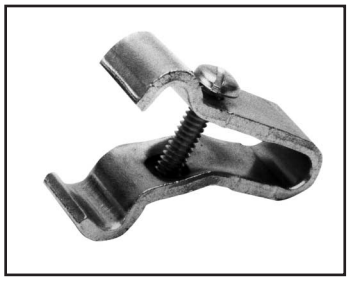
10.56

Job_____

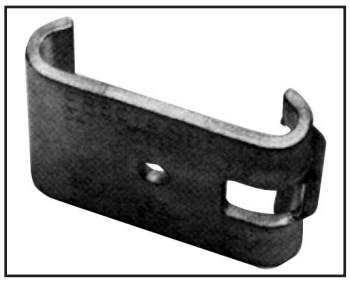
REGULAR ERECTA SHELF®
SHELVING ACCESSORIES

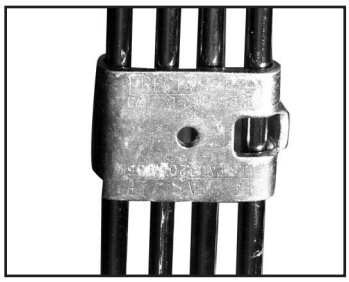
- **Shelf Spacers:** Where shelves are wanted at spacing other than 5" (127mm) increments, shelf spacers wedge into the upright channels to provide a solid support at the desired level. Spacers are used at outside corners, four per shelf.

	Cat. No.
Spacer	9988Z

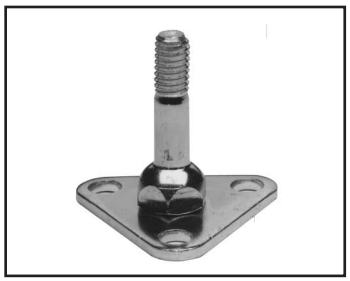


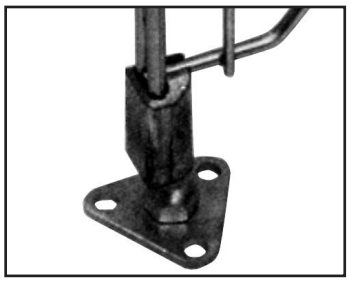
- **Corner Brace:** When regular Erecta Shelf® units are to be joined at right angles, corner braces link shelf ends of one unit to shelf sides of the other, eliminating one upright and leaving the shelving corner open and fully usable. Two required per shelf. **Cat. No 9999Z**





- **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**

REGULAR ERECTA SHELF® **Shelving Accessories**

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

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***

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

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
100 Industrial Boulevard, Clayton, DE 19938-8903 USA
Phone: 302-653-3000 • Fax: 302-653-2065
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Foodservice Division: Phone 800-441-8440
MHC/Retail Display Divisions: Phone 800-637-5100

Certifications / Approvals

NSF

AUTOQUOTES

KCL

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EG20.40 Rev. 02/13

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EAGLE GROUP
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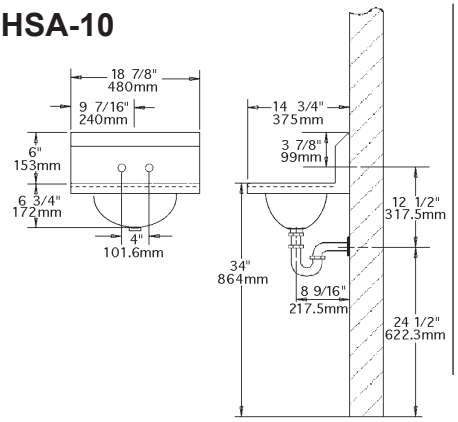
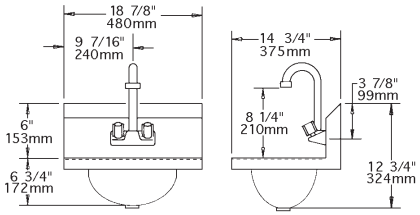
Item No.: _____
Project No.: _____
S.I.S. No.: _____

Traditional Hand Sinks

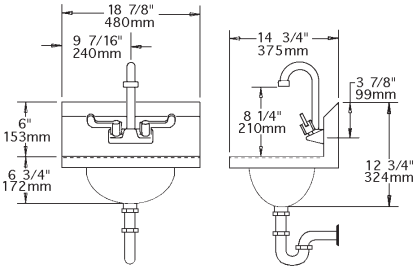
HSA-10



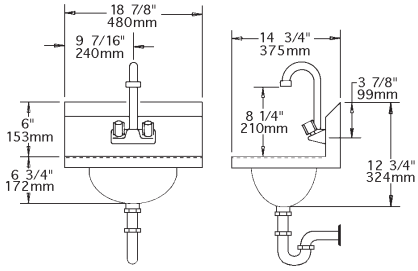
HSA-10-F



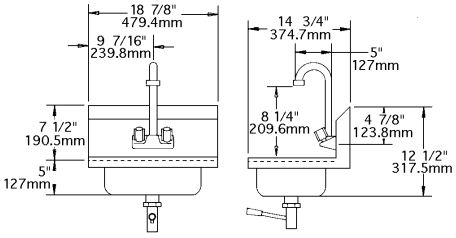
HSA-10-FAW



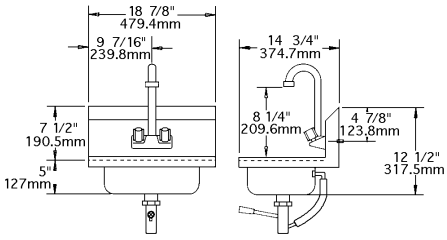
HSA-10-FA



HSA-10-FL



HSA-10-FO



model #	includes	bowl size width x length x depth in.	bowl size mm	overall size width x length x height in.	overall size mm	weight lbs.	weight kg
HSA-10 *	4″ (102mm) centerline faucet holes, basket drain	9¾″ x 13½″ x 6¾″	248 x 343 x 173	14¾″ x 18⅞″ x 12¾″	376 x 480 x 324	10	4.5
HSA-10-F	faucet, basket drain	9¾″ x 13½″ x 6¾″	248 x 343 x 173	14¾″ x 18⅞″ x 12¾″	376 x 480 x 324	12	5.2
HSA-10-FA	faucet, p-trap, tail piece, basket drain	9¾″ x 13½″ x 6¾″	248 x 343 x 173	14¾″ x 18⅞″ x 12¾″	376 x 480 x 324	14	6.4
HSA-10-FAW	faucet w/wrist handles, p-trap, tail piece, basket drain	9¾″ x 13½″ x 6¾″	248 x 343 x 173	14¾″ x 18⅞″ x 12¾″	376 x 480 x 324	14	6.4
HSA-10-FL	faucet, polymer lever drain	10″ x 14″ x 5″	254 x 256 x 127	14¾″ x 18⅞″ x 12½″	376 x 480 x 318	15	6.6
HSA-10-FO	faucet, polymer lever drain w/overflow	10″ x 14″ x 5″	254 x 256 x 127	14¾″ x 18⅞″ x 12½″	376 x 480 x 318	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

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EAGLE GROUP®
Profit from the Eagle Advantage®

Specification Sheet

Item No.: _____
Project No.: _____
S.I.S. No.: _____

Hand Sink Accessories & Options —Faucets & Valves


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˚

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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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℉ maximum output. Maximum pressure of 150 psi. ASSE 1016 and 1070 listed.

model #	description
375612	thermoplastic body, ⅜″ (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. ⅜″ (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	
model #	model #	description
300604	***355994***	foot pedal valve, floor mount
313481	***351738***	knee pedal valve

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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

B-250PF

B-300PF
B-300SF
BD-300PF
BD-300SF

B-500PF
B-500SF
BD-500PF
BD-500SF

B-700PF
B-700SF

B-800PF
B-800SF

B-900PF
B-900SF

CANADIAN ENERGY
PERFORMANCE VERIFIED
RENDEMENT ENERGETIQUE VERIFIE

Features

- **Protected by H-GUARD Plus Antimicrobial Agent** H-GUARD PLUS
- **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

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.

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 ft³	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 ft³	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 ft³	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 ft³	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 ft³	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 ft³	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.

PF/SF Bins

ICE STORAGE BIN SERIES

Ice Machine Model Application

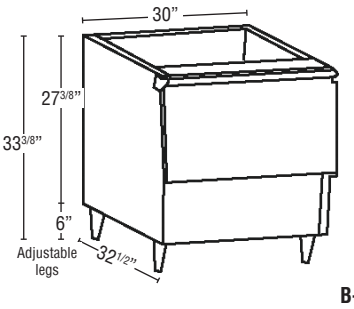
Bins	22" Width KM-340M KM-515M KM-600M KM-650M F-450M F-801M F-1002M	22" Width KMD-410M† KMS-822M† FD-650M-C† FD-1002M-C†	30" Width KM-901M KM-1340M KM-1601M KML Series F-1501M F-2001	30" Width KMD-460M‡ KMD-530M‡ KMD-850M‡ KMD-901MRH KMD-901MWH KMS-1401M* KMS-2000M*	44" Width 2 KM-340M 2 KM-515M 2 KM-600M 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

BD Bins fit 24" - 24 1/2" deep ice machine without Top Kit extension.

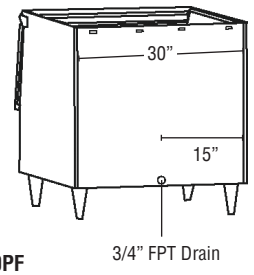
†**BD-300PF/SF:** KMD-410M, KMS-822M, FD-650M-C, FD-1002M-C

‡**BD-500PF/SF:** KMD-460M, KMD-530, KMD-850

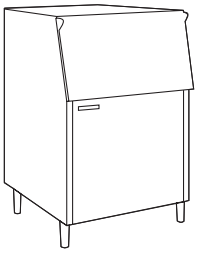
* Any KMS or FD on bin need Top Kit Extension:
- HS-2129 - for use with B-500 bins
- HS-2130 - for use with B-700 bins
- HS-2131 - for use with B-800 bins
- HS-2132 - for use with B-900 bins



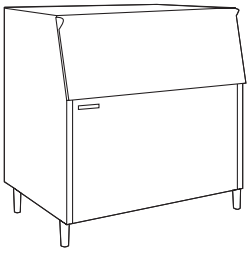
B-250PF



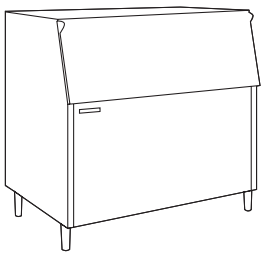
B-300PF/SF
BD-300PF/SF



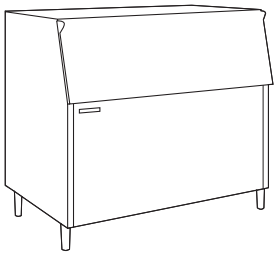
B-500PF/SF
BD-500PF/SF



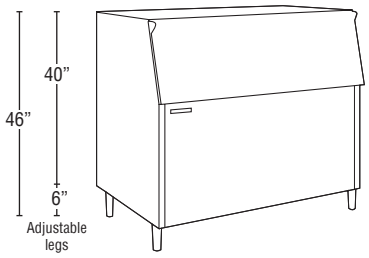
B-700PF/SF



B-800PF/SF

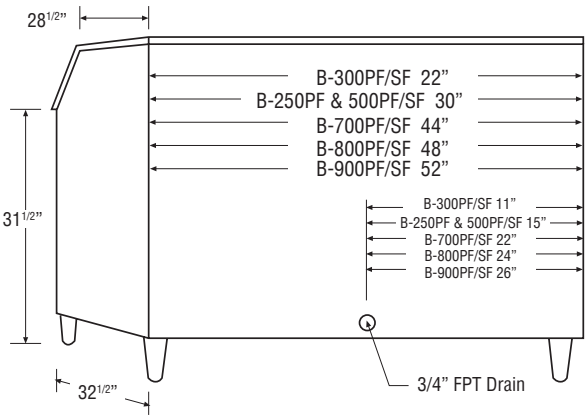


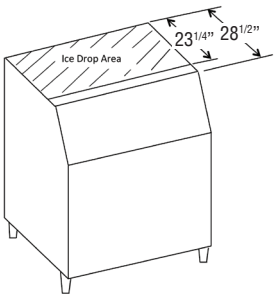
B-900PF/SF



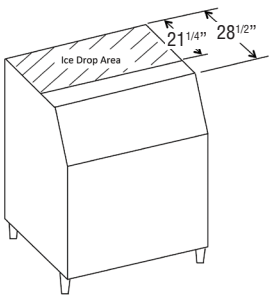
Bin Height

B-300PF/SF
BD-300PF/SF
B-500PF/SF
BD-500PF/SF
B-700PF/SF
B-800PF/SF
B-900PF/SF





B Bins
Top View



BD 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

Item #: _____

Project: _____

Qty: _____

AIA#: _____

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

★ ENERGY STAR

Features

- **Durable stainless steel exterior**
- **Advanced CleanCycle24™ design** (ADVANCED 24 CleanCycle)
- **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.

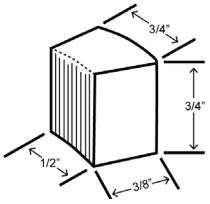
Warranty:

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.

FACTORY WARRANTY
Parts & Labor: 3 YR Entire Machine
Parts: 5 YR Compressor

		ICE PRODUCTION			WATER USAGE		ELECTRICAL						
Condenser	Model	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	Heat Rejection BTU/hr.	Shipping Weight	ENERGY STAR®
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

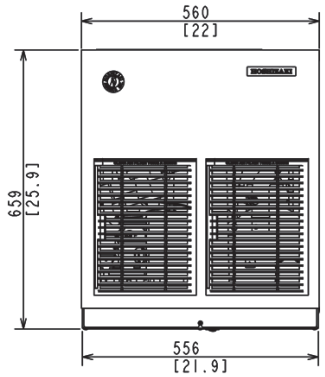
FD-1002M_J-C

Modular Ice Machine
Slim-Line Dispenser Series

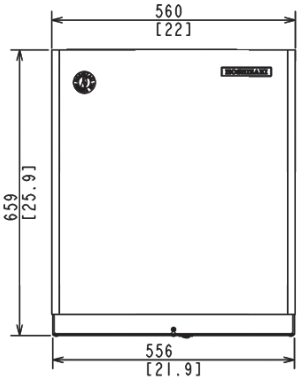
FD-1002M_J-C
08/29/17
Item # 13242

mm
[inch]

FRONT VIEW

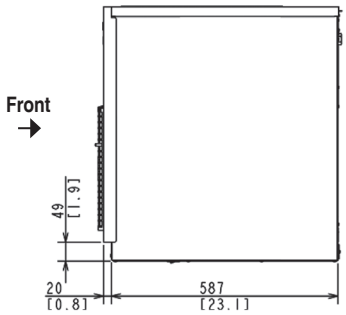


AIR-COOLED

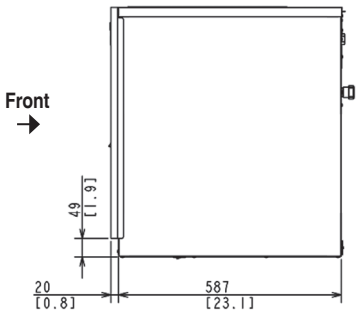


REMOTE AIR-COOLED

SIDE VIEW

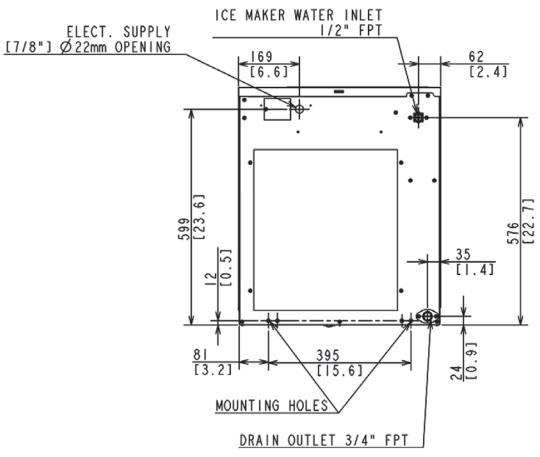


AIR-COOLED

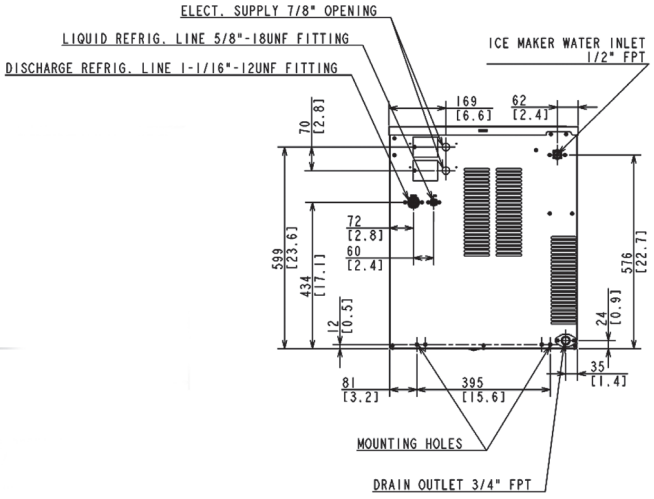


REMOTE AIR-COOLED

REAR VIEW

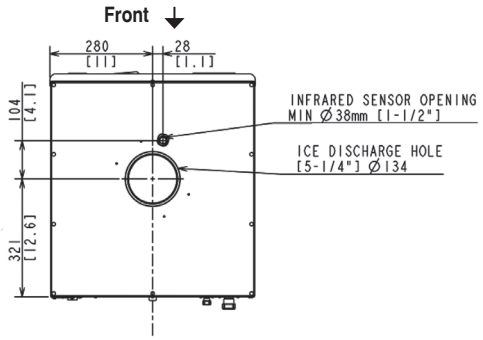


AIR-COOLED



REMOTE AIR-COOLED

BOTTOM VIEW

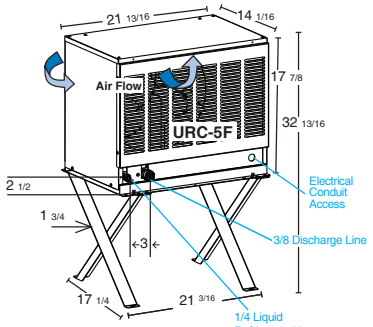


AIR-COOLED
REMOTE AIR-COOLED

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 addtional 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

Item #: _____

Project: _____

Qty: _____

AIA#: _____

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

E-10 PREFILTER
(9795-80)

E-20 PREFILTER
(9795-90)

E-10 PREFILTER (9795-80) Recommended for single configuraton

E-20 PREFILTER (9795-90) Recommended for twin and triple configuraton

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 equiment.

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.

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

NSF

Tray and Dish Cart

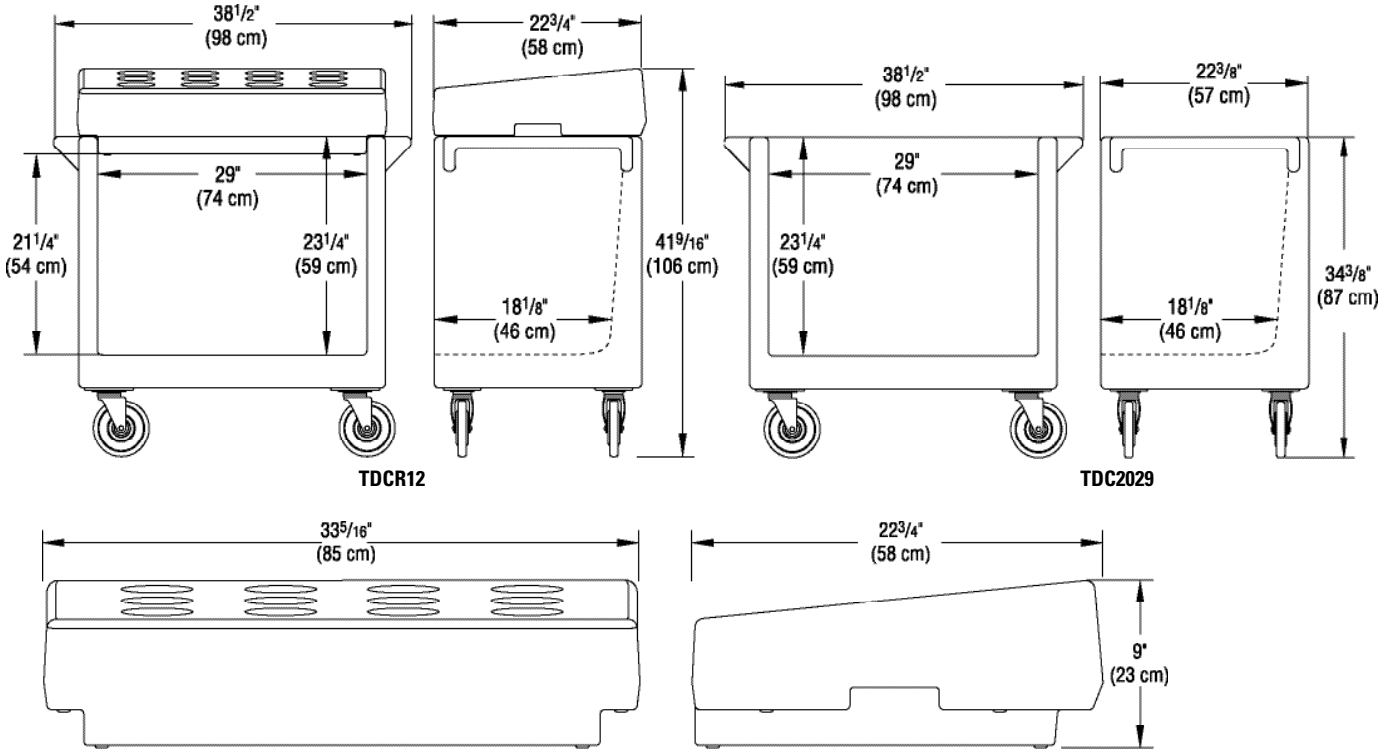
Cart and Cutlery Rack
Model TDCR12
Cart Only
Model TDC2029

Item No. _____

Specifier Identification No. _____

Model No. _____

Quantity _____



CR12 (12-Compartment Cutlery Rack)

Specifications

Dimension Tolerance: +/-¼" (0,64 cm)

Code	Description	Exterior Dimensions W x D x H	Case lbs./cube Kg/m³
TDCR12	Cart & Cutlery Rack Combination	38½" x 22¾" x 41⁹⁄₁₆" (98 x 58 x 106 cm)	88.5 (22.23) 40,5 (0,63)
TDC2029	Cart only	38½" x 22⅜" x 34⅜" (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 33⁵⁄₁₆" x 22¾" 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

NSF

CAMBRO MANUFACTURING COMPANY
http://www.cambro.com

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"	

EAGLE GROUP®

Profit from the Eagle Advantage®

Item No.: _____

Project No.: _____

S.I.S. No.: _____

Specification Sheet

Soiled Dishtables—Straight Design

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 1⅝″ 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)

MODELS:

❑ *SDTL-30-16/4*	❑ *SDTL-60-16/4*	❑ *SDTL-96-16/4*
❑ *SDTL-30-16/3*	❑ *SDTL-60-16/3*	❑ *SDTL-96-16/3*
❑ *SDTL-30-14/3*	❑ *SDTL-60-14/3*	❑ *SDTL-96-14/3*
❑ *SDTR-30-16/4*	❑ *SDTR-60-16/4*	❑ *SDTR-96-16/4*
❑ *SDTR-30-16/3*	❑ *SDTR-60-16/3*	❑ *SDTR-96-16/3*
❑ *SDTR-30-14/3*	❑ *SDTR-60-14/3*	❑ *SDTR-96-14/3*
❑ *SDTL-36-16/4*	❑ *SDTL-72-16/4*	❑ *SDTL-108-16/4*
❑ *SDTL-36-16/3*	❑ *SDTL-72-16/3*	❑ *SDTL-108-16/3*
❑ *SDTL-36-14/3*	❑ *SDTL-72-14/3*	❑ *SDTL-108-14/3*
❑ *SDTR-36-16/4*	❑ *SDTR-72-16/4*	❑ *SDTR-108-16/4*
❑ *SDTR-36-16/3*	❑ *SDTR-72-16/3*	❑ *SDTR-108-16/3*
❑ *SDTR-36-14/3*	❑ *SDTR-72-14/3*	❑ *SDTR-108-14/3*
❑ *SDTL-48-16/4*	❑ *SDTL-84-16/4*	❑ *SDTL-120-16/4*
❑ *SDTL-48-16/3*	❑ *SDTL-84-16/3*	❑ *SDTL-120-16/3*
❑ *SDTL-48-14/3*	❑ *SDTL-84-14/3*	❑ *SDTL-120-14/3*
❑ *SDTR-48-16/4*	❑ *SDTR-84-16/4*	❑ *SDTR-120-16/4*
❑ *SDTR-48-16/3*	❑ *SDTR-84-16/3*	❑ *SDTR-120-16/3*
❑ *SDTR-48-14/3*	❑ *SDTR-84-14/3*	❑ *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.
- 1⅝″ (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**

Options / Accessories

- ❑ Rack slides
- ❑ Scrap basket
- ❑ Scrap basket/ rack slide combo
- ❑ Prerinse unit
- ❑ Faucets
- ❑ Undershelf
- ❑ Stainless steel legs
- ❑ Stainless steel gussets
- ❑ Stainless steel feet

Certifications / Approvals

NSF

AutoQuotes

KCL

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

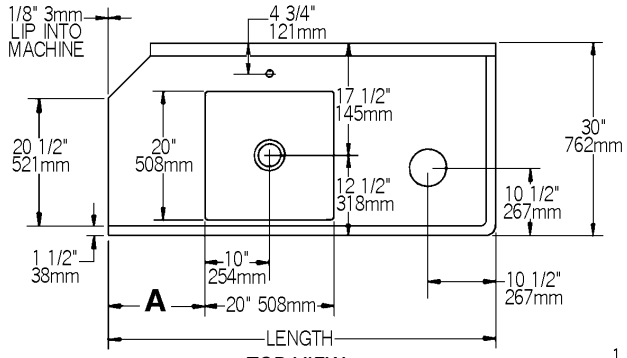
EG50.02 Rev. 11/17

Spec sheets available for viewing, printing or downloading from our online literature library at *www.eaglegrp.com*

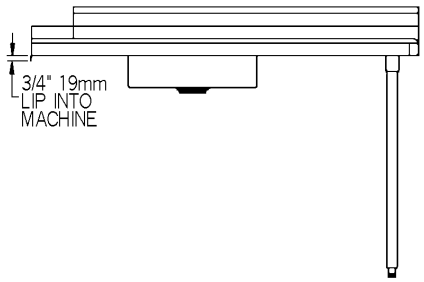
EAGLE GROUP®
Profit from the Eagle Advantage®

Item No.: _____
Project No.: _____
S.I.S. No.: _____

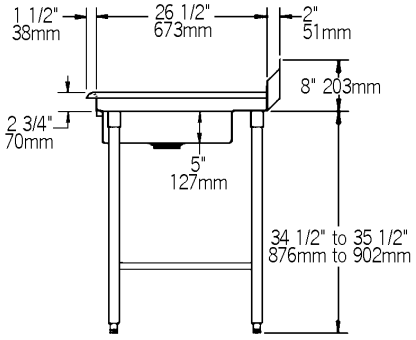
Soiled Dishtables—Straight Design



TOP VIEW



FRONT VIEW



SIDE VIEW

(right-hand model shown)

Dimension A

- ***3½˝*** *– for 30˝ & 36˝ tables L or R, and 48˝ left only.*
- ***15˝*** *– for 48˝ right and 60˝ & 72˝ both L or R.*
- ***23½˝*** *– 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 in.	length mm	weight lbs.	weight 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***

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100 Industrial Boulevard, Clayton, DE 19938-8903 USA
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www.eaglegrp.com

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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 "Ell" 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

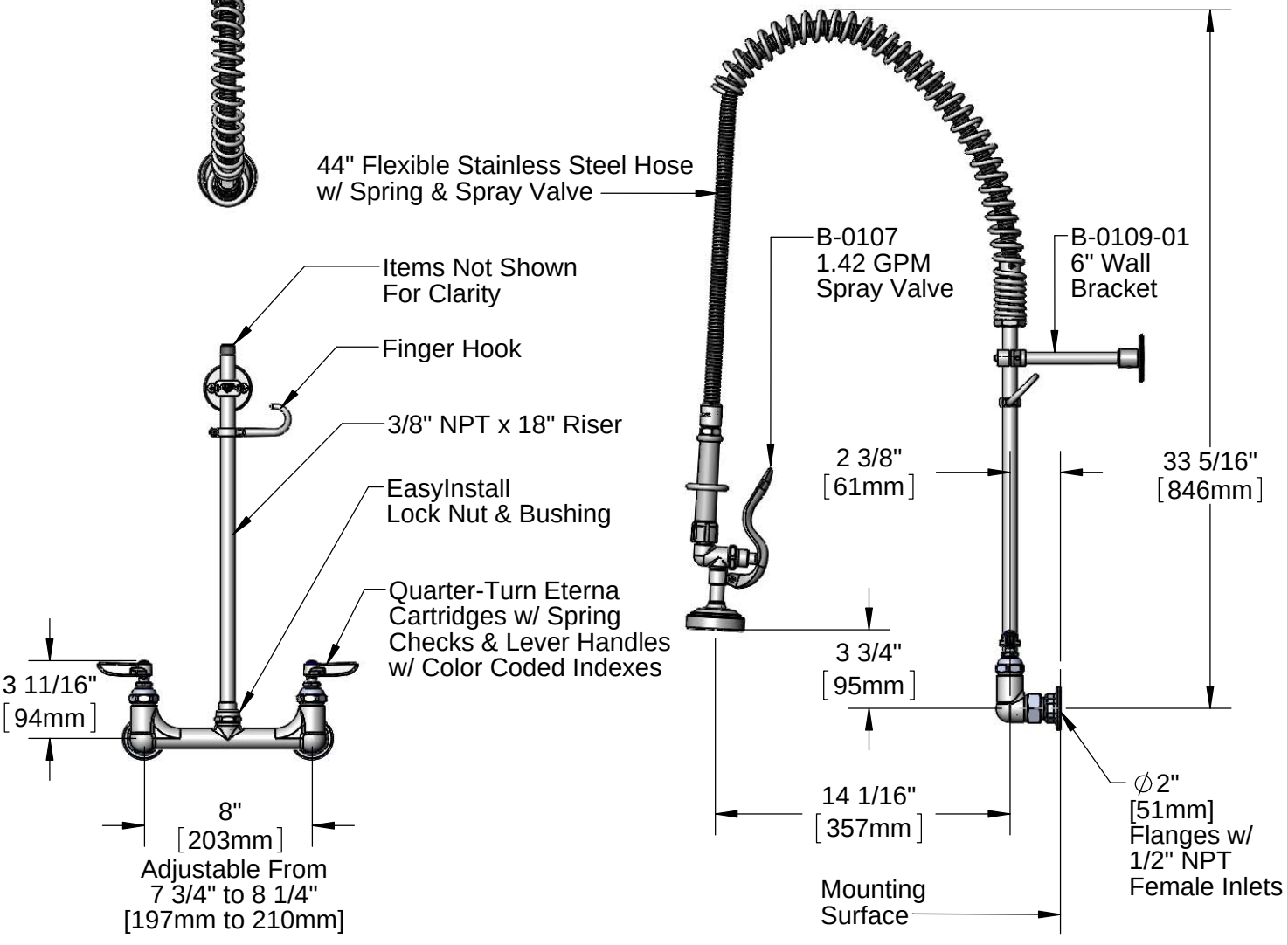
Job Name_____Date_____

Model Specified_____ Quantity_____

Customer/Wholesaler_____

Contractor_____

Architect/Engineer_____



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)
EPAct 2005 (PRSV)

Drawn:	DHL	Checked:	JRM	Approved:	JHB	Date:	08/27/15	Scale:	1:8	Sheet:	1 of 2

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Travelers Rest, SC 29690

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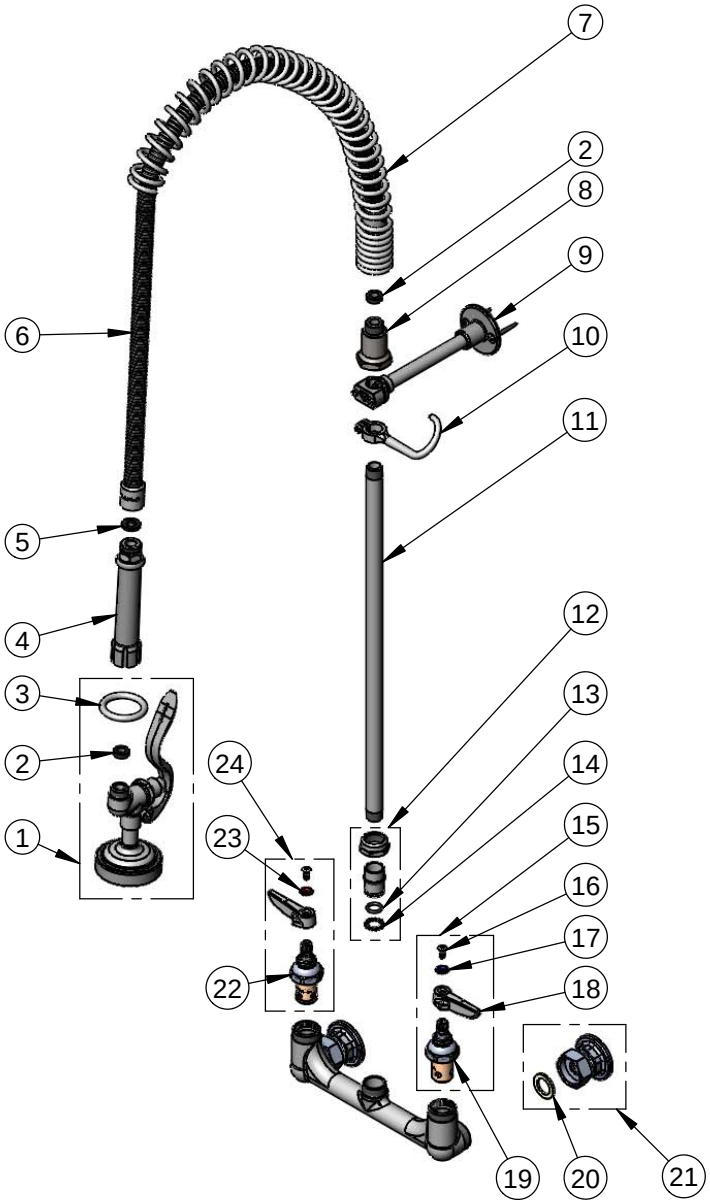
Model No.
B-0133-B

Item No.



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)
EPAct 2005 (PRSV)

Drawn:	DHL	Checked:	JRM	Approved:	JHB	Date:	08/27/15	Scale:	NTS	Sheet:	2 of 2

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Model No.
B-0230-K

Item No.

This Space for Architect/Engineer Approval

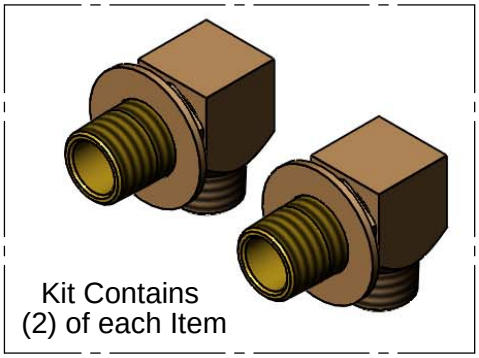
Job Name_____Date_____

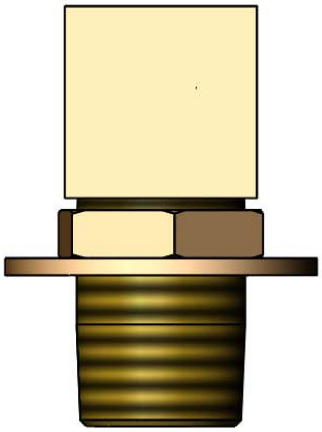
Model Specified_____ Quantity_____

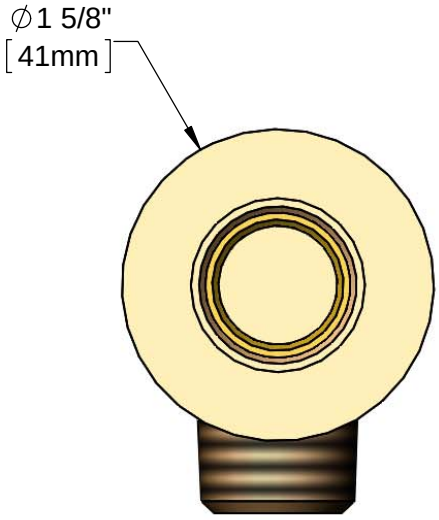
Customer/Wholesaler_____

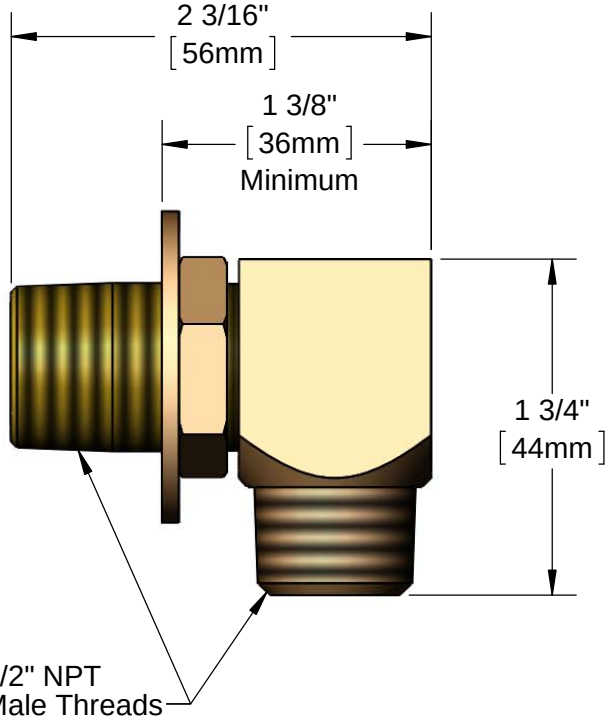
Contractor_____

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

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Travelers Rest, SC 29690

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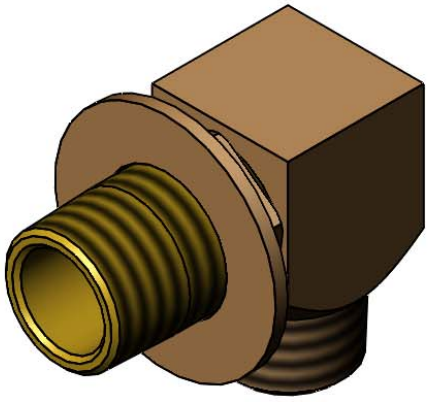
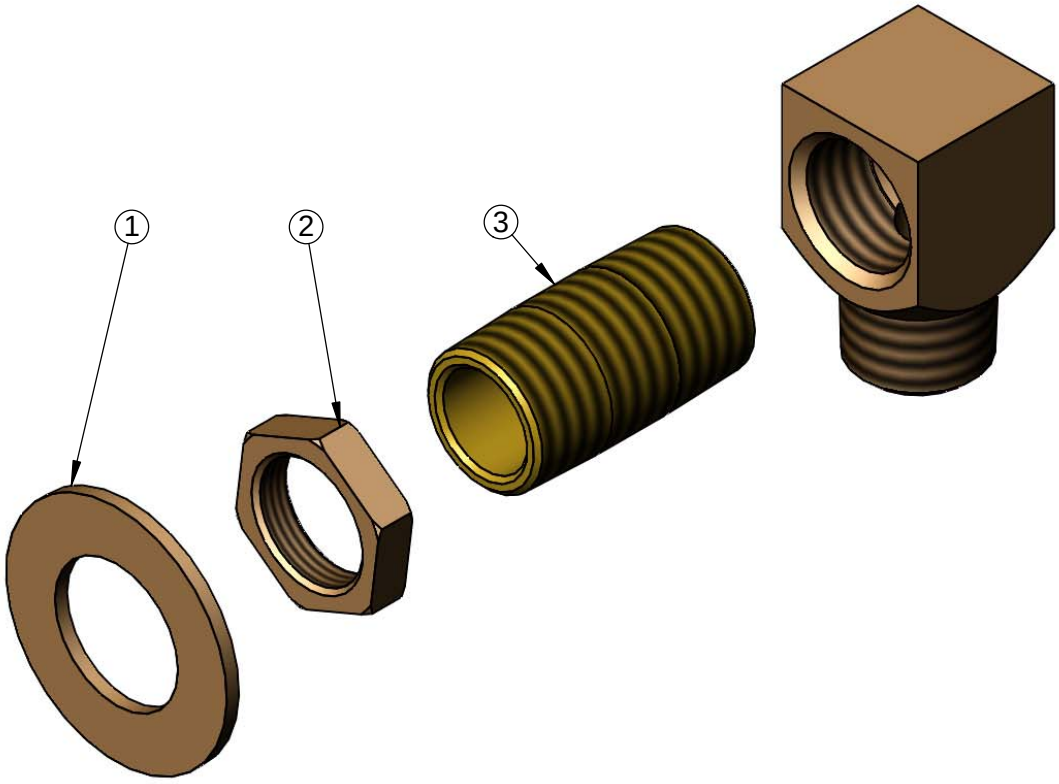
Model No.
B-0230-K

Item No.

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)

Drawn: DHL	Checked: JRM	Approved: JHB	Date: 03/13/14	Scale: NTS	Sheet: 2 of 2

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®

Item No.: _____
Project No.: _____
S.I.S. No.: _____

Specification Sheet

Short Form Specifications

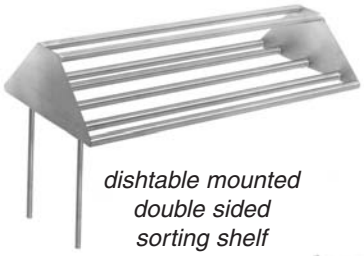
Eagle Wall-Mounted Slanted Rack Shelf, model _____ constructed of 16/304 stainless steel, with stainless steel wall brackets and drip tube.

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 1⅝˝ diameter full-length tubing.

Eagle Wall-Mounted Tubular Rack Shelf, model _____ with ends constructed of 14/304 stainless steel, and 1⅝˝ 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***	❑ ***606643***	❑ ***606302***
❑ ***605381***	❑ ***606644***	❑ ***606303***
❑ ***605382***	❑ ***605383***	❑ ***606296***
❑ ***606294***	❑ ***606295***	❑ ***606297***
❑ ***606641***	❑ ***606300***	❑ ***606298***
❑ ***606642***	❑ ***606301***	❑ ***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 1⅝˝ (41mm)-diameter full-length tubing.
- Please note that one end is wall-mounted.

Tubular Design Rack Shelves
- Wall mounted.
- Features 1⅝˝ (41mm)-diameter full-length tubing.
- Models #606300-606303 feature all-welded construction.
- Models #606296-606299 feature knock-down construction.

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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

AutoQuotes KCL

EG50.06 Rev. 06/09

Spec sheets available for viewing, printing or downloading from our online literature library at *www.eaglegrp.com*

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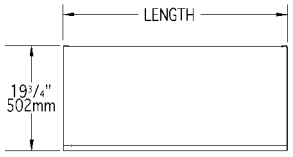
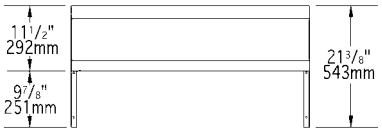
Item No.: _____
Project No.: _____
S.I.S. No.: _____

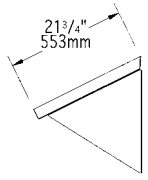
Slanted Rack Shelves



TOP VIEW



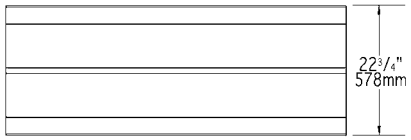
FRONT VIEW



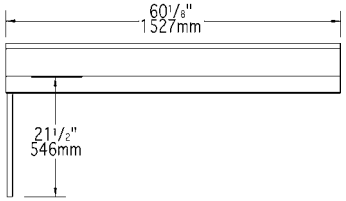
SIDE VIEW

TUBE ON LEFT model #	TUBE ON RIGHT model #	width in.	width mm	length in.	length mm	weight lbs.	weight 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

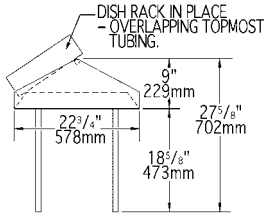
Double Rack Shelf



TOP VIEW



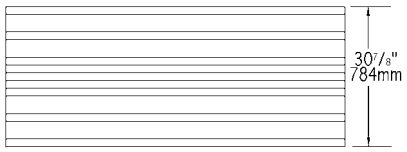
FRONT VIEW



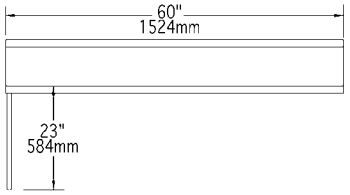
SIDE VIEW

model #	weight lbs.	weight kg
605383	61	27.7

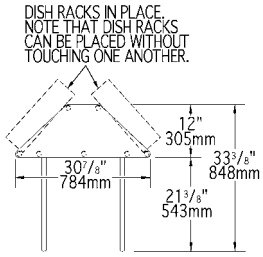
Double Sided Sorting Shelf



TOP VIEW



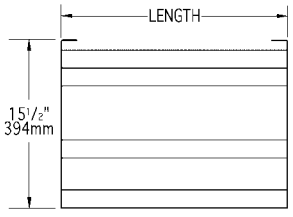
FRONT VIEW



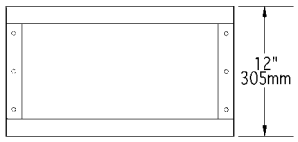
SIDE VIEW

model #	weight lbs.	weight kg
606295	75	34.0

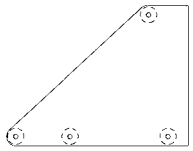
Tubular Design Rack Shelves



TOP VIEW



FRONT VIEW


SIDE VIEW

ALL-WELDED MODELS model #	weight lbs.	weight kg	KNOCK-DOWN MODELS model #	weight lbs.	weight kg	length in.	length 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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Rev. 06/09

Spec sheets available for viewing, printing or downloading from our online literature library at *www.eaglegrp.com*

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, inclues: , (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 _____

44 DR SERIES RACK CONVEYOR

DualRinse
44 DR SERIES
44 DR, 66 DRPW, 70 DRFFPW, 80 DRHDPW
High-Temperature
Rack Conveyor Dishwashing Machine with
Dual Stage Rinse

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

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.

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44 DR SERIES

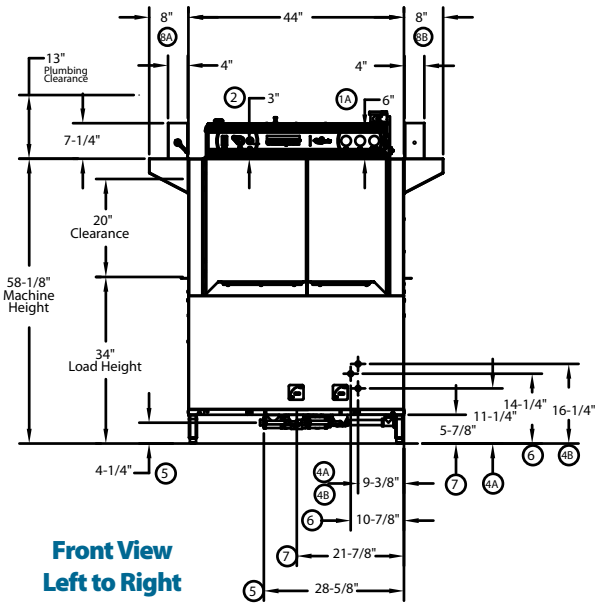
44 DR, 66 DRPW, 70 DRFFPW, 80 DRHDPW
High-Temperature
Rack Conveyor Dishwashing Machine with
Dual Stage Rinse

Champion®
The Dishwashing Machine Specialists

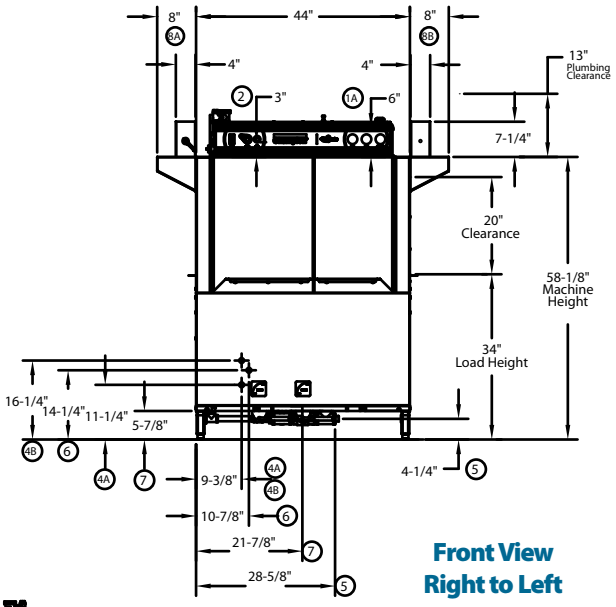
MODEL 44 DR

Shipping weight crated: **600 lbs.**

Dimensions shown in inches [mm]

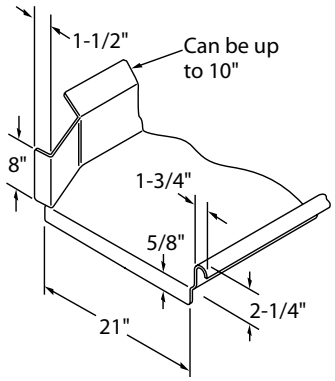


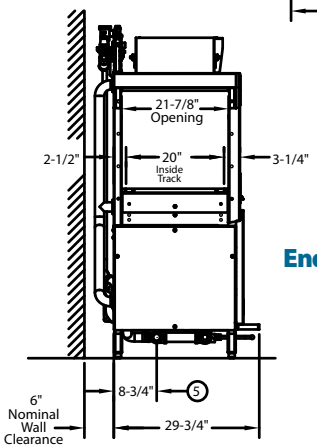
Front View Left to Right



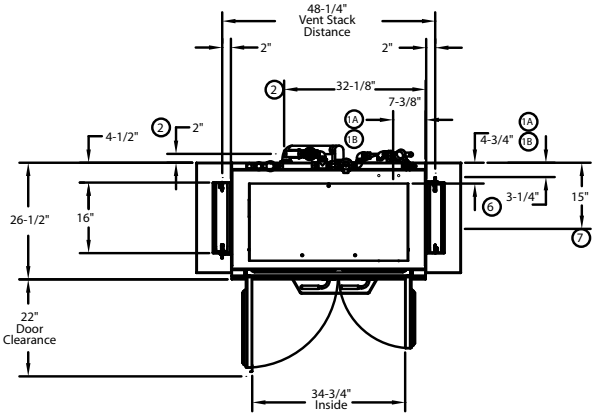
Front View Right to Left

Suggested Table Construction

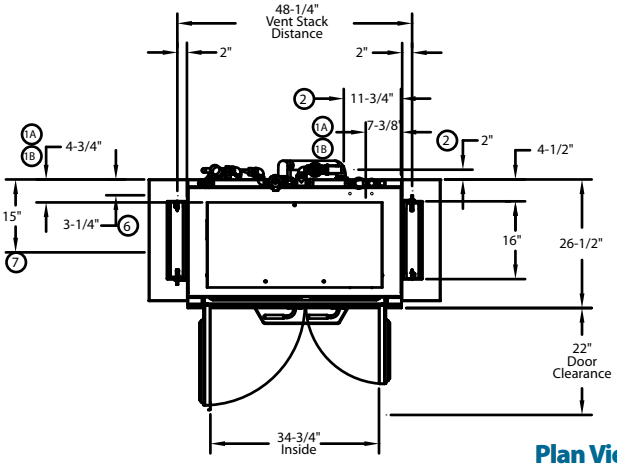




End View



Plan View Left to Right



Plan View Right to Left

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

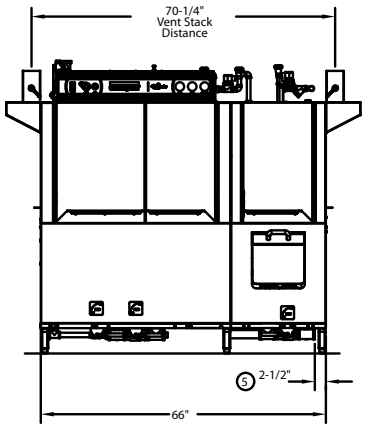
44 DR, 66 DRPW, 70 DRFFPW, 80 DRHDPW
High-Temperature
Rack Conveyor Dishwashing Machine with
Dual Stage Rinse

Champion®
The Dishwashing Machine Specialists

Dimensions shown in inches [mm]

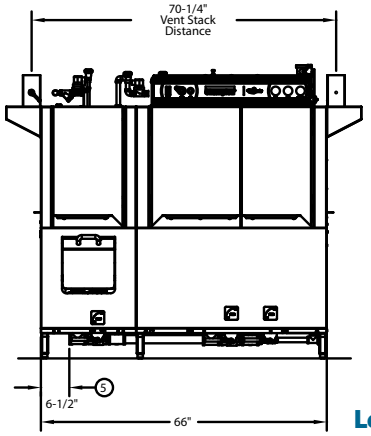
MODEL 66 DRPW WITH 22" PREWASH

Shipping weight crated: **800 lbs.**



Front View

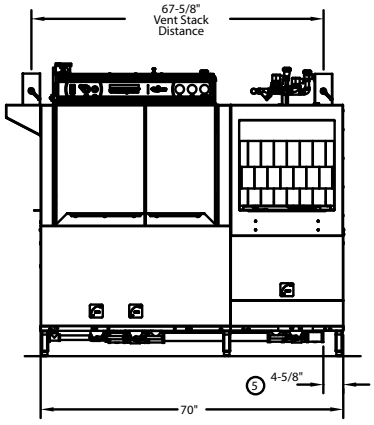
Right to Left



Left to Right

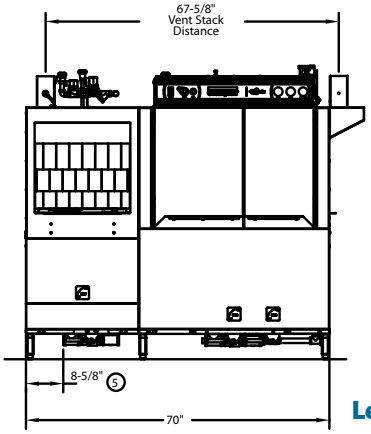
MODEL 70 DRFFPW WITH 26" FRONT FEED PREWASH

Shipping weight crated: **850 lbs.**



Front View

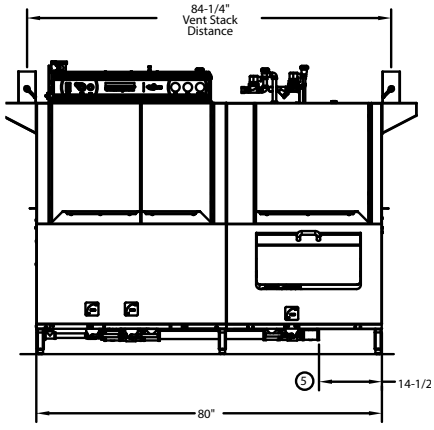
Right to Left



Left to Right

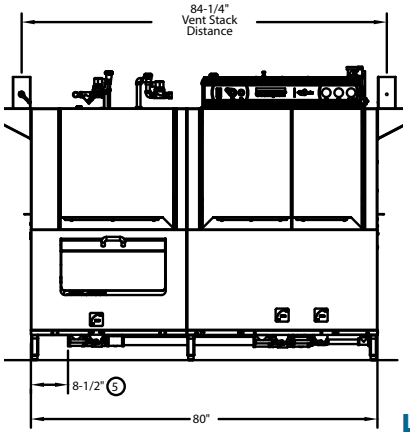
MODEL 80 DRHDPW WITH 36" HEAVY DUTY PREWASH

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

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

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

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

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

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

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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 RACK CONVEYOR

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

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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

EAGLE GROUP®
Profit from the Eagle Advantage®

Item No.: _____
Project No.: _____
S.I.S. No.: _____

Specification Sheet

Clean Dishtables—Straight Design

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 1⅝″ 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)*

MODELS:

❑ *CDTL-24-16/4*	❑ *CDTL-48-14/3*	❑ *CDTR-84-16/3*
❑ *CDTL-24-16/3*	❑ *CDTR-48-16/4*	❑ *CDTR-84-14/3*
❑ *CDTL-24-14/3*	❑ *CDTR-48-16/3*	❑ *CDTL-96-16/4*
❑ *CDTR-24-16/4*	❑ *CDTR-48-14/3*	❑ *CDTL-96-16/3*
❑ *CDTR-24-16/3*	❑ *CDTL-60-16/4*	❑ *CDTL-96-14/3*
❑ *CDTR-24-14/3*	❑ *CDTL-60-16/3*	❑ *CDTR-96-16/4*
❑ *CDTL-30-16/4*	❑ *CDTL-60-14/3*	❑ *CDTR-96-16/3*
❑ *CDTL-30-16/3*	❑ *CDTR-60-16/4*	❑ *CDTR-96-14/3*
❑ *CDTL-30-14/3*	❑ *CDTR-60-16/3*	❑ *CDTL-108-16/4*
❑ *CDTR-30-16/4*	❑ *CDTR-60-14/3*	❑ *CDTL-108-16/3*
❑ *CDTR-30-16/3*	❑ *CDTL-72-16/4*	❑ *CDTL-108-14/3*
❑ *CDTR-30-14/3*	❑ *CDTL-72-16/3*	❑ *CDTR-108-16/4*
❑ *CDTL-36-16/4*	❑ *CDTL-72-14/3*	❑ *CDTR-108-16/3*
❑ *CDTL-36-16/3*	❑ *CDTR-72-16/4*	❑ *CDTR-108-14/3*
❑ *CDTR-36-14/3*	❑ *CDTR-72-16/3*	❑ *CDTL-120-16/4*
❑ *CDTR-36-16/4*	❑ *CDTR-72-14/3*	❑ *CDTL-120-16/3*
❑ *CDTR-36-16/3*	❑ *CDTL-84-16/4*	❑ *CDTL-120-14/3*
❑ *CDTR-36-14/3*	❑ *CDTL-84-16/3*	❑ *CDTR-120-16/4*
❑ *CDTL-48-16/4*	❑ *CDTL-84-14/3*	❑ *CDTR-120-16/3*
❑ *CDTL-48-16/3*	❑ *CDTR-84-16/4*	❑ *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.
- 1⅝″ (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.

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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Foodservice Division: Phone 800-441-8440
MHC/Retail Display Divisions: Phone 800-637-5100

Certifications / Approvals

NSF

AutoQuotes

KCL

For custom configuration or fabrication needs, contact our **SpecFAB® Division.**
Phone: 302-653-3000 • Fax: 302-653-2065 • e-mail: quotes@eaglegrp.com

EG50.00 Rev. 11/17

Spec sheets available for viewing, printing or downloading from our online literature library at *www.eaglegrp.com*

EAGLE GROUP®
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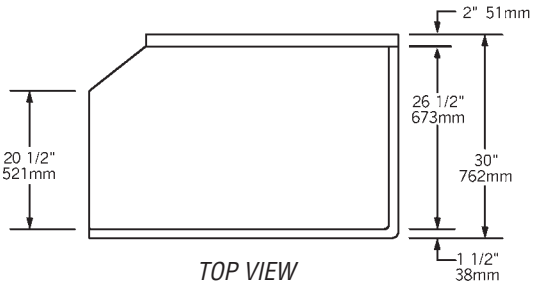
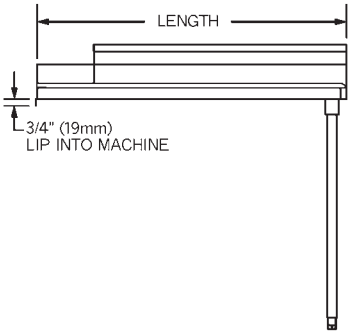
Item No.: _____
Project No.: _____
S.I.S. No.: _____

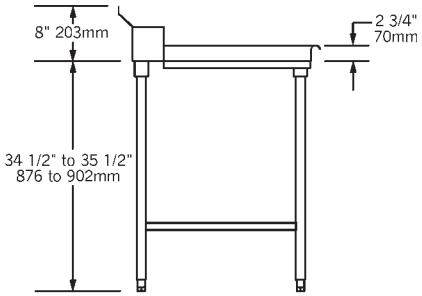
Clean Dishtables—Straight Design



TOP VIEW



FRONT VIEW



SIDE VIEW

16 gauge type 430 model #	16 gauge type 304 model #	Spec-Master® 14 gauge type 304 model #	description	length in.	length mm	weight lbs.	weight 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

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Foodservice Division: Phone 800-441-8440
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Rev. 11/17

Spec sheets available for viewing, printing or downloading from our online literature library at *www.eaglegrp.com*

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.

EAGLE GROUP®
Profit from the Eagle Advantage®

Item No.: _____
Project No.: _____
S.I.S. No.: _____

Specification Sheet

Spec-Master® FN Series Coved Corner Three-Compartment Sinks

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 ⅝″ radius, and shall have a 14″ water level. Drainboards, when required, shall be "V" creased for positive drainage. 9½″ high backsplash with 1″ upturn and tile edge. Legs to be 1⅝″ O.D., stainless steel, with stainless steel gussets, stainless steel crossbracing and adjustable stainless steel bullet feet.

MODELS:

❑ ***FN2048-3-**** ❑ ***FN2472-3-****
❑ ***FN2054-3-**** ❑ ***FN2860-3-****
❑ ***FN2060-3-****

** See table on back for complete model numbers.*

3-compartment sink
(faucets not included)

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.
- 9½″ high backsplash with 1″ upturn and tile edge.
- 1⅛″ (29mm) faucet holes** punched on 8″ (203mm) centers.

Base:

- Legs: 1⅝″ (41mm)-diameter stainless steel tubing with stainless steel gussets and fully adjustable stainless steel bullet feet.
- Crossbracing: Adjustable, 1¼″ (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 ⅝″ (41mm) radius and constructed using state-of-the-art seamless welding techniques.
- Basket-type waste drain fits sink bowls' 3½″ (89mm) opening and features 1½″ (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.

Options / Accessories

❑ Lever drain
❑ Lever drain with overflow
❑ Twist handle drains
❑ Overflow hole
❑ Sink kits
❑ Faucets
❑ Polyboard sink covers
❑ Stainless steel sink covers
❑ Skirted front panel

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 ½″ (13mm) IPS for hot and cold lines.

Certifications / Approvals

NSF

AUTOQUOTES

KCL

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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

EAGLE GROUP®
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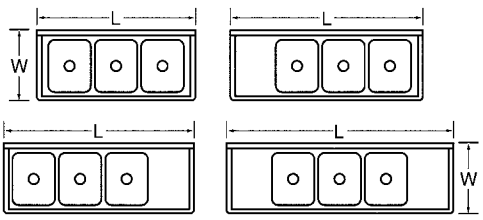
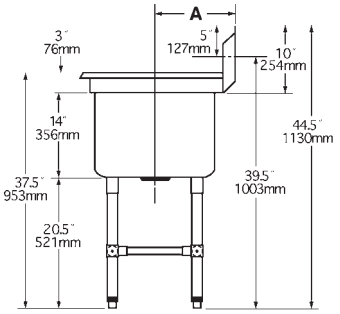
Item No.: _____
Project No.: _____
S.I.S. No.: _____

Spec-Master® FN Series Coved Corner Three-Compartment Sinks



Drain location for rough-in

bowl width in.	bowl width mm	bowl length in.	bowl length 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 width in.	width mm	length in.	length mm	DRAINBOARD quantity	length in.	length mm	OVERALL DIMENSIONS width in.	width mm	length in.	length mm	weight lbs.	weight 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″	610	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″	457	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.

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Rev. 04/10

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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 "Ell" 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

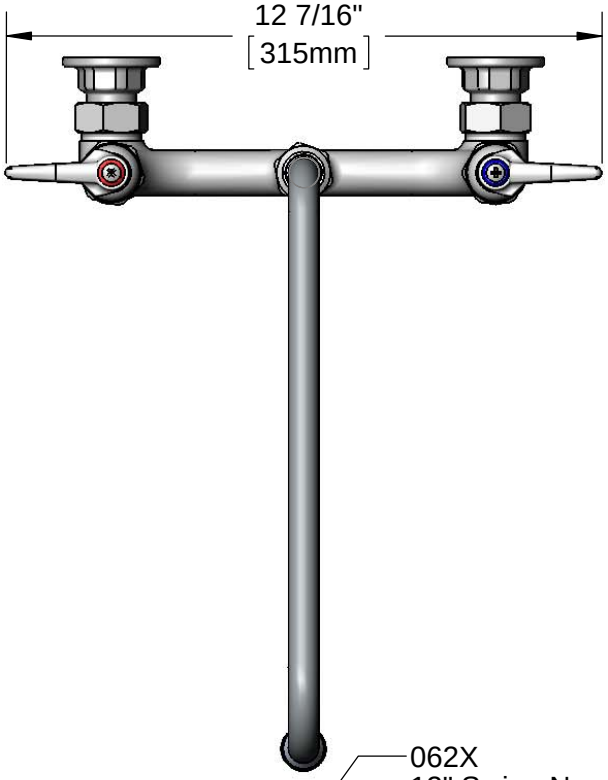
Job Name_____Date_____

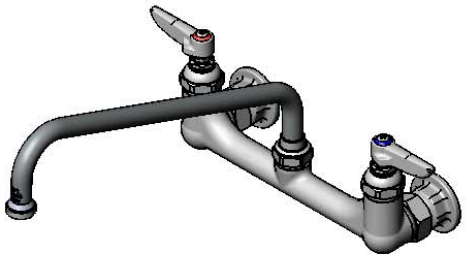
Model Specified_____ Quantity_____

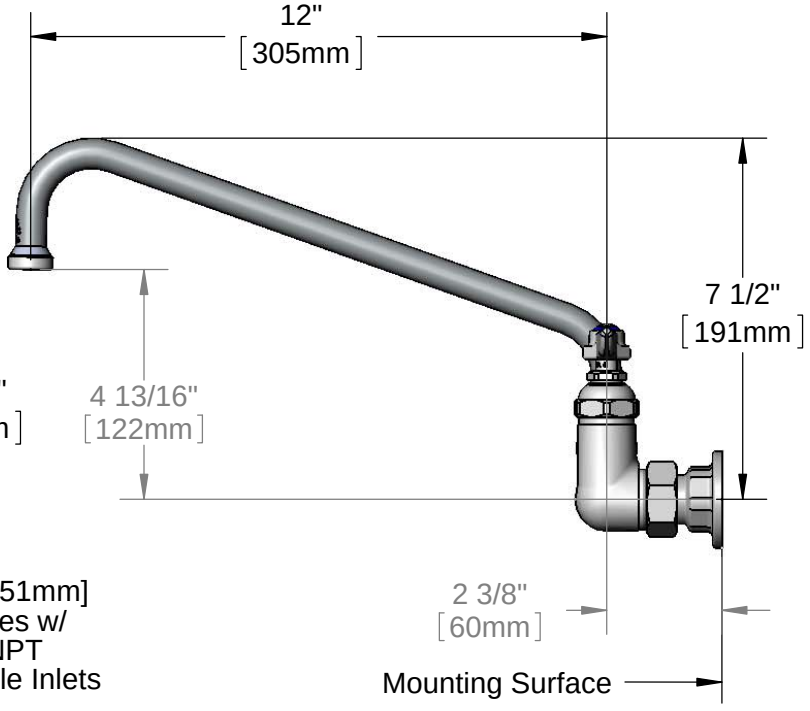
Customer/Wholesaler_____

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)

Drawn: DHL	Checked: JRM	Approved: JHB	Date: 03/17/14	Scale: 1:4	Sheet: 1 of 2

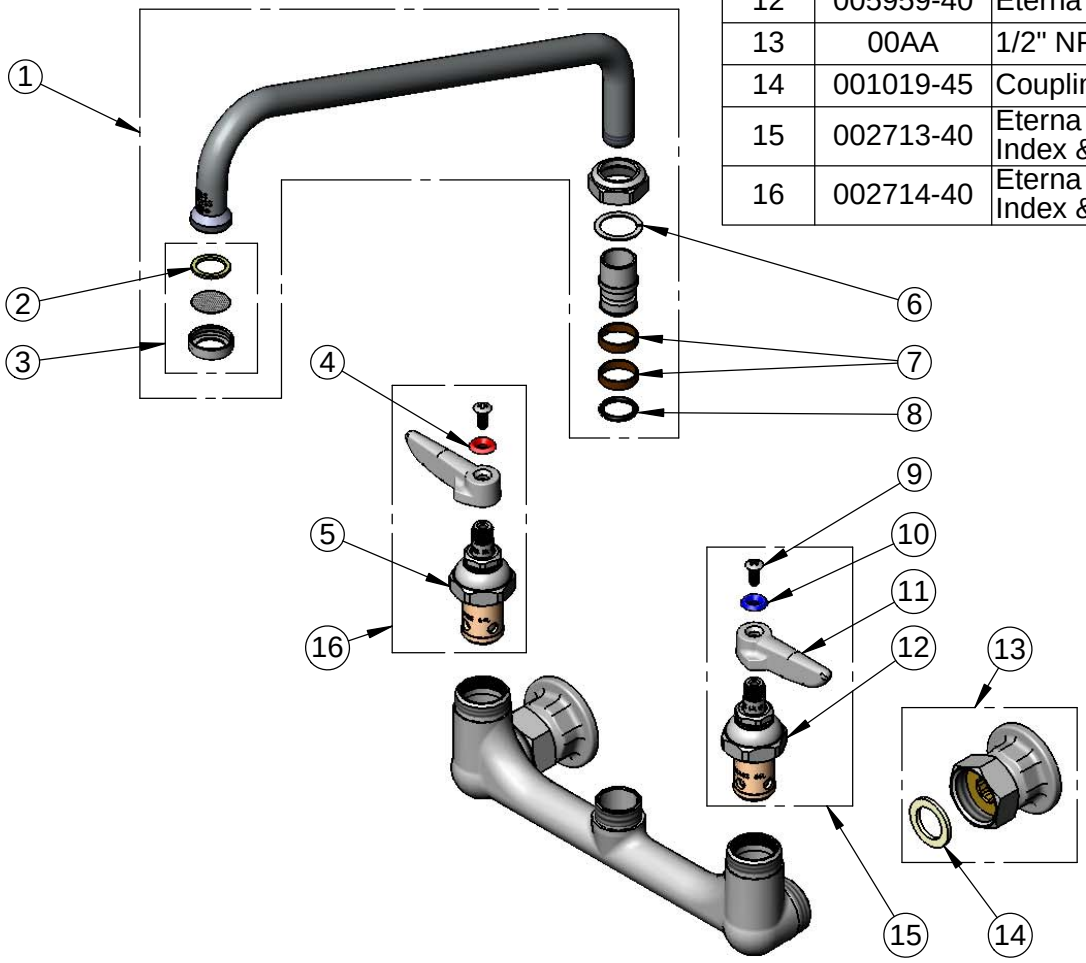
T&S BRASS AND BRONZE WORKS, INC.
2 Saddleback Cove / P.O. Box 1088
Travelers Rest, SC 29690

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.

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:	Checked:	Approved:	Date:	Scale:	Sheet:
DHL	JRM	JHB	03/17/14	NTS	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

Item No.: _____
Project No.: _____
S.I.S. No.: _____

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: 1⅝˝ O.D. tubular legs with 1¼˝ 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. 1⅝˝ O.D. stainless steel tubular legs and two 4˝ casters with brake.

mobile mixer stand

mobile equipment stand

Options / Accessories

❑ Drawers

Mobile Mixer/Equipment Stands

MODELS:

❑ ***MMT3030G*** ❑ ***MMT3036G*** ❑ ***MET2430S***
❑ ***MMT3030S*** ❑ ***MMT3036S***

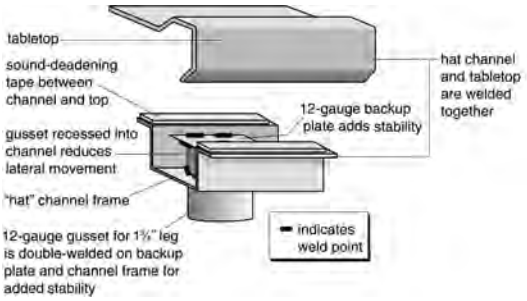
Mobile Mixer Stands

- 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.
- 1⅝˝ (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.
- 1⅝˝ (41mm)-diameter legs with two 4˝ (102mm) casters with brake.
- 1˝ (25mm)-diameter stainless steel handle is welded to heavy duty brackets and stand.

Patented uni-lok® System
(Patent No. 5,165,349)



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

AUTOQUOTES

KCL

For custom configuration or fabrication needs, contact our **SpecFAB® Division.**
Phone: 302-653-3000 • Fax: 302-653-2065 • e-mail: quotes@eaglegrp.com

EG10.26B Rev. 05/15

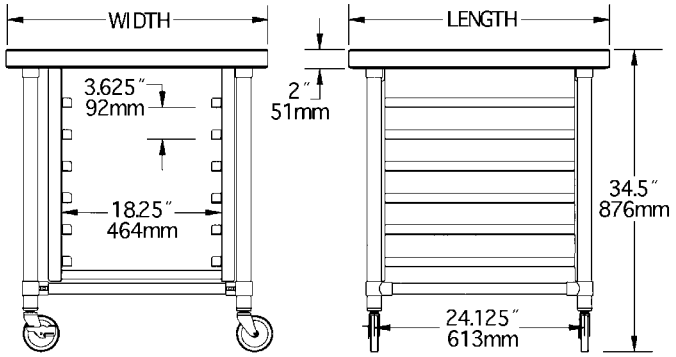
Spec sheets available for viewing, printing or downloading from our online literature library at *www.eaglegrp.com*

EAGLE GROUP
Profit from the Eagle Advantage®

Item No.: _____
Project No.: _____
S.I.S. No.: _____

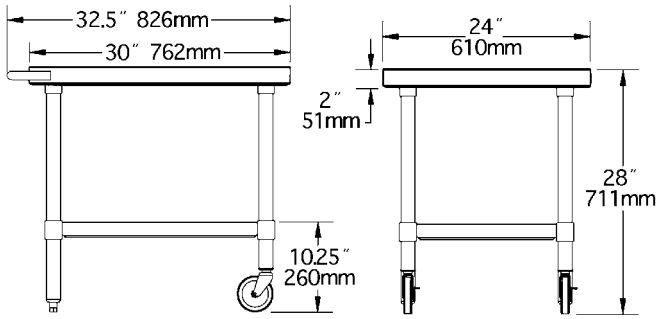
Mobile Mixer/Equipment Stands

Mobile Mixer Stands



galvanized model #	stainless steel model #	weight lbs.	weight kg	width in.	width mm	length in.	length mm
MMT3030G	***MMT3030S***	55	24.9	30″	762	30″	762
MMT3036G	***MMT3036S***	60	27.2	30″	762	36″	914

Mobile Equipment Stand



model #	weight lbs.	weight kg	width in.	width mm	length in.	length mm
MET2430S	47	21.3	24″	610	30″	762

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

Rev. 05/15

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**							

Item # _____

Quantity _____

C.S.I. Section 11400

HOBART
701 S Ridge Avenue, Troy, OH 45374
1-888-4HOBART • www.hobartcorp.com

LEGACY® HL200 MIXER

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

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

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.

HOBART

LEGACY® HL200 MIXER

LEGACY®
HL200 MIXER

HOBART
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.

HOBART
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
701 S Ridge Avenue, Troy, OH 45374
1-888-4HOBART • www.hobartcorp.com

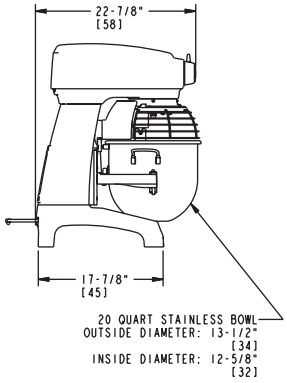
SPECIFICATIONS

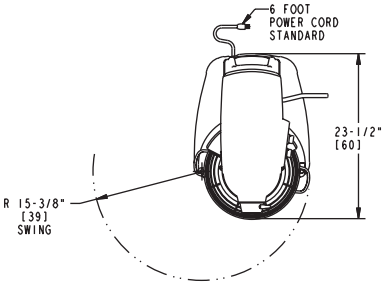
ELECTRICAL SPECIFICATIONS: 100-120/50/60/1, 200-240/50/60/1 – UL Listed.

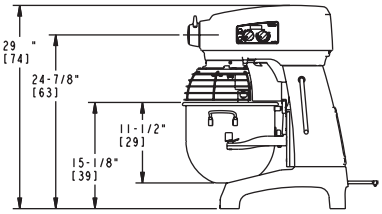
WEIGHT: 189 lbs. net; 204 lbs. domestic shipping.

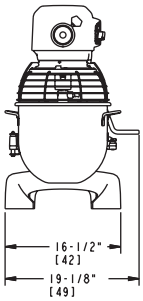
WARRANTY: Unit has full one-year warranty on parts, labor and mileage against manufacturer's defects. Service contracts are available.

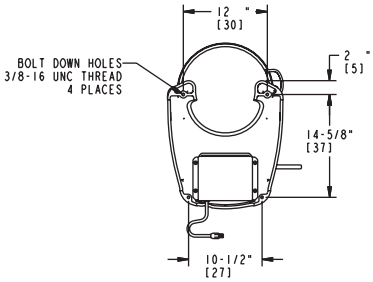
DETAILS AND DIMENSIONS









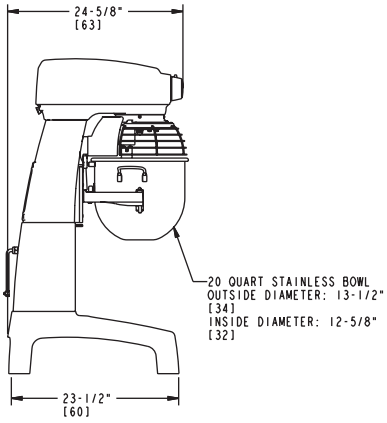


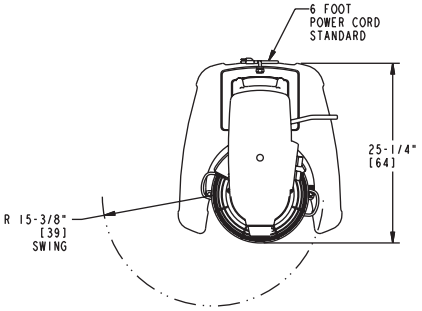
WARNING

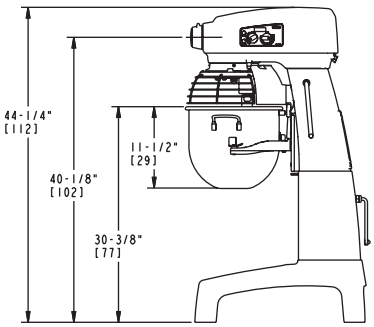
ELECTRICAL AND GROUNDING CONNECTIONS MUST COMPLY WITH THE APPLICABLE PORTIONS OF THE NATIONAL ELECTRICAL CODE AND/OR OTHER CODES IN FORCE

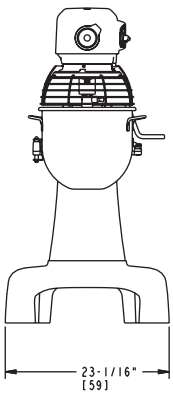
NOTE

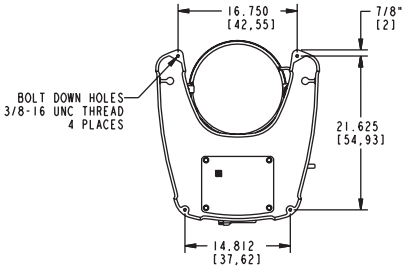
MACHINE WEIGHT (LESS BOWL)-----	189 LBS
SHIPPING WEIGHT----------	204 LBS
BOWL WEIGHT----------	9 LBS











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)

Item No. _____

Specifier Identification No. _____

Model No. _____

Quantity _____

IBS20

IBS27

IBS37

Scoops not Included

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.

Approvals

NSF

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

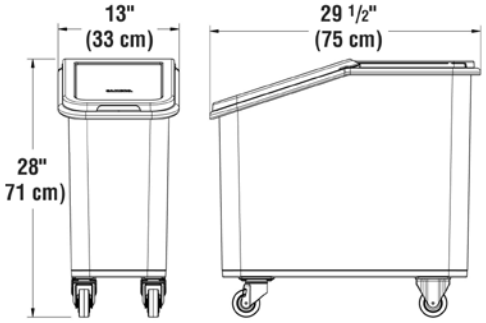
Models IBS20 – 21 gallon (81 L)
IBS27 – 27 gallon (102 L)
IBS37 – 37 gallon (140 L)

Item No. _____

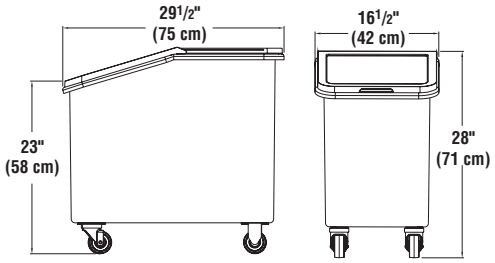
Specifier Identification No. _____

Model No. _____

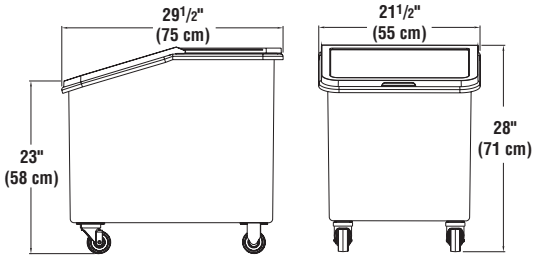
Quantity _____



IBS20



IBS27



IBS37

Specifications

Dimension Tolerance: +/- 1/4" (0,64 cm)

Code	Description	Volume Capacity	Load Capacity Sugar	Load Capacity Flour	Exterior Dimensions W x D x H	Case lbs./cube Kg/m³
Slant Top Ingredient Bin						
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

NSF

CAMBRO

 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

D041115 Ingredient Bin Slant Top CS

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

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

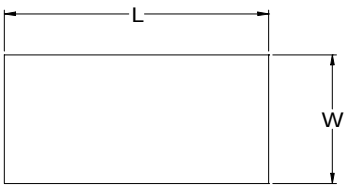
OPTIONAL ACCESSORIES

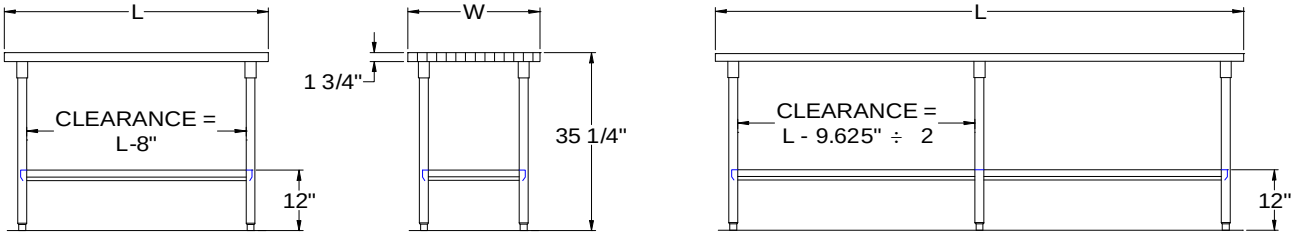
	MODEL #	Qty
DRAWER		
DRAWER LOCK		
ADJUSTABLE SHELF		
CASTERS		
OVERSHELVES		
POT RACK		

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**							

Item # _____

Quantity _____

C.S.I. Section 11400

HOBART
701 S Ridge Avenue, Troy, OH 45374
1-888-4HOBART • www.hobartcorp.com

LEGACY® HL300 MIXER

STANDARD FEATURES

- Heavy-Duty ¾ 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

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

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.

HOBART

LEGACY® HL300 MIXER

LEGACY®
HL300 MIXER

HOBART
701 S Ridge Avenue, Troy, OH 45374
1-888-4HOBART • www.hobartcorp.com

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.

HOBART
701 S Ridge Avenue, Troy, OH 45374
1-888-4HOBART • www.hobartcorp.com

LEGACY® HL300 MIXER

SPECIFICATIONS

MOTOR:
¾ 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
701 S Ridge Avenue, Troy, OH 45374
1-888-4HOBART • www.hobartcorp.com

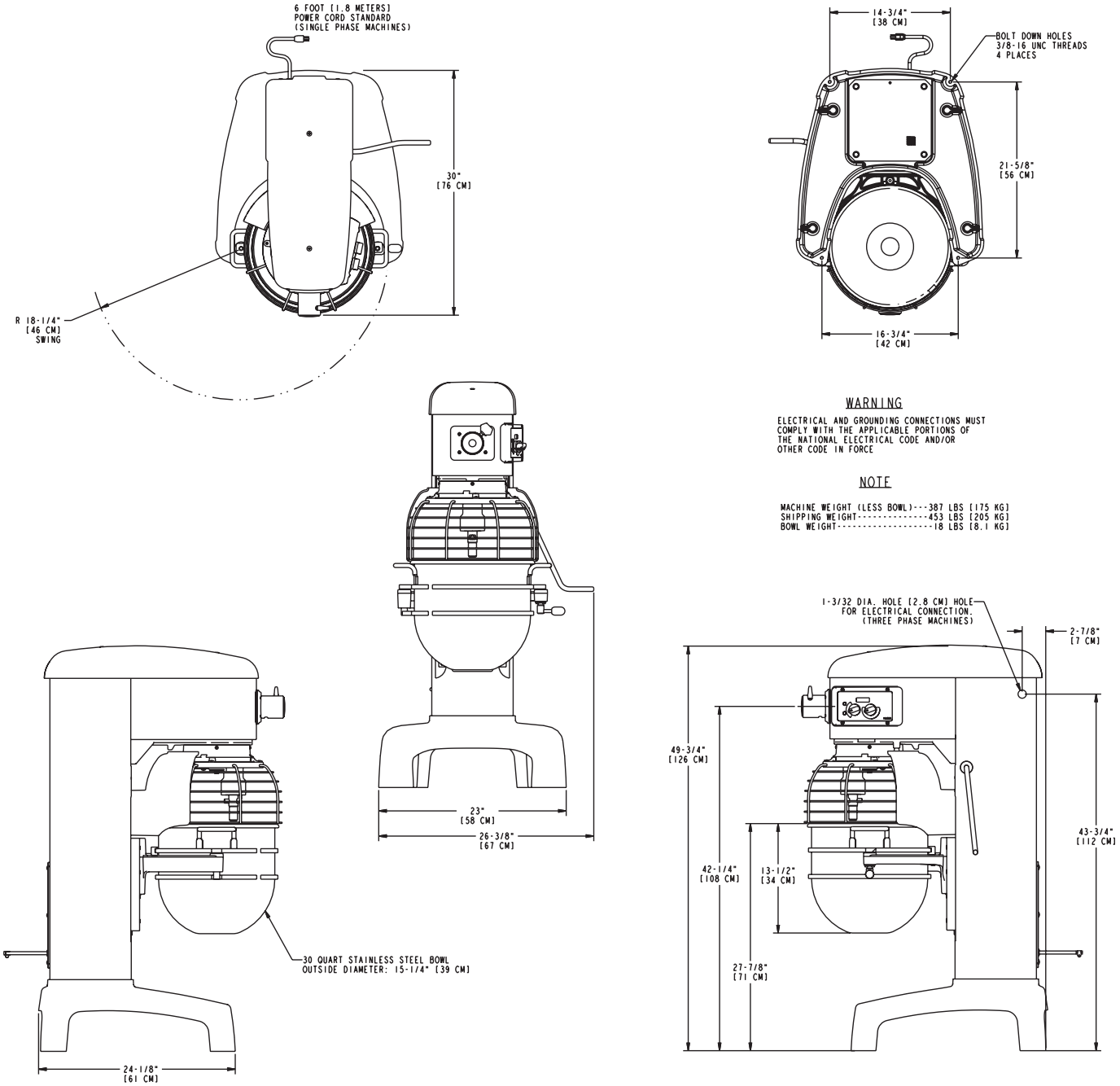
SPECIFICATIONS

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



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), 3/4 Height (59", 1499mm), and 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 1/2 Height Full Solid Door | Gray 3/4 Height Full Clear Door | Red Full Height Dutch Solid Doors | Blue Full Height Full Clear Door

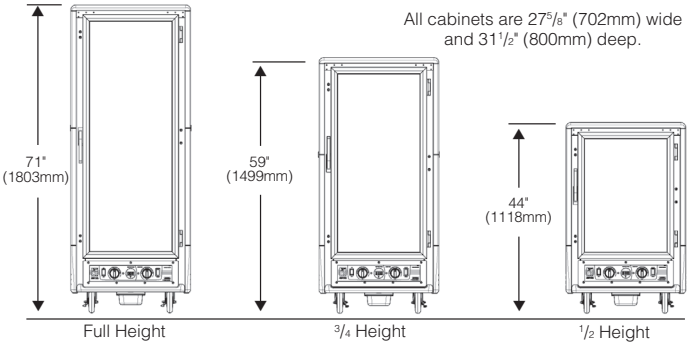
3 Series Removable Control Modules

- **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).

InterMetro Industries Corporation
North Washington Street
Wilkes-Barre, PA 18705
www.metro.com

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).
- **Casters:** 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:** ¼" (6.4mm) dia. nickel-chrome electroplated wire, adjustable on 1½" (38mm) increments.
- **Lip Load Slides:** 1½"x½"x.063" (38x38x1.8mm) extruded aluminum channel slides, 1½" (38mm) fixed spacing.
- **Fixed Wire Slides:** ¼" (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, 7½' 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 1½" (38mm) on sides, back and top.
- **Slide Capacities:**

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

C5 3 9 - C DC - U

NEMA 5-20P
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

C5 3 9 - C L DC - U

NEMA 5-15P
Add "L" for Lower Wattage Combination or Holding Module Cabinets (120V, 12A, 60Hz, 1440W)

Export Model Number Description

C5 3 9 - C X DC - U

NEMA 6-15P
Add "X" for Export Cabinets (220-240V, 7.6-8.3A, 50/60Hz, 1681-2000W)

Blue or Gray Model Description

C5 3 9 - C DC - U - BU

** Cabinets ordered without a color designation default to Red.

Color **: No Suffix = Red, BU = Blue, GY = Gray

Models with Accessories or Options

C5 3 9 - CDC - U A
C5 3 9 - CDC - U - BU A

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

	Universal Wire Pan Capacity**				Lip Load Pan Capacity	Fixed Wire Pan Capacity	
Cabinet Size	Slide Pairs Provided	Slide Pairs Max.*	18"x26"	12"x20"x2.5" GN 1/1	18"x26"	18"x26"	12"x20"x2.5" GN 1/1
Full Height	18	37	18	34	35	18	34
Full Height Dutch	18	35	17	32	34	17	32
¾ Height	14	29	14	26	27	14	26
½ Height	8	17	8	16	17	8	16

*Maximum number of slide pairs @ 1½" spacing. Additional slide pairs ordered separately.
**Capacity based on standard number of slide pairs provided.

Metro Heated cabinets are for hot food holding applications only.

All Metro Catalog Sheets are available on our website: **www.metro.com**

InterMetro Industries Corporation
North Washington Street • Wilkes-Barre, PA 18705 • 570.825.2741
Fax: 800.638.9263 (East Coast/Canada) • Fax: 800.638.3292 (West Coast)
FOR PRODUCT INFORMATION/CUSTOMER SERVICE:
U.S./Canada/Latin America: 1.800.992.1776 • Europe: +31.76.587.7550
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L03-270
Rev. 05/12
Printed in U.S.A.

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

Project Name:	
Model Specified:	
Location:	
Item No:	**Quantity:**
AIA #:	**SIS #:**

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.

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.

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.)	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)

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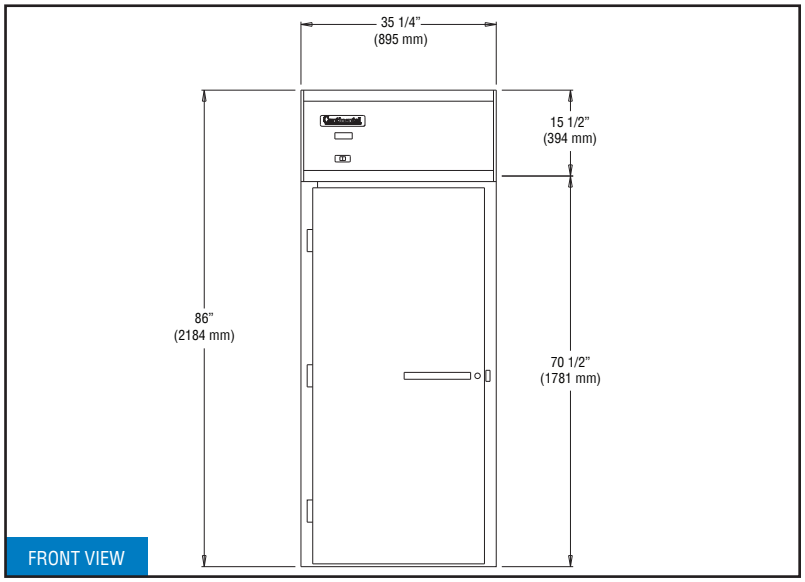
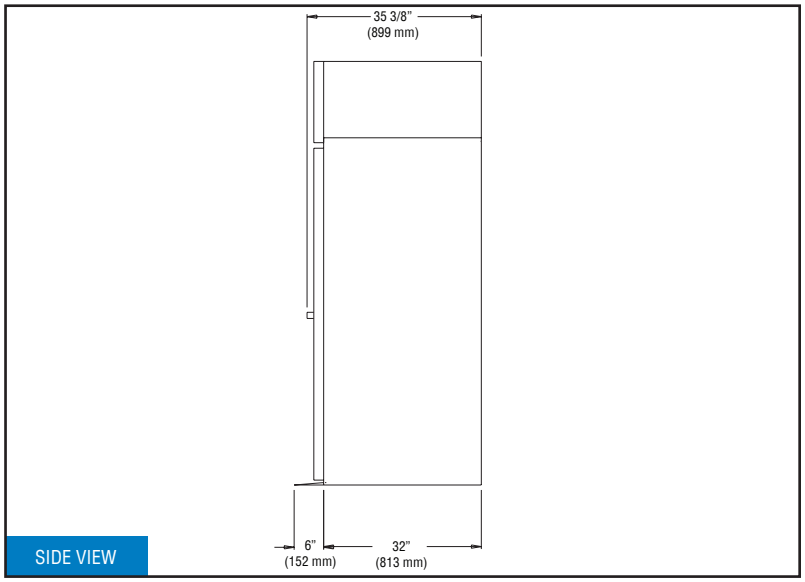
Due to our continued efforts in developing innovative products, specifications subject to change without notice.

MADE IN THE U.S.A.

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.

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.

DL1RI (8/14/13)

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.

Project Name:

Model Specified:

Location:

Item No: **Quantity:**

AIA #: **SIS #:**

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.

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

Continental® Refrigerator

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Phone: 215-244-1400
Fax: 215-244-9579

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Bensalem, PA 19020
www.continentalrefrigerator.com

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)

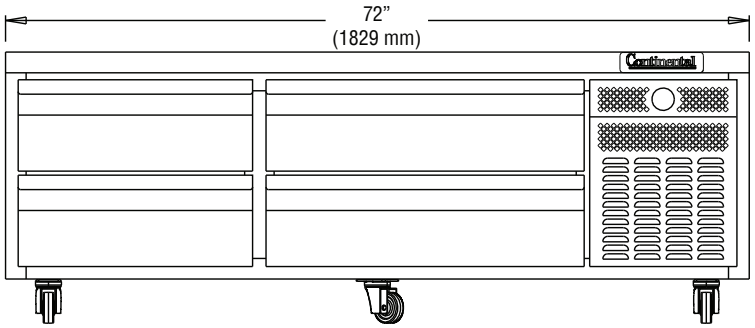
TOP WEIGHT CAPACITY

Max. Top Weight Capacity (lbs.)	1200 (544 kg)

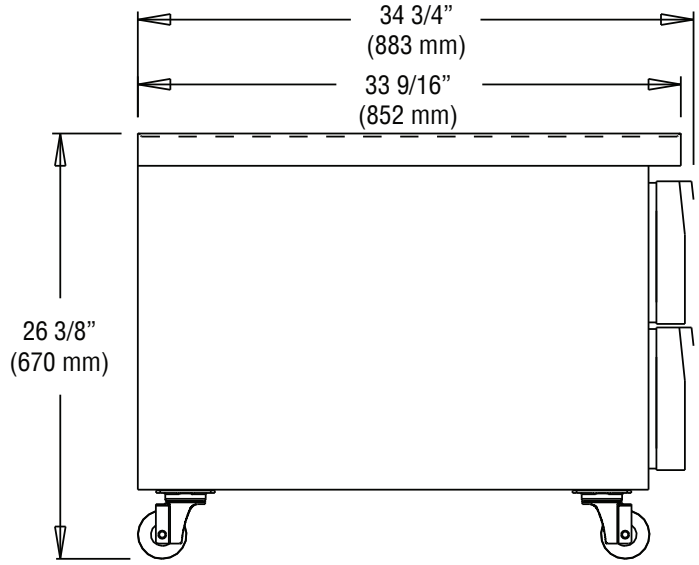
** Rating @ +25°F evaporator, 90°F ambient*
Figures in parentheses reflect metric equivalents rounded to the nearest whole unit.

Equipped with one NEMA-5-15P Plug
(varies by country)

Model Plan Views

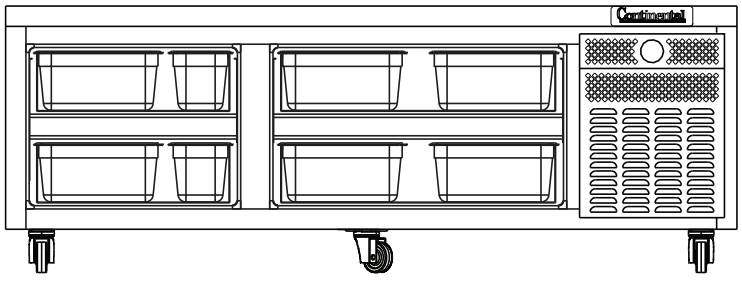


FRONT VIEW



SIDE VIEW

Shown with (6) 12 x 20 x 6 pans and (2) 6 x 20 x 6 pans (not furnished)



DRAWER PAN CONFIGURATION

Continental Refrigerator

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Intertek

MADE IN THE U.S.A.

DL72G (3/8/17)

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

Job

Item#

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)

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.

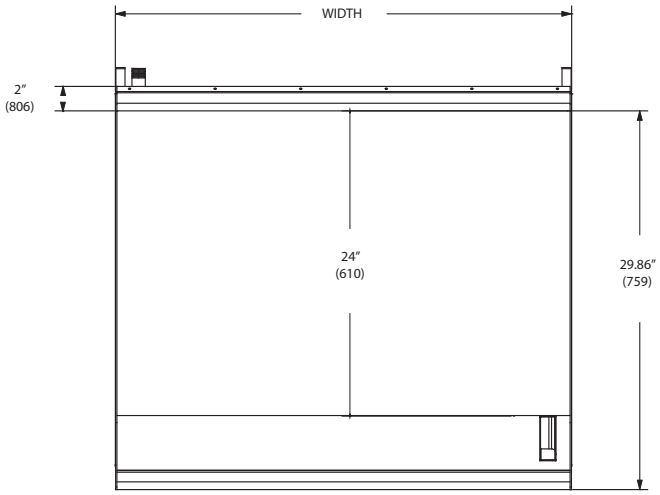
Griddle Plate: 18”, 24”, 36”, 48”, 60”, 72” wide unit with one 30,000 BTU (NAT or LP) burners every 12” on thermostatic models and one 20,000 BTU (NAT or LP) burners every 12” on manual models. Fully welded, 1” thick polished steel griddle plate with side splash guards, and grease drawer.

Griddle Controls: Independent, “Insta-on” thermostatic controls with uniform temperature range of 200°F to 400°F. (Thermostatic models ONLY)

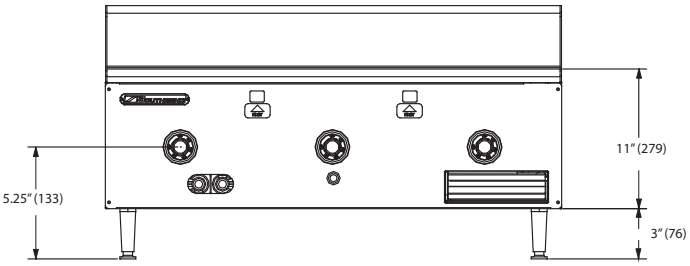
Legs: Stainless steel 4” adjustable legs.

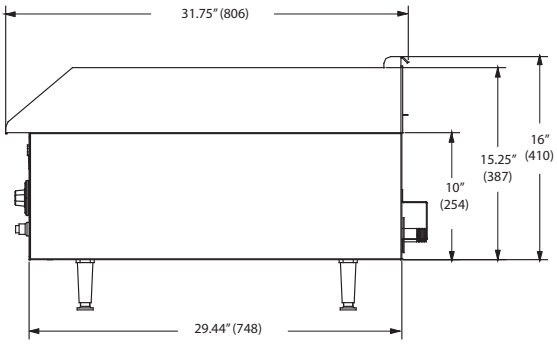
Gas Heat Control System: Each foot of griddle is heated by a “U” shaped burner. Each burner is controlled by a thermostatic control. For safety, each pilot has a flame failure device. A 3/4” rear gas connection is standard. Units over 48” wide are constructed of two bodies.(Thermostatic models ONLY)

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 stain 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
- ❑ Stainless steel plate shelf with or without cutting board
- ❑ Casters for stand
- ❑ Grooved griddle plates
- ❑ Chrome plated griddle plates
- ❑ 2" high insulator base for mounting on refrigerated base

INTENDED FOR COMMERCIAL USE ONLY.
NOT FOR HOUSEHOLD USE.

Since 1898 SOUTHBEND
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(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

Job

Item#

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

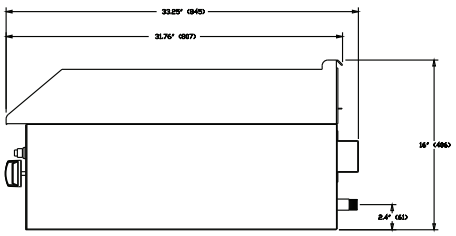
Exterior Finish: Front and sides are constructed of #3 polished 430 and 304 stainless steel. Bottom and rear are aluminized steel. Sides are reinforced and fully insulated. 5” rear and side splash.

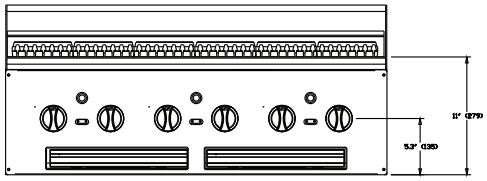
Charbroiler: 12”, 24”, 36”, 48” and 60” (available in radiant or lava). Stainless steel, 20,000 BTU (NAT or LP) burners every 6”. Removable two-sided cast-iron grates. Field convertible from radiant to briquette.

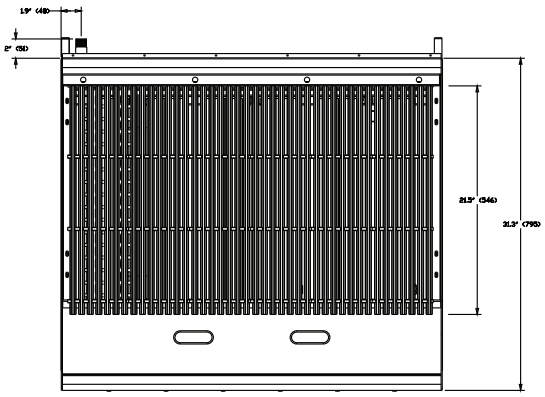
Gas Heat Control System: Each straight burner is controlled by a gas valve for independent control of flame. One standing pilot services each burner. A 3/4” rear gas connection is standard.

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 stain 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

- ❑ Stainless steel stand
- ❑ Casters for stand
- ❑ Stainless steel plate shelf with or without cutting board
- ❑ Plated grids for fish
- ❑ 2" high insulator base for mounting on refrigerated base
- ❑ Battery Spark Ignition
- ❑ Briquette kit to convert radiant to briquette
- ❑ Radiant kit to convert briquette to radiant

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# 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

Job

Item#

HDO-12, HDO-24, HDO-36, HDO-48
Step-up Models: HDO-24SU, HDO-36SU, HDO-48SU

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

Model HDO-36SU

STANDARD CONSTRUCTION SPECIFICATIONS

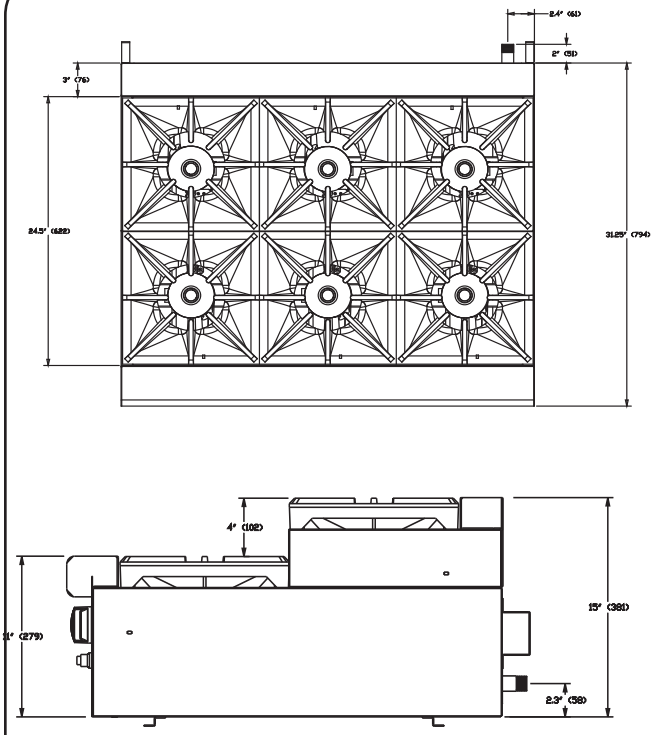
Exterior Finish: Stainless steel front and sides. Rear and bottom panels are constructed of aluminized steel.

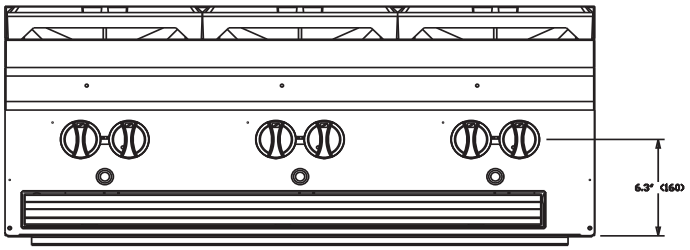
Range Top: Each burner is a 33,000 BTU NAT (24,000 BTU LP) cast iron non-clogging burner (available in step-up). Removable flush top grates. Center-to-center measurements between burners not less than 12”, side-to-side or front-to-back. Removable one piece, full width crumb tray provided under burners.

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 stain 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

INTENDED FOR COMMERCIAL USE ONLY.
NOT FOR HOUSEHOLD USE.

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(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	MOCP
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					

CLEVELAND

Project _____
Item _____
Quantity _____
FCSI Section 11400 _____
Approved _____
Date _____

DURAPAN™ SERIES

GAS, OPEN OR MODULAR BASE, 30 & 40 GALLON (115 & 150 LITER)

Braising Pans / Tilting Skillets

Models

- SGL-30-TR
- SGM-30-TR
- SGL-40-TR
- SGM-40-TR

Open base model shown with optional Drain Drawer (SLD)

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
- 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

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

18301 St. Clair Street
Cleveland, OH 44110

Tel 1.216.481.4900
Fax 1.216.481.3782
Email steam@clevelandrange.com

www.clevelandrange.com

WELBILT
KE004046-93

CLEVELAND

Braising Pans / Tilting Skillets

DIMENSIONS

MODEL	A	B	C	D	E	G
SGL-30-TR	36"	32"	9"	5"	20"	32 7/8""
	(915mm)	(812mm)	(229mm)	(127mm)	(508mm)	(835mm)
SGL-40-TR	48"	44"	12 1/8"	8"	22"	44 7/8"
	(1220mm)	(1118mm)	(308mm)	(203mm)	(559mm)	(1140mm)

CAPACITIES

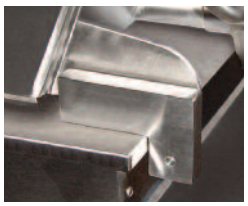
In 4 oz. servings. Other sizes may be calculated.
30 gallons / 115 Liters 960
40 gallons / 150 Liters 1280

SPECIFICATIONS

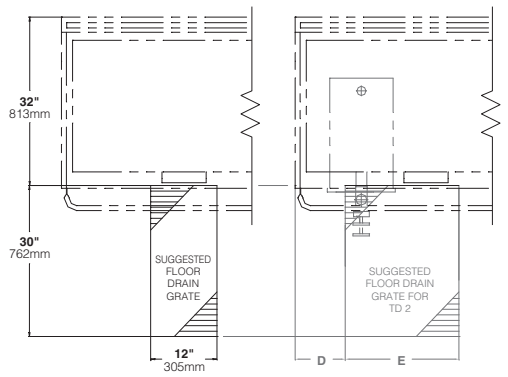
ELECTRICAL SUPPLY (6' CORD & PLUG)			GAS SUPPLY (PIPING 3/4" NPT)	CLEARANCE
VOLTS:	120	220/240	TYPE: NAT or LP	MIN. TO COMBUSTABLE SURFACES: SIDES: 0, REAR: 6" (153mm)
PHASE:	1	1	WATER COLUMN: 4.5 (NAT), 10.5 (LP)	MIN. TO NON COMBUSTABLE SURFACES: SIDES & REAR: 0
AMPS:	1.8	.83	BTU PER CU. FT.: 1000 (NAT), 2500 (LP)	NOTE: 4 1/2" (115mm) required on right hand side for faucet
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	

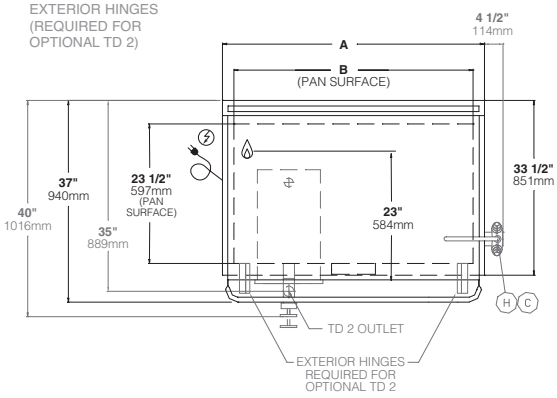
Shipping Weights & Dimensions

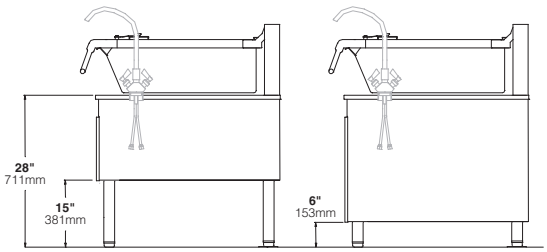
Model -
SGL30TR Weight - 504 lbs
Width - 44"
Depth - 44"
Height - 54"
SGL40TR Weight - 624 lbs
Width - 48"
Depth - 58"
Height - 54"

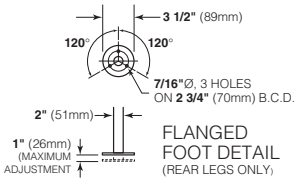


EXTERIOR HINGES (REQUIRED FOR OPTIONAL TD 2)

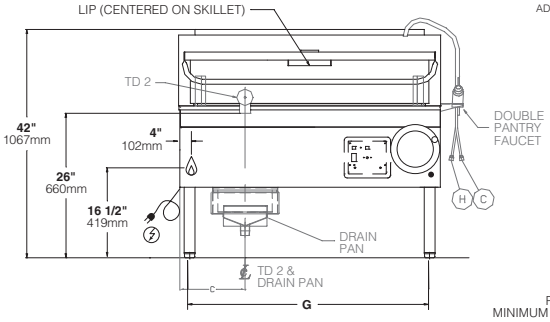


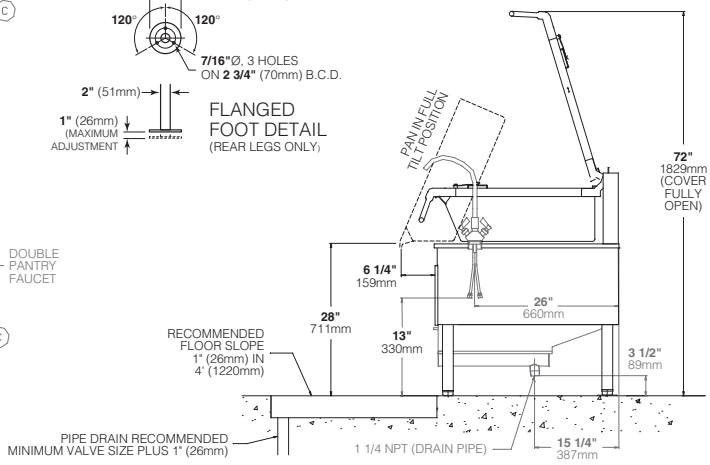






FLANGED FOOT DETAIL (REAR LEGS ONLY)





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)

18301 St. Clair Street
Cleveland, OH 44110

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www.clevelandrange.com

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'.

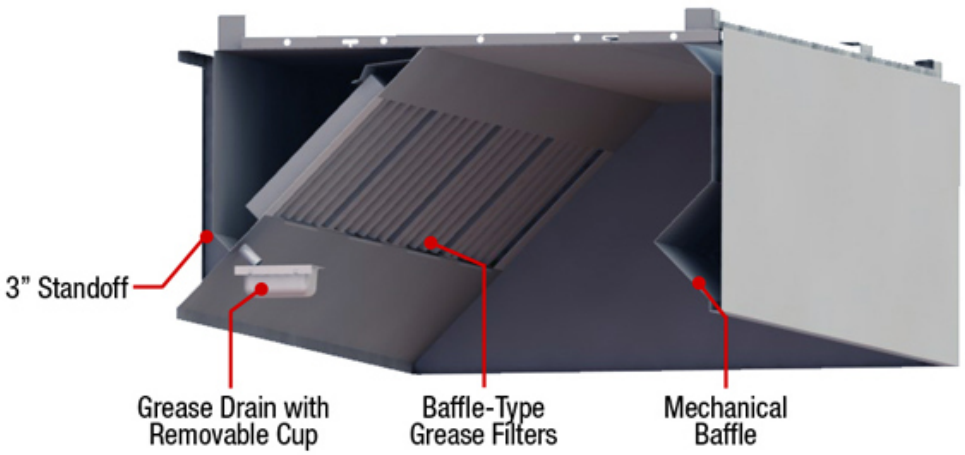
- **Construction:** Polished stainless steel on the interior and exterior of the front enhance aesthetics. Fully welded and polished front corners. Fabricated from Type 430 stainless steel with option of Type 304 available.
- **Channels:** Hood comes standard with structural channels on top and wrapper 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

Project Name:

Model Specified:

Location:

Item No: **Quantity:**

AIA #: **SIS #:**

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)	• One way security screws
Custom laminates	• Locking hasp (lock not included)
Half doors	• Stainless steel mesh cover
Roll-Thru	• Coverless hinges
Hinged glass doors	

Consult factory for other model configurations, options and accessories.

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.

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.)	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

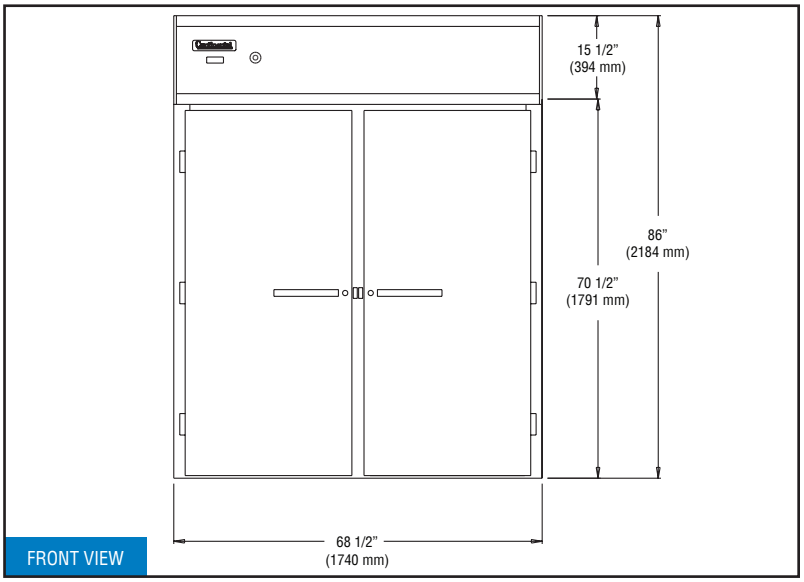
Voltage (int'l)	115/208-230/60/1 (220/50/1)
Total Wattage @ 208-230 Volts	3000
Feed Wires (incl. ground)	4
Total Amps (int'l)	14.5 (13.8)
10 ft. Cord/Plug [attached] (int'l)	No (No)

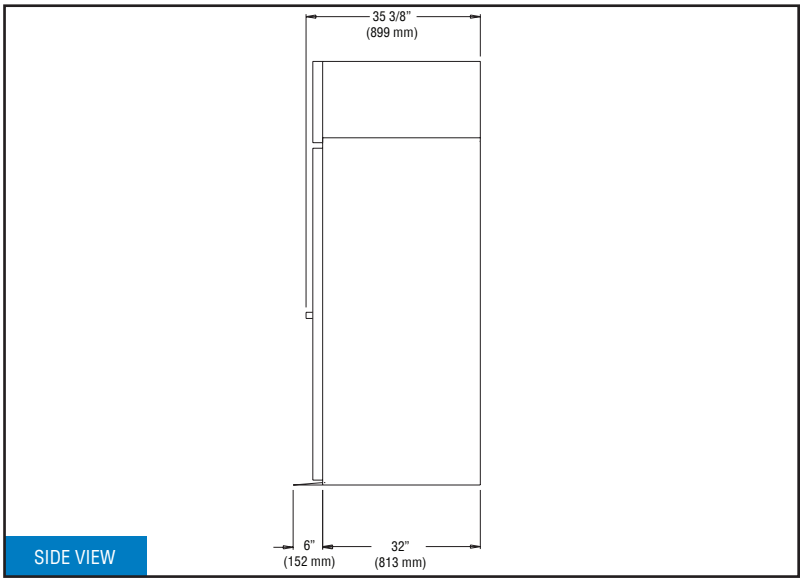
SHIPPING DATA

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.

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.

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.

Continental Refrigerator

Toll-Free: 800-523-7138
Phone: 215-244-1400
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MADE IN THE U.S.A.

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

NSF

Phone:800-255-0104
Fax: 877-877-7687
www.newageindustrial.com
sales@newageindustrial.com

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).

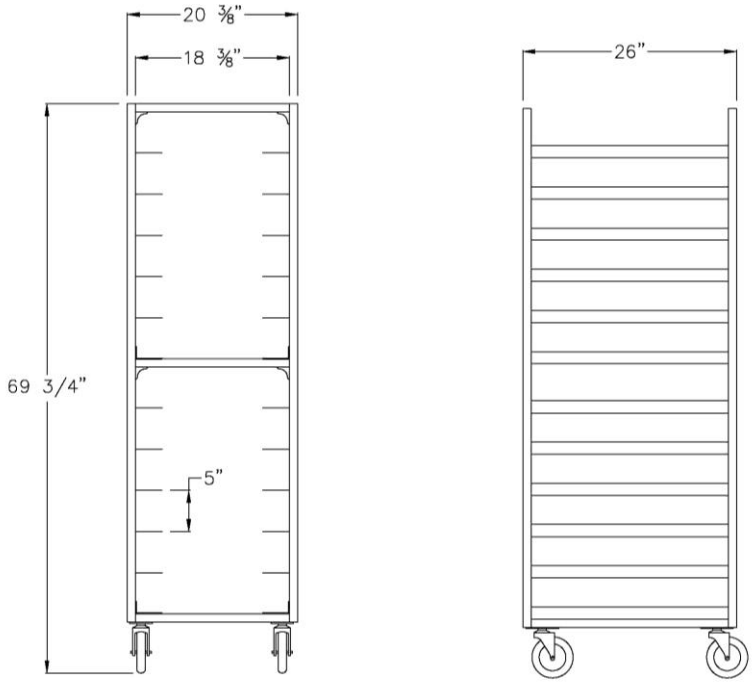
SIDES: Each side had two vertical posts of 1" x 1" x .070 wall tube. Welded to each side are angle runners of 1 1/2" x 3 1/4" x .100 wall aluminum angle, spaced on 3" or 5" centers.

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 #.

Phone:800-255-0104
Fax: 877-877-7687
www.newageindustrial.com
sales@newageindustrial.com

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.

Project Name:

Model Specified:

Location:

Item No: **Quantity:**

AIA #: **SIS #:**

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.

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

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.)	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 (2089 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)

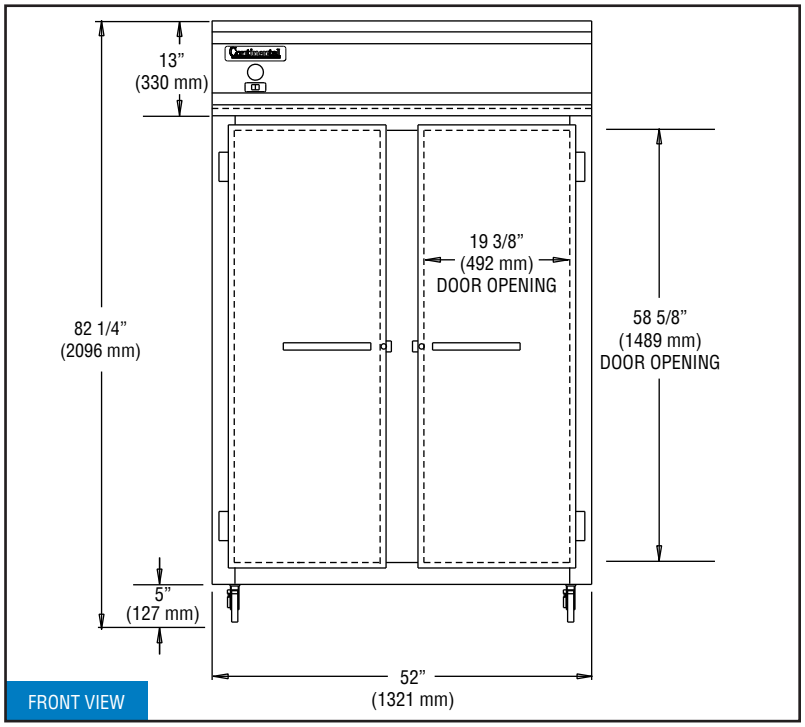
SHIPPING DATA

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)

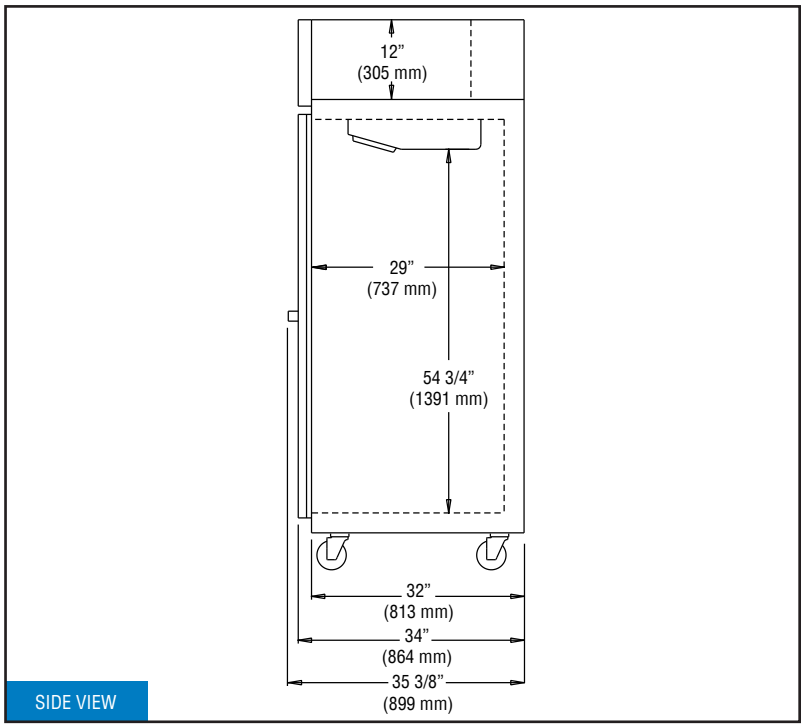
** Rating @ +25°F evaporator, 90°F ambient*
Figures in parentheses reflect metric equivalents rounded to the nearest whole unit.

Equipped with one NEMA-5-15P Plug
(varies by country)

Model Plan Views



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.

Continental Refrigerator

Toll-Free: 800-523-7138
Phone: 215-244-1400
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Intertek

MADE IN THE U.S.A.

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.

Project Name:

Model Specified:

Location:

Item No: **Quantity:**

AIA #: **SIS #:**

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.

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

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.)	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)

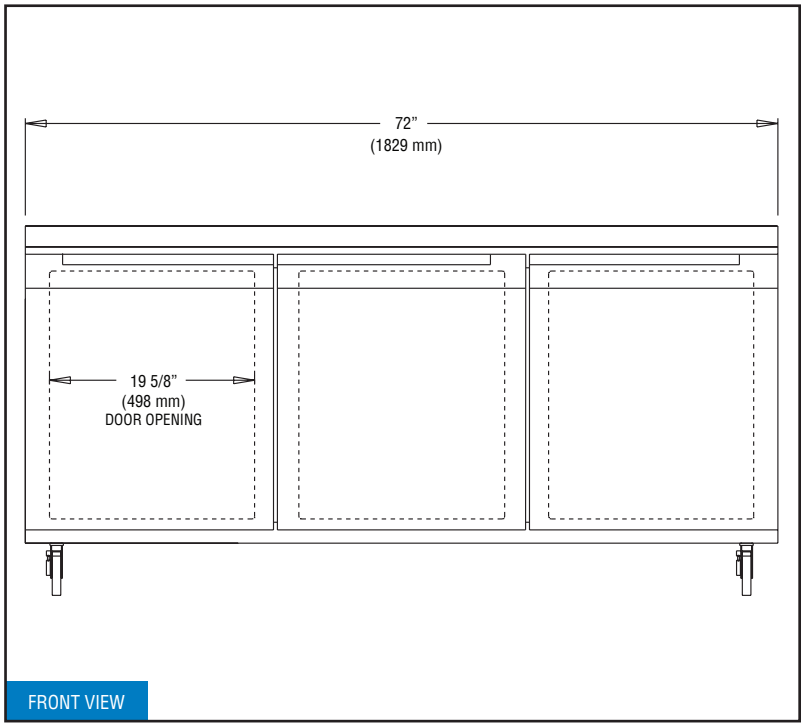
SHIPPING DATA

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)

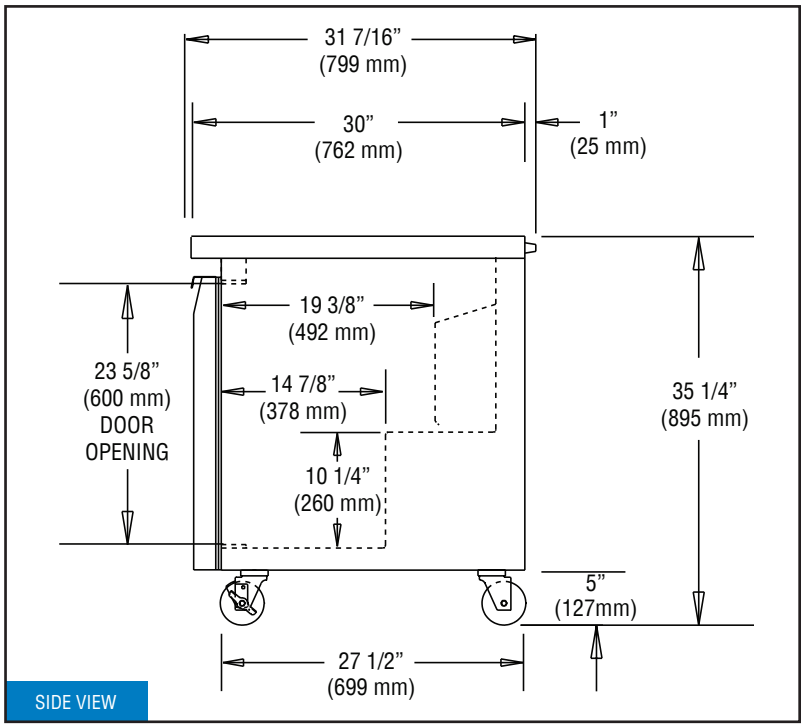
** Rating @ +25°F evaporator, 90°F ambient*
Figures in parentheses reflect metric equivalents rounded to the nearest whole unit.

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®

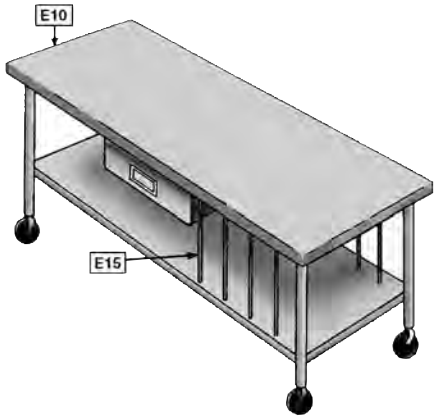
Specification Sheet

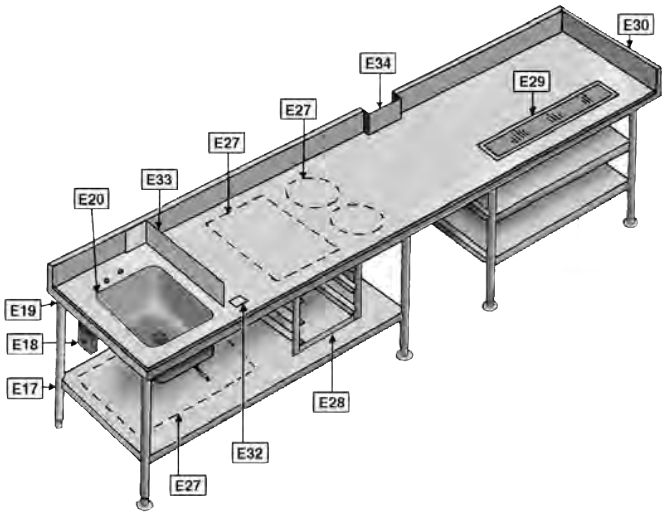
Item No.: _____
Project No.: _____
S.I.S. No.: _____

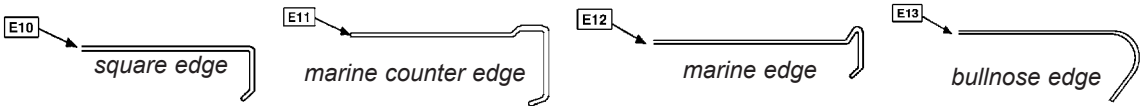
Table Modifications and Accessories

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 overshelf)
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
NSF
(fabricated to NSF-applicable standards)

AUTOQUOTES
KCL

EG10.50 Rev. 04/12

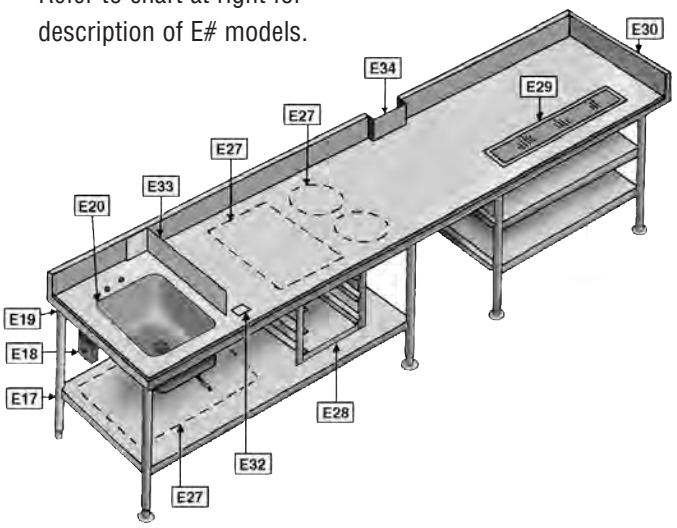
Spec sheets available for viewing, printing or downloading from our online literature library at *www.eaglegrp.com*

EAGLE GROUP
Profit from the Eagle Advantage®

Item No.: _____
Project No.: _____
S.I.S. No.: _____

Table Modifications and Accessories

Refer to chart at right for description of E# models.



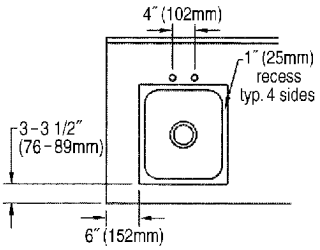
model #	description
Sinks — complete with faucet and basket drain (Specify location)	
E20	- 10″ x 14″ x 9.5″ bowl (254 x 356 x 241mm)
E21	- 14″ x 16″ x 9.5″ bowl (356 x 406 x 241mm)
E22*	- 16″ x 20″ x 8″ bowl (406 x 508 x 203mm)
E23*	- 16″ x 20″ x 14″ bowl (406 x 508 x 356mm)
E24*	- 18″ x 20″ x 14″ bowl (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

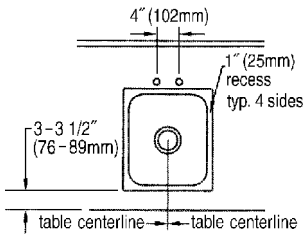
model #	description
E35	16 gauge s/s apron in front of sinks or cutouts
E36	Fully welded - top, undershelf & legs
E36A	Welded base only - undershelf & legs
E37	NSF sprayed-on sound deadening up to 12′ (3658mm)
E37A	- for each additional foot
E38-6***	Cantilever mount up to 6′ (1829mm) - add to wall shelf 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.

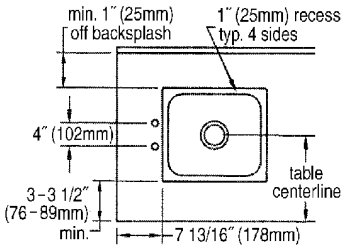
Optional Sinks Built Into Tables – Standard Locations



sink on left/right side of table



sink on center of table



sink with faucet on end of table

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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

Rev. 04/12

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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

Item No.: _____
Project No.: _____
S.I.S. No.: _____

Specification Sheet

Short Form Specifications

Eagle Table Mounted Rack, model _____. Constructed of 3/16″ 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″. 1⅝″ 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 3/16″ 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 hangars for ceiling suspension.

Eagle Wall Mounted Rack, model _____. Constructed of 3/16″ 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

Racks

MODELS:

❑ ***CM36****	❑ ***TM36****	❑ ***WM36****
❑ ***CM48****	❑ ***TM48****	❑ ***WM48****
❑ ***CM60****	❑ ***TM60****	❑ ***WM60****
❑ ***CM72****	❑ ***TM72****	❑ ***WM72****
❑ ***CM84****	❑ ***TM84****	❑ ***WM84****
❑ ***CM96****	❑ ***TM96****	❑ ***WM96****
❑ ***CM108****	❑ ***TM108****	❑ ***WM108****
❑ ***CM120****	❑ ***TM120****	❑ ***WM120****
❑ ***CM132****	❑ ***TM132****	❑ ***WM132****
❑ ***CM144****	❑ ***TM144****	❑ ***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.
- 1⅝″ (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

NSF

AUTOQUOTES

KCL

EAGLE GROUP
100 Industrial Boulevard, Clayton, DE 19938-8903 USA
Phone: 302-653-3000 • Fax: 302-653-2065
www.eaglegrp.com

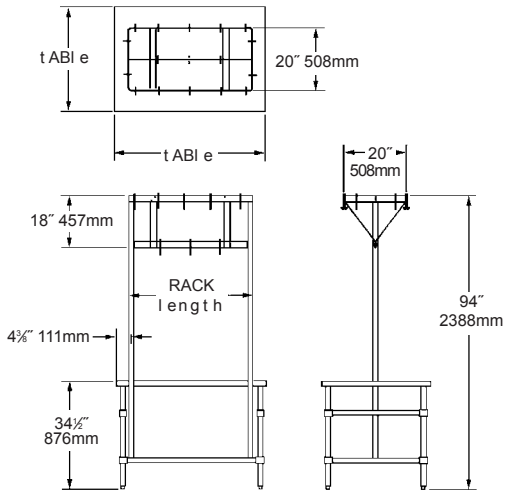
Foodservice Division: Phone 800-441-8440
MHC/Retail Display Divisions: Phone 800-637-5100

For custom configuration or fabrication needs, contact our **SpecFAB® Division.**
Phone: 302-653-3000 • Fax: 302-653-3091 • e-mail: specfab@eaglegrp.com

EAGLE GROUP®
Profit from the Eagle Advantage®

Item No.: _____
Project No.: _____
S.I.S. No.: _____

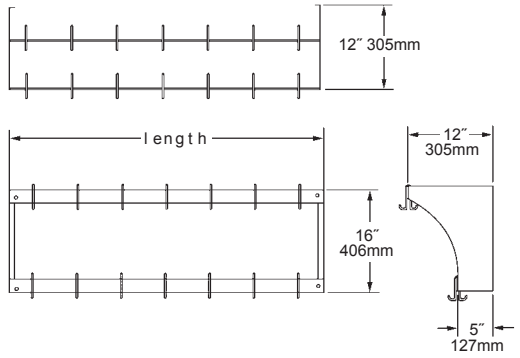
Table Mounted Racks



ALUMINUM	weight		STAINLESS STEEL	weight		rack length		fits table length	
model #	lbs.	kg	model #	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

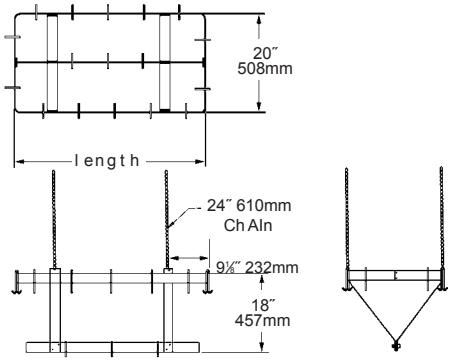
***** These racks include center tubular support.

Wall Mounted Racks



ALUMINUM	weight		STAINLESS STEEL	weight		rack length	
model #	lbs.	kg	model #	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	weight		STAINLESS STEEL	weight		rack length	
model #	lbs.	kg	model #	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

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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.

Project Name:

Model Specified:

Location:

Item No: **Quantity:**

AIA #: **SIS #:**

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.

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

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.)	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)

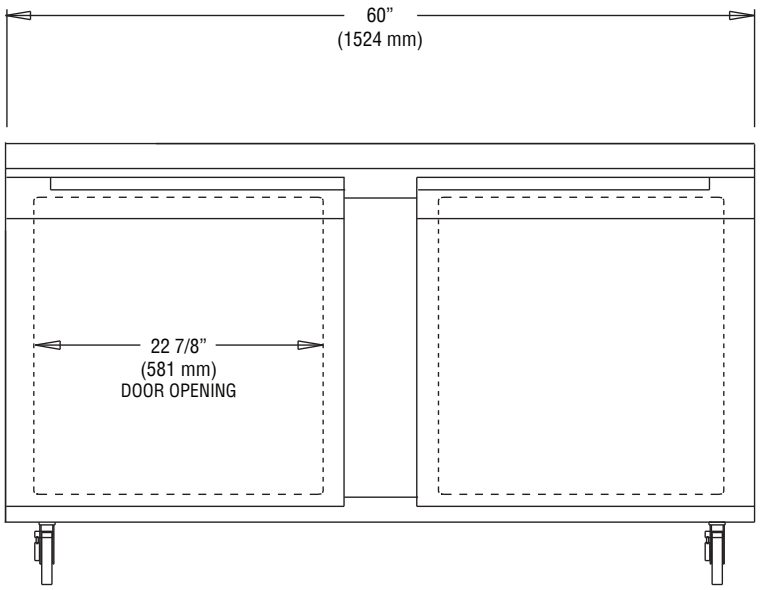
SHIPPING DATA

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)

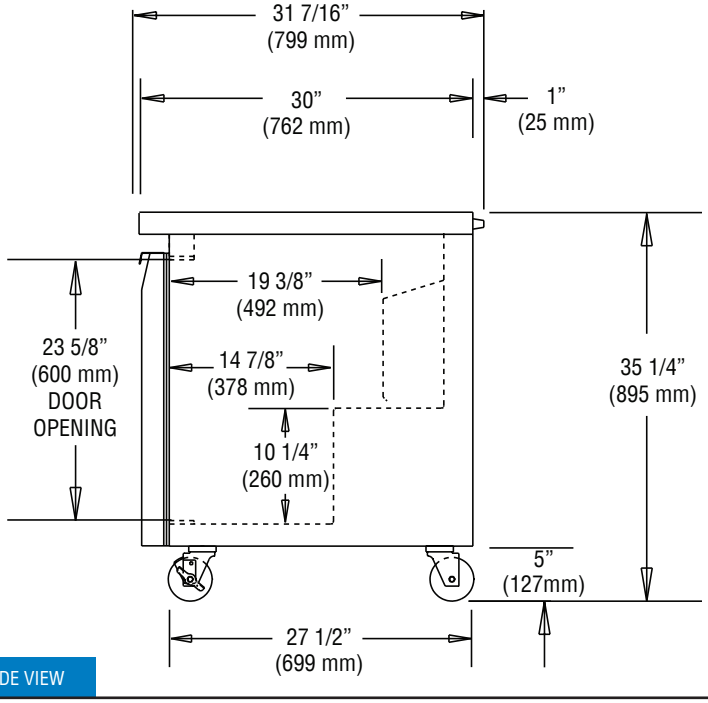
** Rating @ +25°F evaporator, 90°F ambient*
Figures in parentheses reflect metric equivalents rounded to the nearest whole unit.

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.

MADE IN THE U.S.A.

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					

Project_____

Item No._____

Quantity_____

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 ¼" (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

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 availabilty.
- ❑ 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
- ❑ ***SPIN***FRESH See Spec Sheet L10-524 for details

The Australian Gas Association

SOLOFILTER Solstice Gas (SFSG) Series SFSG14, 14R, 14T, 18 Fryer

Pitco Frialator, Inc • P.O. Box 501, Concord, NH 03302-0501 • 509 Route 3A, Bow, NH 03304
603-225-6684 • FAX: 603-225-8497 • www.pitco.com

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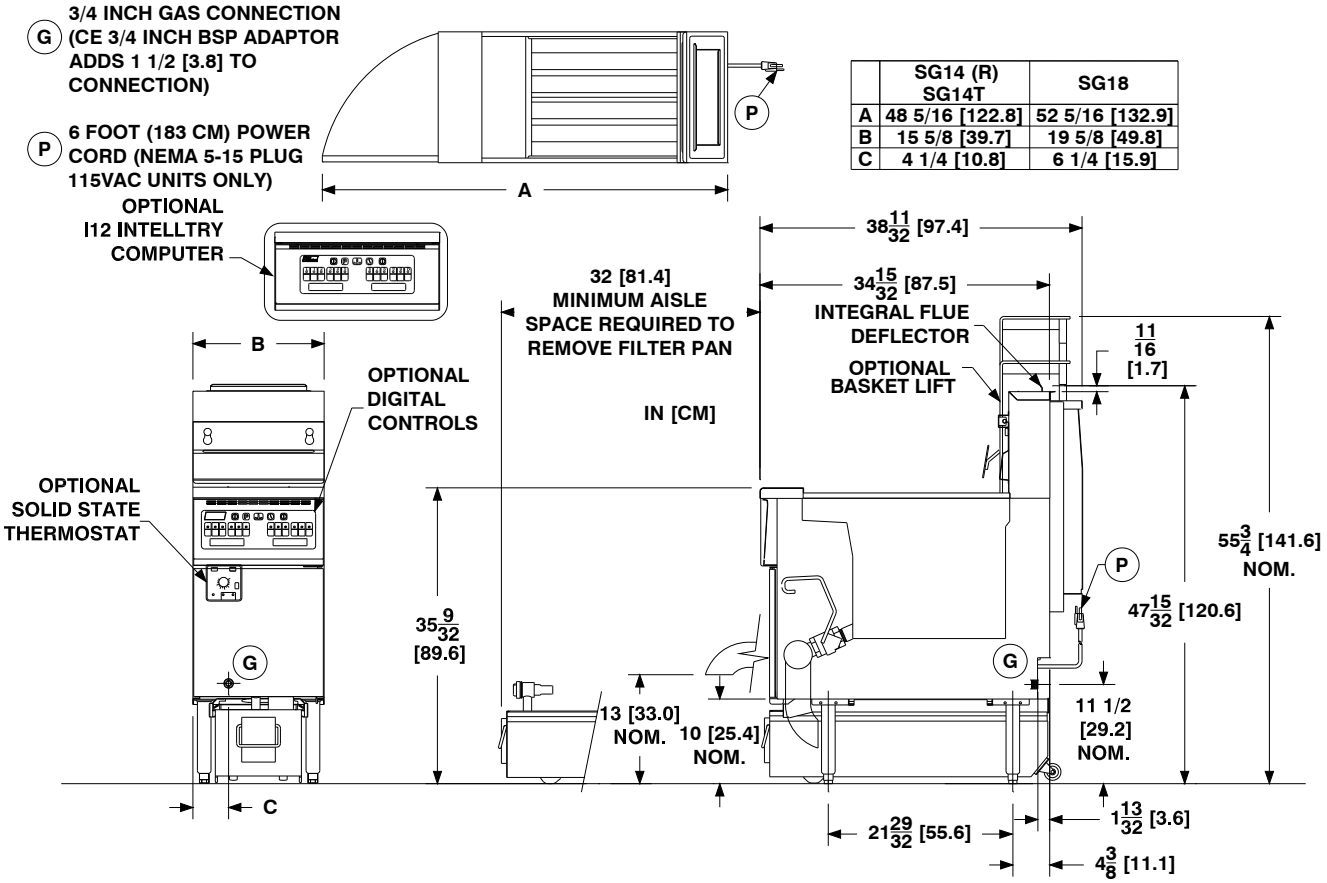
SOLOFILTER Solstice Gas (SFSG) Series SFSG14, 14R, 14T, 18 Fryer

SOLOFILTER Solstice Gas (SFSG) Series SFSG14, 14R, 14T, 18 Fryer



	SG14 (R) SG14T	SG18
A	48 5/16 [122.8]	52 5/16 [132.9]
B	15 5/8 [39.7]	19 5/8 [49.8]
C	4 1/4 [10.8]	6 1/4 [15.9]

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	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
SFSG14T				
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
		Sides min.	Rear min.	Sides min.	Rear min.	
32" (81.4 cm)	6" (15.25 cm)	6" (15.2cm)	6" (15.2cm)	0"	0"	Do not block / restrict flue gases from flowing into hood or install vent hood drains over the flue.

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 t-stat 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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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 breading, 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.

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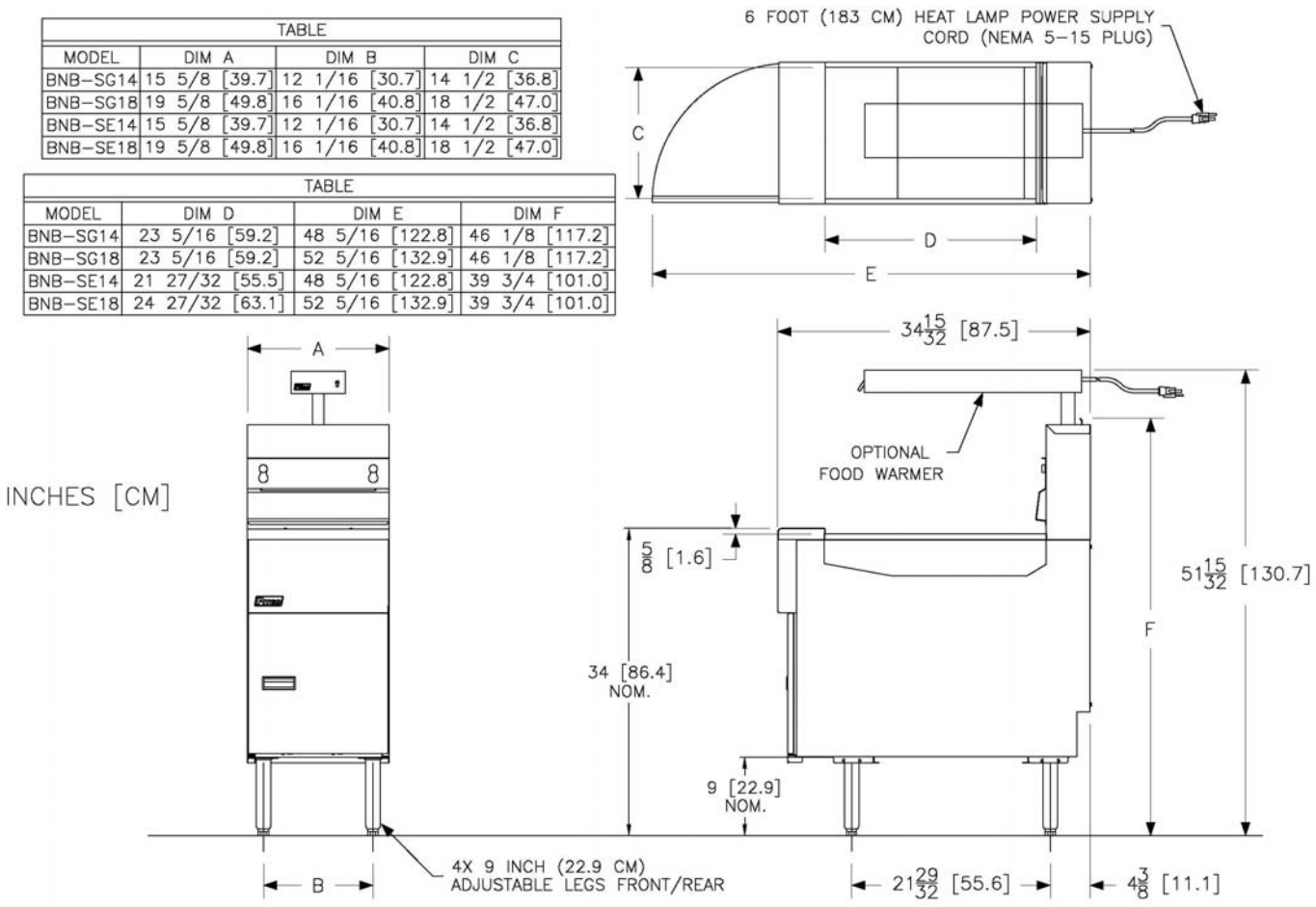
Model SG/SE Solstice Bread & Batter Cabinet-Dump Station

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 ft³ (0.5 m³)
BNB-SG/SE18	175.0 lb (79.4 kg)		

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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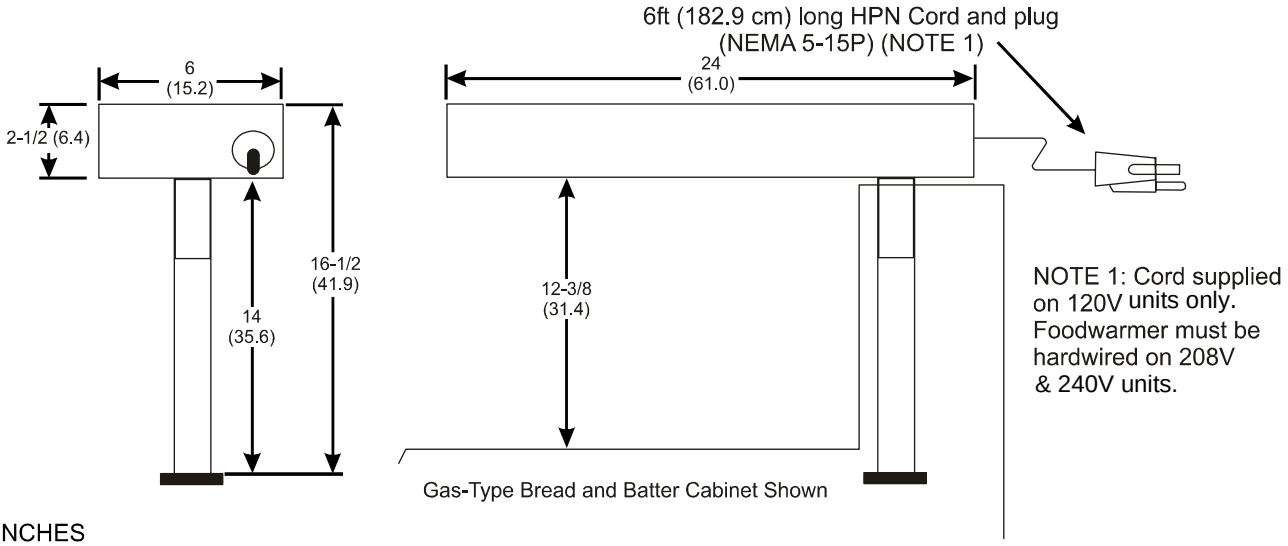
Model PFW-1 & PFW-2 Food Warmers

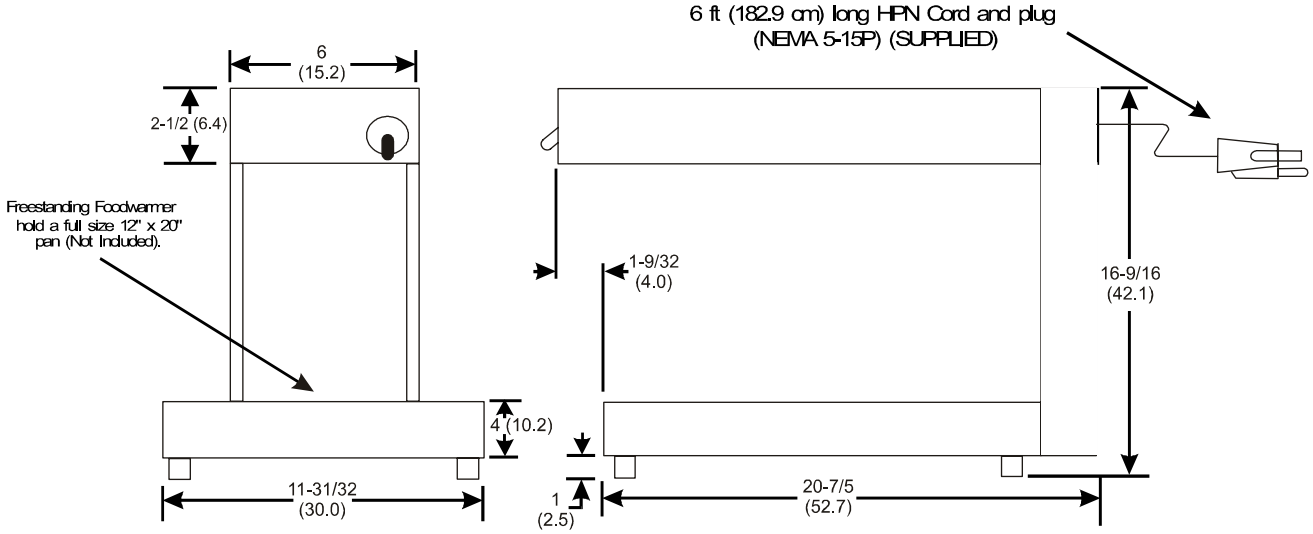
Model PFW-1 & PFW-2 Food Warmers

Model PFW-1 (Built-In)
750 WATT



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**
PFW-2 (500 watt)	4.2	N/A	Specify designed infrared reflecting system maintains food at peak temperature without overcooking.

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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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 recepticle, (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"**

IMC/TEDDY
DECADES OF FINE CRAFTMANSHIP

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 leakproof. 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 walkins 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

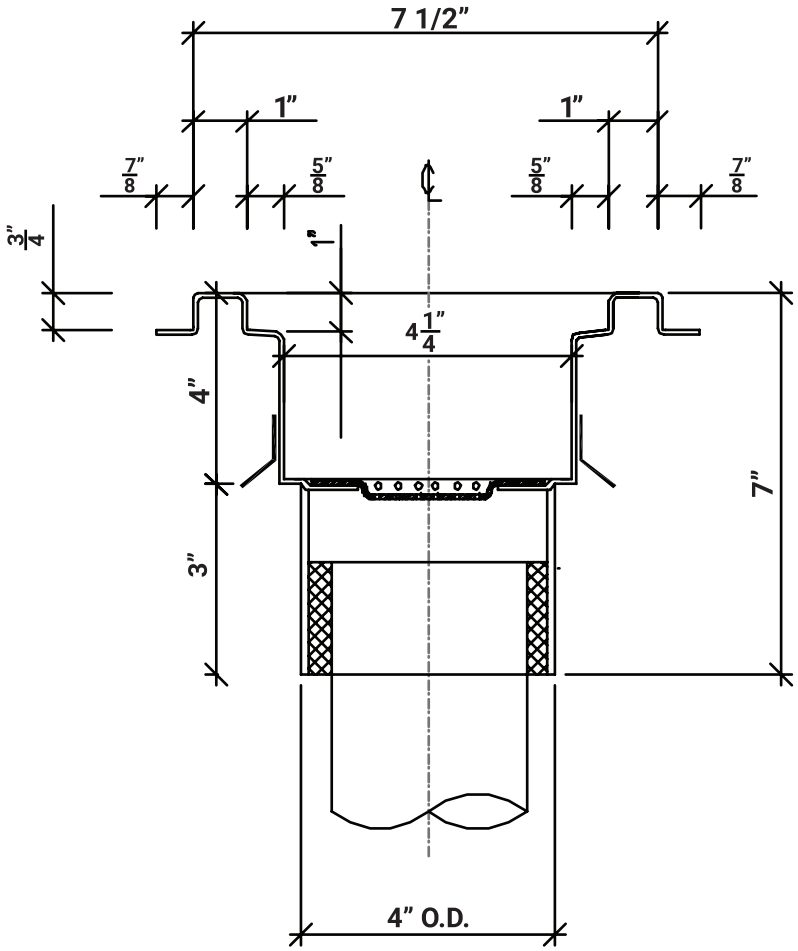
PROUDLY MADE IN THE USA

NSF

FWR-40 0716

IMC/TEDDY
DECADES OF FINE CRAFTMANSHIP

FWR
Floor Water Receptacle



FLOOR WATER RECEPTACLES, STANDARD DESIGN - 4" DEEP

Model	Size (W x L)
☐ FWR-24	7 1/2" x 24"
☐ FWR-36	7 1/2" x 36"
☐ FWR-42	7 1/2" x 42"
☐ FWR-48	7 1/2" x 48"
☐ FWR-54	7 1/2" x 54"
☐ FWR-60	7 1/2" x 60"
☐ FWR-72	7 1/2" x 72"
☐ FWR-84	7 1/2" x 84"
☐ FWR-96	7 1/2" x 96"
☐ FWR-108	7 1/2" x 108"
☐ FWR-120	7 1/2" x 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

Job _____ Item# _____

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).

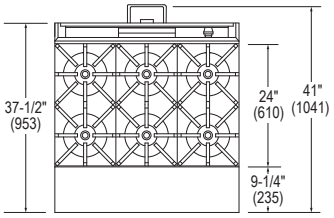
Legs: 6" stainless steel adjustable legs standard.

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.

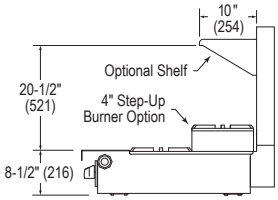
Model 36A: 45,000 BTU NAT (45,000 BTU LP) convection oven with standing pilot and thermostat range of 175°F to 550°F (79°C to 288°C). Porcelain enamel interior, measuring 14” high x 26” wide x 24” deep. Three racks with five-position side rails. Two-speed, 1/2 hp blower motor.

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



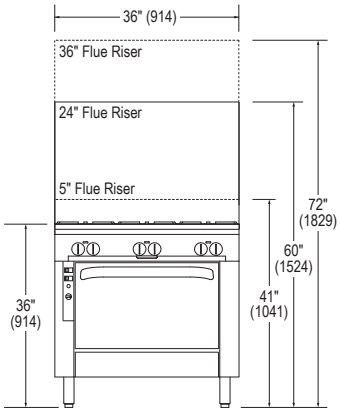
SIDE VIEW of MODULAR MODEL

Solid shelving has a depth of 10".

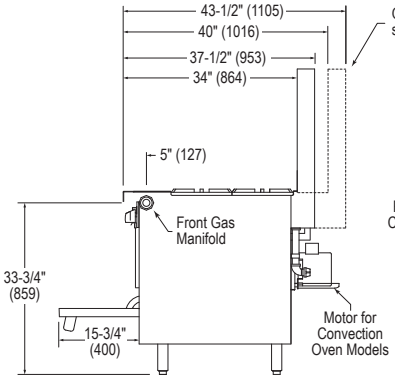
Tubed and Tray shelving have a depth of 11-1/8".

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)

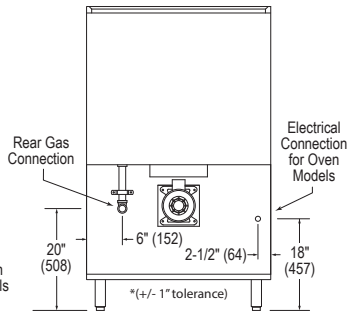
Dimensions shown in inches and (millimeters)



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.

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

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).

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

- ❑ External pressure regulator
- ❑ Front rail options:
  - ❑ Cutouts in front rail for sauce pans
  - ❑ 7-1/4" deep front rail (to match old style sectional)
  - ❑ Square belly bar mounted on 7-1/4" deep front rail
- ❑ Casters (front two casters lock)
- ❑ Cable restraint kit (to restrict movement when on casters)
- ❑ 24" or 36" high flue riser
- ❑ Shelves on flue riser (one on 24" flue riser, one or two on 36" flue riser, 10" deep)
- ❑ Tray or tubular shelving (12" deep)
- ❑ Open-frame base with casters for battery
- ❑ Extra-deep rear-extending flue riser
- ❑ Stainless steel oven interior
- ❑ Salamander or cheesemelter mounted on 36" high flue riser
- ❑ Removable shelf inside cabinet
- ❑ Electronic pilot ignition - Piezo
- ❑ Removable, cast iron grate tops
- ❑ Electronic oven pilot ignition (no charge)
- ❑ Battery spark ignition for open tops

INTENDED FOR COMMERCIAL USE ONLY.
NOT FOR HOUSEHOLD USE.

Since 1898 SOUTHBEND

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.

Project Name:

Model Specified:

Location:

Item No: **Quantity:**

AIA #: **SIS #:**

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.

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

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.)	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)

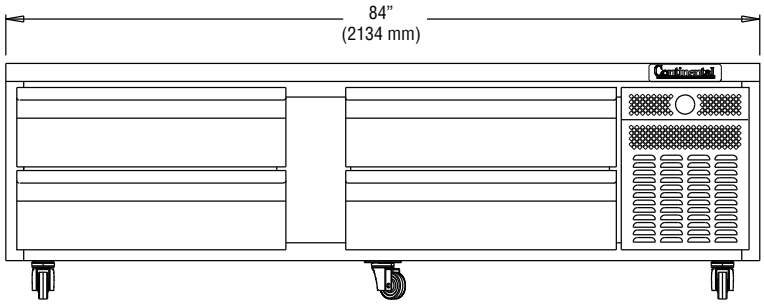
TOP WEIGHT CAPACITY

Max. Top Weight Capacity (lbs.)	1400 (635 kg)

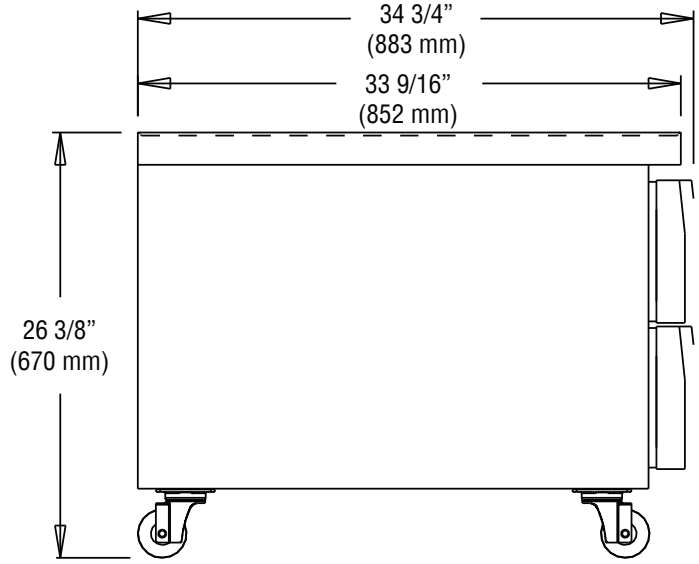
** Rating @ +25°F evaporator, 90°F ambient*
Figures in parentheses reflect metric equivalents rounded to the nearest whole unit.

Equipped with one NEMA-5-15P Plug
(varies by country)

Model Plan Views

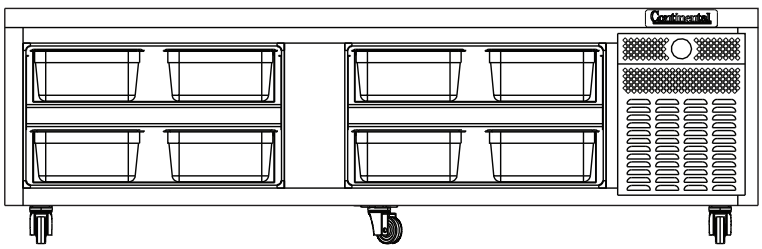


FRONT VIEW



SIDE VIEW

Shown with (8) 12 x 20 x 6 pans (not furnished)



DRAWER PAN CONFIGURATION

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.

Intertek

MADE IN THE U.S.A.

DL84G (3/8/17)

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:

Sat May 13 14:08:37 CEST 2017

Specification

CombiMaster® Plus XS 61 G (6 x 12 x 20 inch/6 x 13 x 18 inch)

2 years RATIONAL warranty

5 years warranty on steam generator

ENERGY STAR

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 ¼ 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

NSF/ ANSI 4

Project:	Quantity:	Item No:	FCSI Section:	Approval:	Date:

Sat May 13 14:08:37 CEST 2017

Specification

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 ft²/h
One side against a wall	8405 ft²/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 (Cl2)	< 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, Commercium
Rolling Meadows, IL 60008
Toll Free: 888-320-7274, Fax.: 847-755-9583

Visit us on the internet: www.rationalusa.com

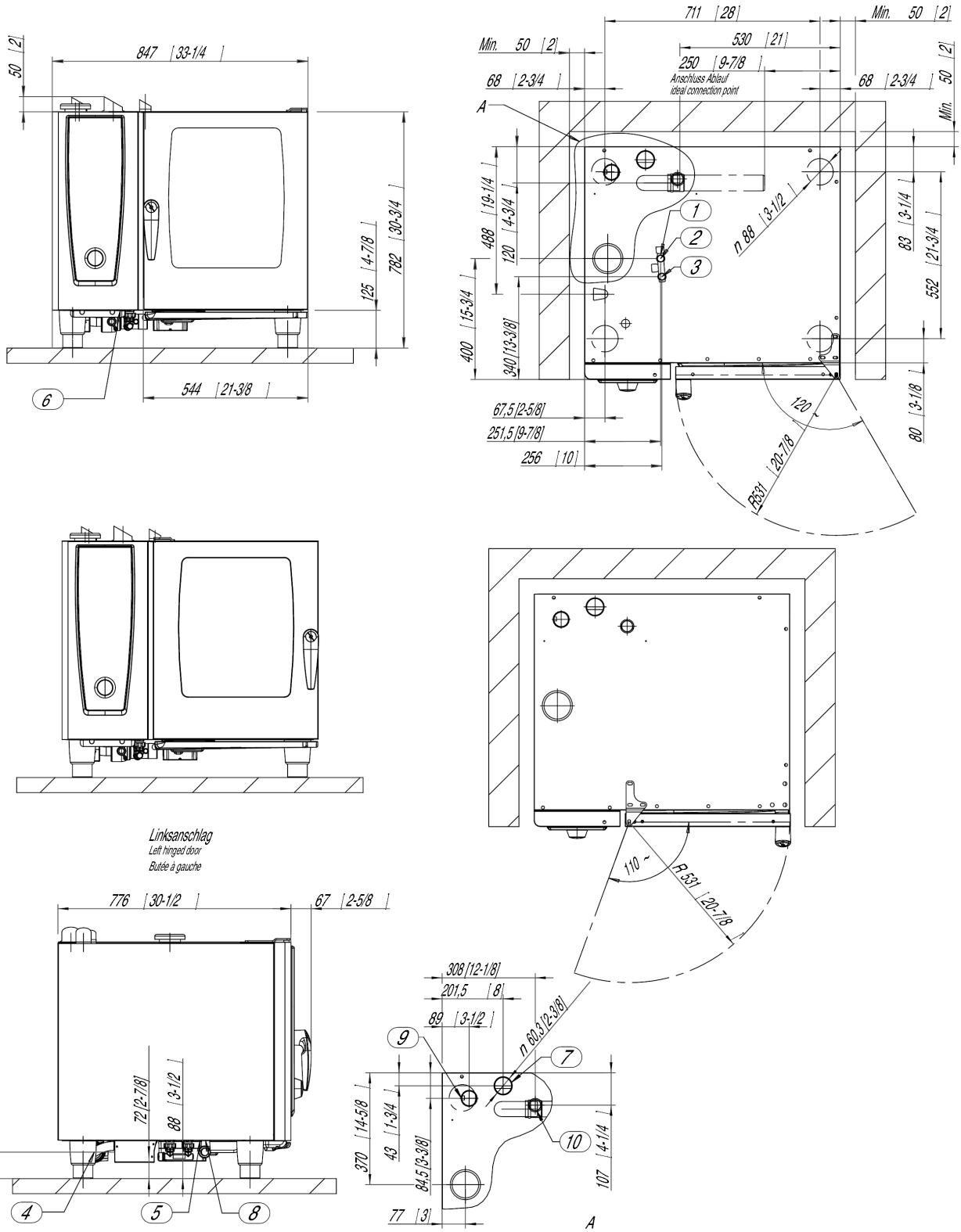
We reserve the right to make technical improvements

Project:	Quantity:	Item No:	FCSI Section:	Approval:	Date:

Sat May 13 14:08:37 CEST 2017

Specification

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 ¾ 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:

Sat May 13 14:08:37 CEST 2017

Specification

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

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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

WHATCOM
GAS VERTICAL ROTISSERIE

Job Name	
Model	WS-GVR-10
Item#	

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

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.

Optional Rear Door (rear view) shown.

Optional Closed Cabinet & Rear Door (rear view) shown.

Intertek ANSI Z83.11:2016 Ed.4 CSA 1.8:2016 Ed.4

Intertek ANSI/NSF STD 4

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woodstone-corp.com

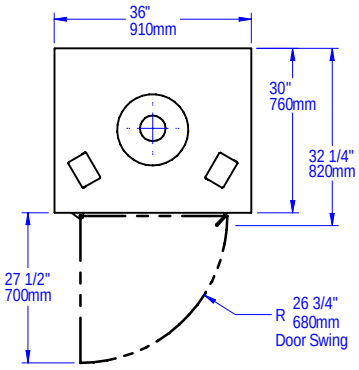
REVISED: SPRING 2017

Wood Stone

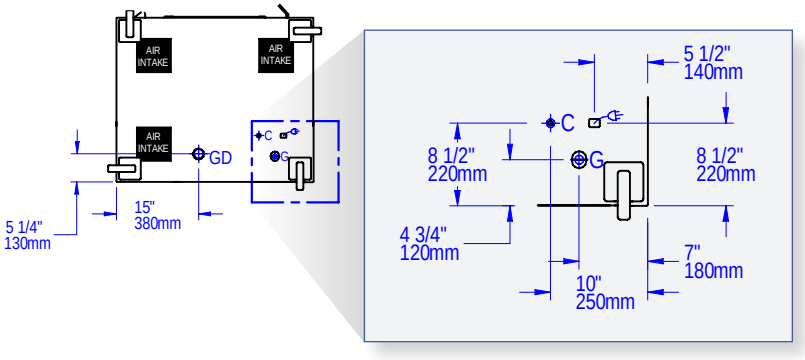
WHATCOM
GAS VERTICAL ROTISSERIE • WS-GVR-10

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

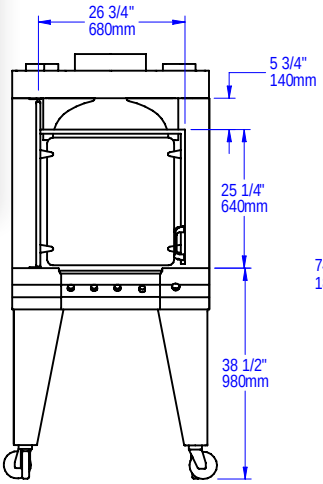


BOTTOM VIEW
w/bottom utility connections
on (optional) rear door models

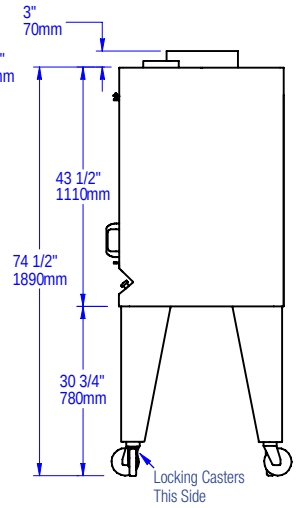


C	Water Supply ¼" NPT
G	Gas Inlet ¾ NPT
GD	Grease Drain
	Cord with NEMA 5-15 Plug
	AIR INTAKE

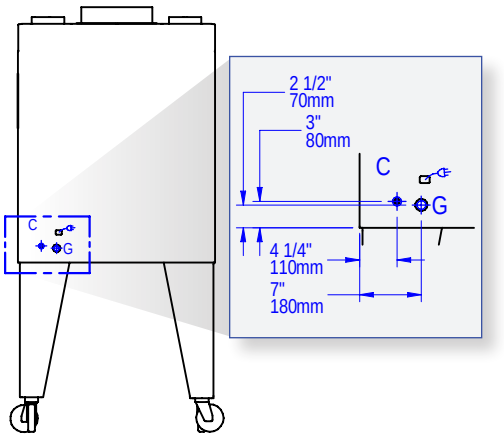
FRONT VIEW



SIDE VIEW



REAR VIEW
w/standard rear utility connections



UTILITIES SPECIFICATIONS

GAS
¾ 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 ¼" 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 1½" 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

Intertek ANSI Z83.11:2016 Ed.4 CSA 1.8:2016 Ed.4

Intertek ANSI/NSF STD 4

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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.

Project Name:

Model Specified:

Location:

Item No: **Quantity:**

AIA #: **SIS #:**

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
Additonal epoxy-coated steel shelves	Special electrical requirements (*consult factory*)
Drawers in lieu of doors	

Consult factory for other model configurations, options and accessories.

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)

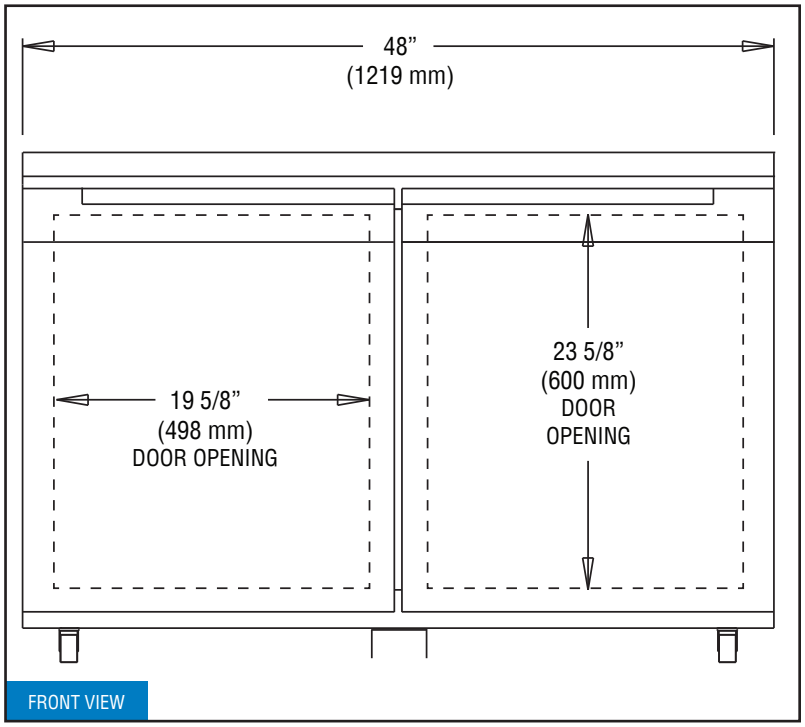
SHIPPING DATA

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)

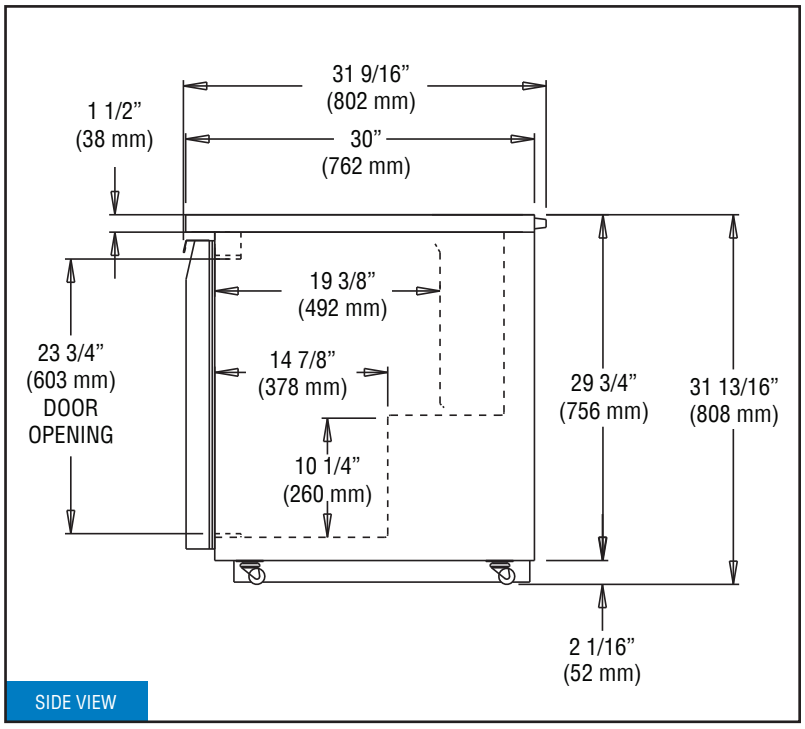
** Rating @ +25°F evaporator, 90°F ambient*
Figures in parentheses reflect metric equivalents rounded to the nearest whole unit.

Equipped with one NEMA-5-15P Plug
(varies by country)

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.

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MADE IN THE U.S.A.

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	Casters, 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.

Project Name:

Model Specified:

Location:

Item No: **Quantity:**

AIA #: **SIS #:**

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.

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

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)
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)

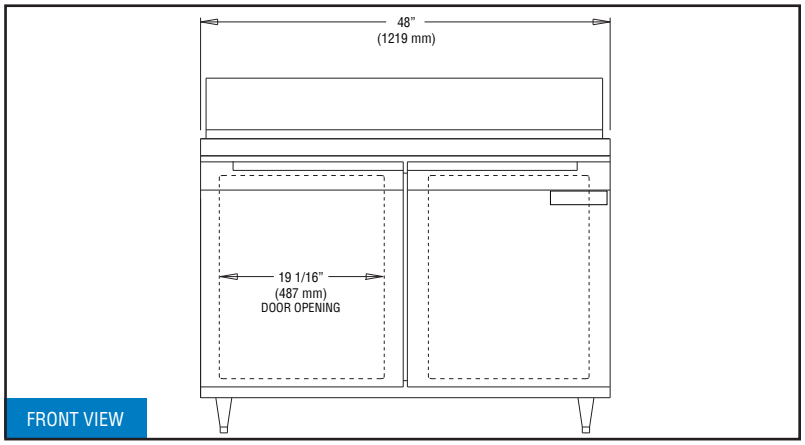
SHIPPING DATA

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)

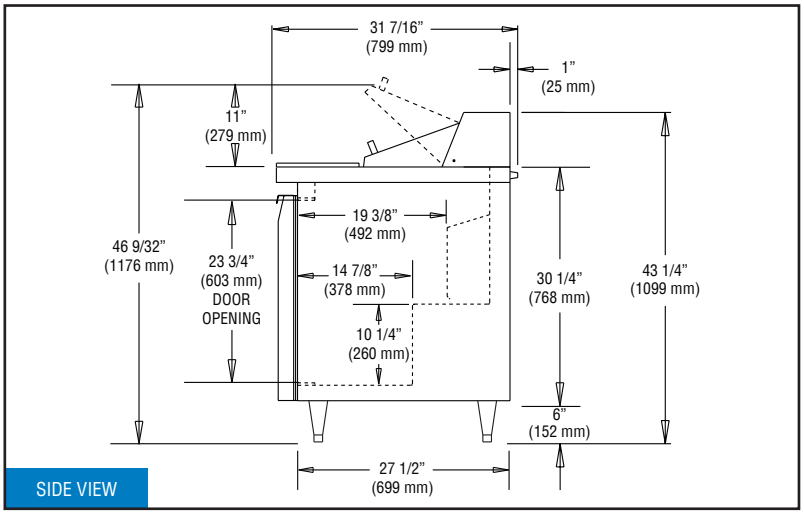
** Rating @ +25°F evaporator, 90°F ambient*
Figures in parentheses reflect metric equivalents rounded to the nearest whole unit.

Equipped with one NEMA-5-15P Plug
(varies by country)

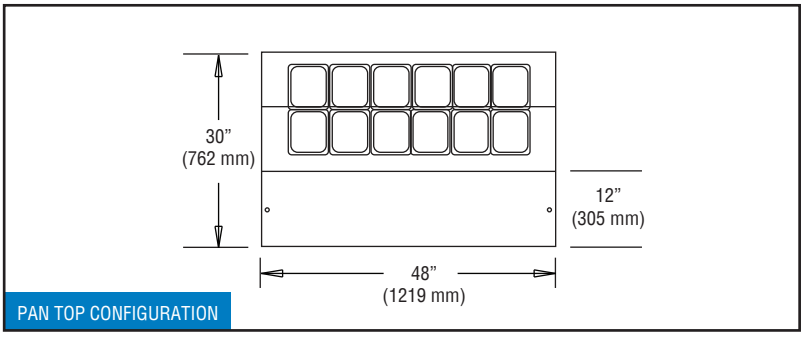
Model Plan Views



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.

Continental Refrigerator

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Phone: 215-244-1400
Fax: 215-244-9579

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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			

CRES COR®

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

NSF/ANSI 4

C US

ACCESSORIES and OPTIONS

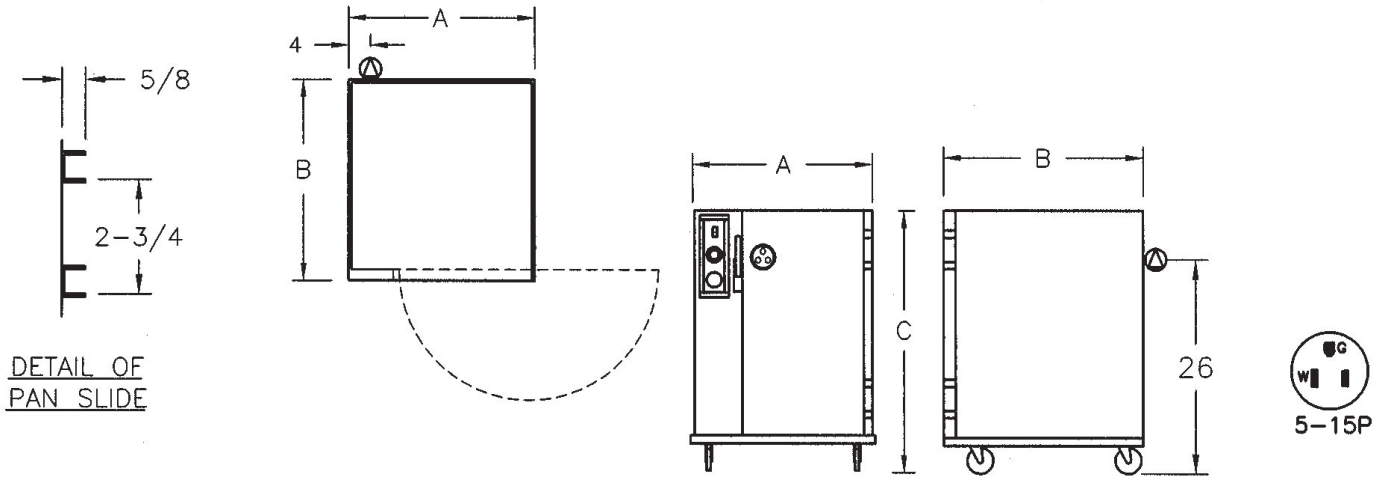
(Available at extra cost):

- ❑ 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.

CRES COR®
5925 Heisley Road • Mentor, OH 44060-1833
Phone: 877/CRESCOR • Fax: 440/350-7267
www.crescor.com

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.

CRES COR®
5925 Heisley Road • Mentor, OH 44060-1833
Phone: 877/CRESCOR • Fax: 440/350-7267
www.crescor.com

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

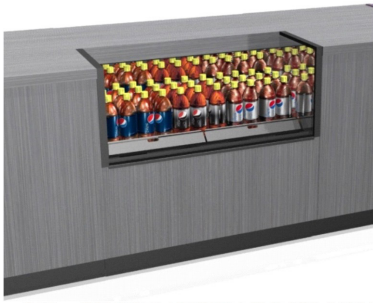
	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1	110-120	60	1	Cord & Plug			15.02				
2						5-20P					

Oasis®
Product Specifications

ITEM NO.
PROJECT:
DATE:

Refrigerated Self-Service Counter Case

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

	Lengths include end panels
□ CO33R	36-1/4"L x 32-3/8"D x 33-3/4"H
□ CO43R	47-1/4"L x 32-3/8"D x 33-3/4"H
□ CO53R	59-1/4"L x 32-3/8"D x 33-3/4"H
□ CO63R	71-1/4"L x 32-3/8"D x 33-3/4"H

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	□ Freestanding (-FS) Counter ht. 33-3/4"H; freestanding unit w/2 end panels. Top & front panels positioned between end panels	□ Counter height (-CH) Counter ht. 33-3/4"H; Top & front panels extended over end panels to blend w/adj. counters (supplied by others) □ 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	□ Laminated (non-premium) Confirm pattern/grain direction	□ Laminated (premium) Confirm pattern/grain direction □ Stainless steel exterior
INTERIOR COLOR	□ Black interior	□ Stainless steel interior
END PANEL LEFT	□ Square full end panel w/mirror	□ Curved end panel w/mirror (-FS model only) □ No end panel w/ synchronized defrost
END PANEL RIGHT	□ Square full end panel w/mirror	□ Curved end panel w/mirror (-FS model only) □ No end panel w/ synchronized defrost
EXTERIOR BACK PANEL	□ Solid back panel, black	□ Solid back panel, stainless steel
ELECTRICAL CONNECT	□ 6' straight blade power cord (self-cont.)	□ 6' locking power cord (self-cont.) □ Electrical leads (remote)
REFRIGERATION	□ Breeze~E (Type-II) w/ EnergyWise s/c refrigeration	□ Note: Remote doesn't incl Conds unit. Floor drain reqd. □[1] Remote w/thermostat, solenoid & TXV
MISCELLANEOUS		□ Second year parts & labor warranty (excludes compressor)
ACCESSORIES		□ 2"H Full depth display riser(s) for lower display □ Clean Sweep® coil cleaner (n/a w/remote) □ Night curtain, retractable, non-locking □ Solid security cover, removable, locking

Option Notes: 1 - See tech spec for remote load reqmts

Structural Concepts
888 E. Porter Rd.
Muskegon, MI 49441
Ph. 231-798-8888
Fx. 231-798-4960
www.structuralconcepts.com

Note: Information is subject to change at any time.
Visit www.structuralconcepts.com for the most current specs.

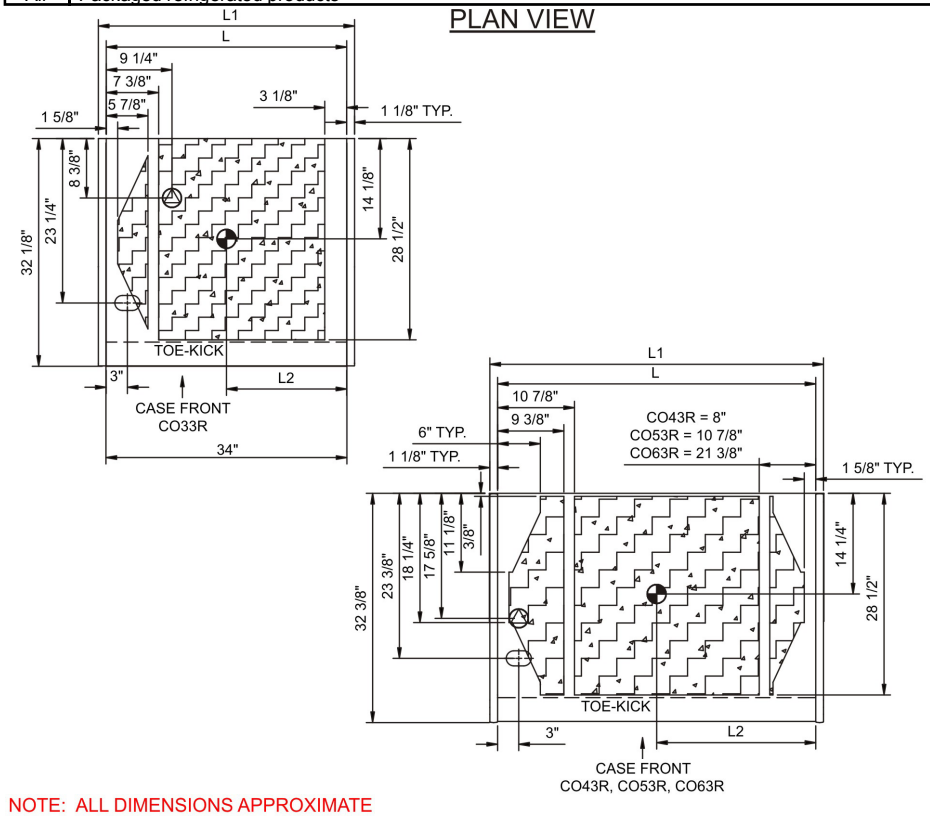
Revised 8/4/2017 20030431

Oasis®

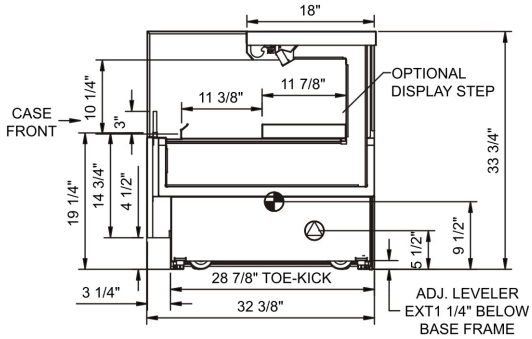
Product Specifications

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

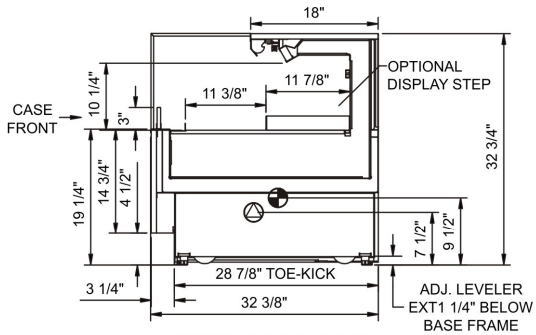
PLAN VIEW



SIDE VIEW



STANDARD COUNTER HEIGHT -FS & -CH MODELS



UNDER COUNTER HEIGHT -UC MODELS

NOTE: ALL DIMENSIONS APPROXIMATE

- ELECTRICAL JUNCTION BOX (SUPPLIED WITH 6" LEADS OR POWER CORD).
- LOCATION OF DRAIN TUBE FOR REMOTE REF. ONLY (SUPPLIED WITH $\frac{3}{4}$" OR $1\frac{1}{2}$" PVC TUBE).
- 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
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	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) 33" Minumum entry door clearence 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.).

Structural Concepts
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www.structuralconcepts.com

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Visit www.structuralconcepts.com for the most current specs.

Revised 8/4/2017 20030431

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


GRSBF-60-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**

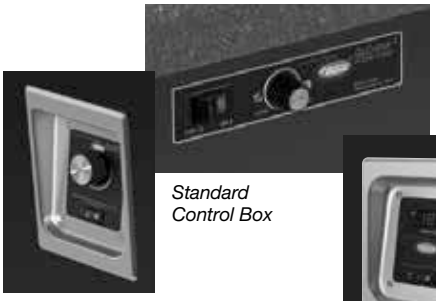
☐ Warm Red ☐ Black ☐ Gray Granite ☐ White Granite
☐ Navy Blue ☐ Hunter Green ☐ Antique Copper

☐ 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 electronic control box with lighted On/Off rocker switch and angled recessed controls

Optional flush mount recessed thermostatic 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.

ANSI/NSF 4

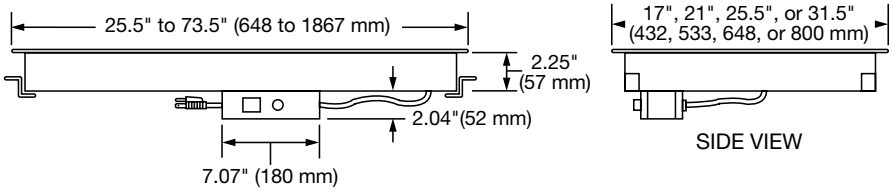
MADE IN THE USA

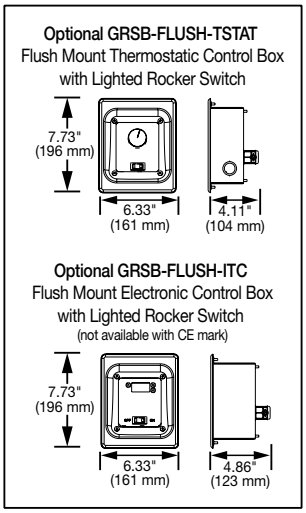
HATCO CORPORATION | P.O. Box 340500 Milwaukee, WI 53234-0500 U.S.A.
(800) 558-0607 | (414) 671-6350 | www.hatcocorp.com | equipsales@hatcocorp.com | intlsales@hatcocorp.com

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





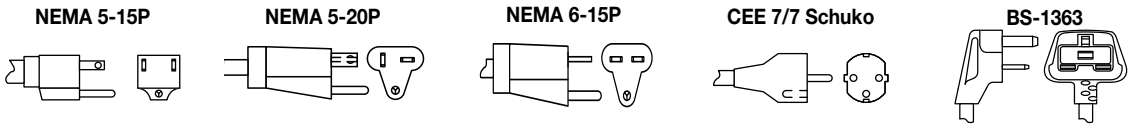
GRSBF Built-In Countertop Cut-Out Dimensions

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



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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	
			230-240 (CE)		505-550	2.2-2.3	BS-1363	
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	
			230-240 (CE)		611-665	2.7-2.8	BS-1363	
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	
			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	
			230-240 (CE)		813-885	3.5-3.7	BS-1363	
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	
			230-240 (CE)		918-1000	4.0-4.2	BS-1363	
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		
			220		1894	8.6	CEE 7/7 Schuko	68 lbs. (31 kg)
			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).

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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

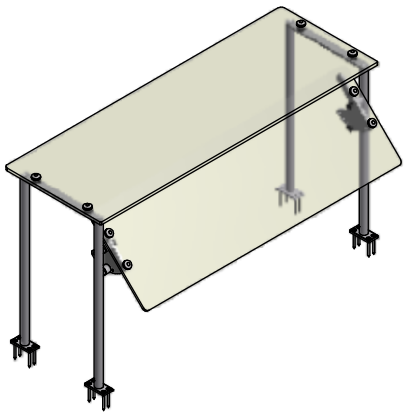
Adjustable Self-Service Protector w/ Shelf

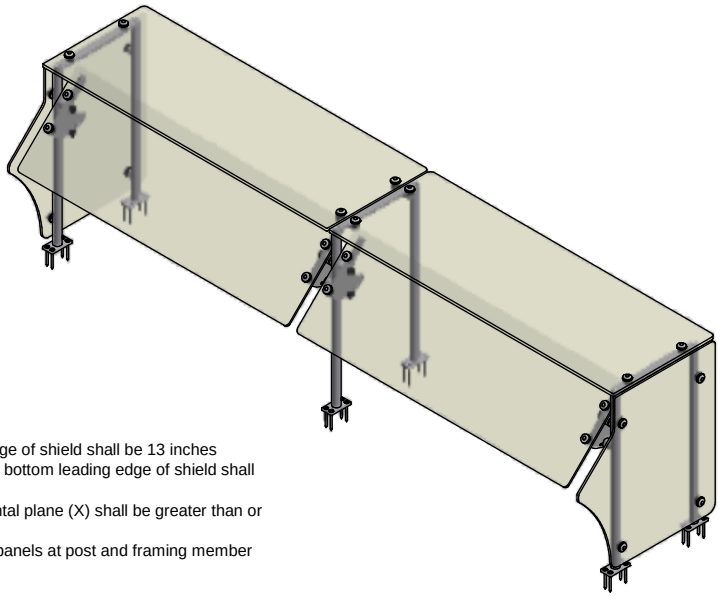
FINISH:
- ☐ Brushed Stainless Steel
- ☐ Clear Anodized Aluminum
- ☐ Powder Coat:
  - ☐ Black ☐ Silver
  - RAL # _____

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 shell be 2 inches

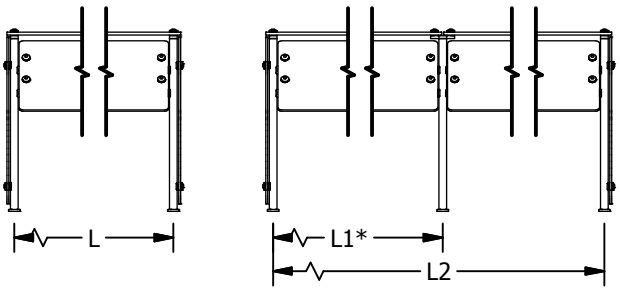
5.35.7.10 Food shields for use on mobile buffet counters shall conform to 5.35.7

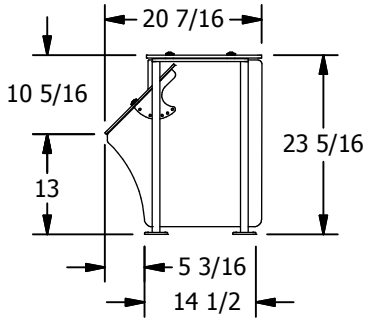
5.35.6 A vertical barrier (end shield) shall be provided at each end of a foodshield. The vertical barrier shall be a minimum of 18 inches deep (front to back) beginning at the bottom leading edge of the foodshield. The minimum height of the vertical barrier shall be equal to the overall height of the 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)

Versa-Gard,LLC - 1094 Parkway Industrial Park Drive, Buford, GA 30518

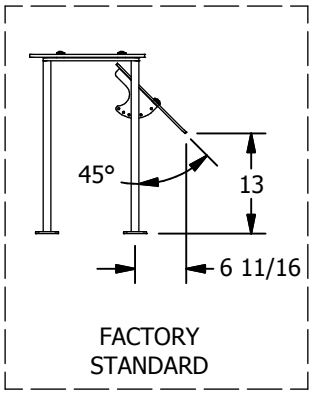
05/02/11

VG3.3-SK

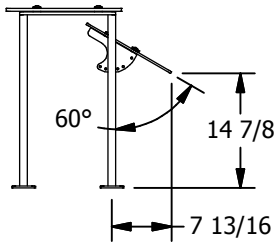
Protected by US Patent 7,040,723
Other Patents Pending

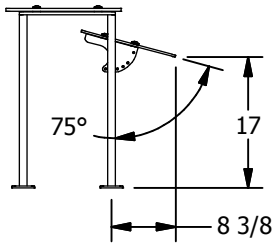
Adjustable Self-Service Protector w/ Shelf

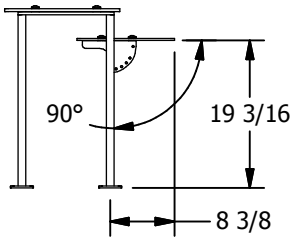
GLASS SETTING - 1



FACTORY STANDARD

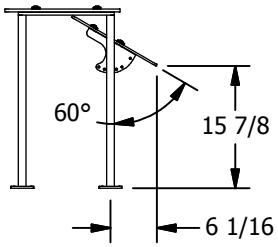


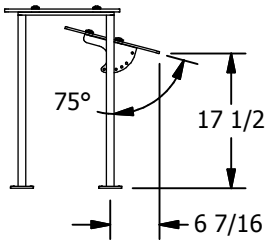


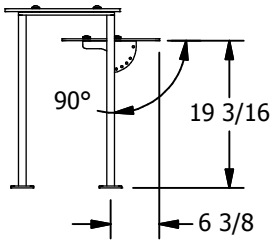


GLASS SETTING - 2

FACTORY STANDARD CONFIGURATION NOT AVAILABLE AS 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

Frymaster

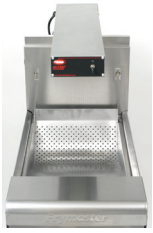
Food Warmers/Holding Stations/Spreader Cabinets

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.

NSF

c UL us LISTED

CE

Agency approvals are for food warmers only.

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

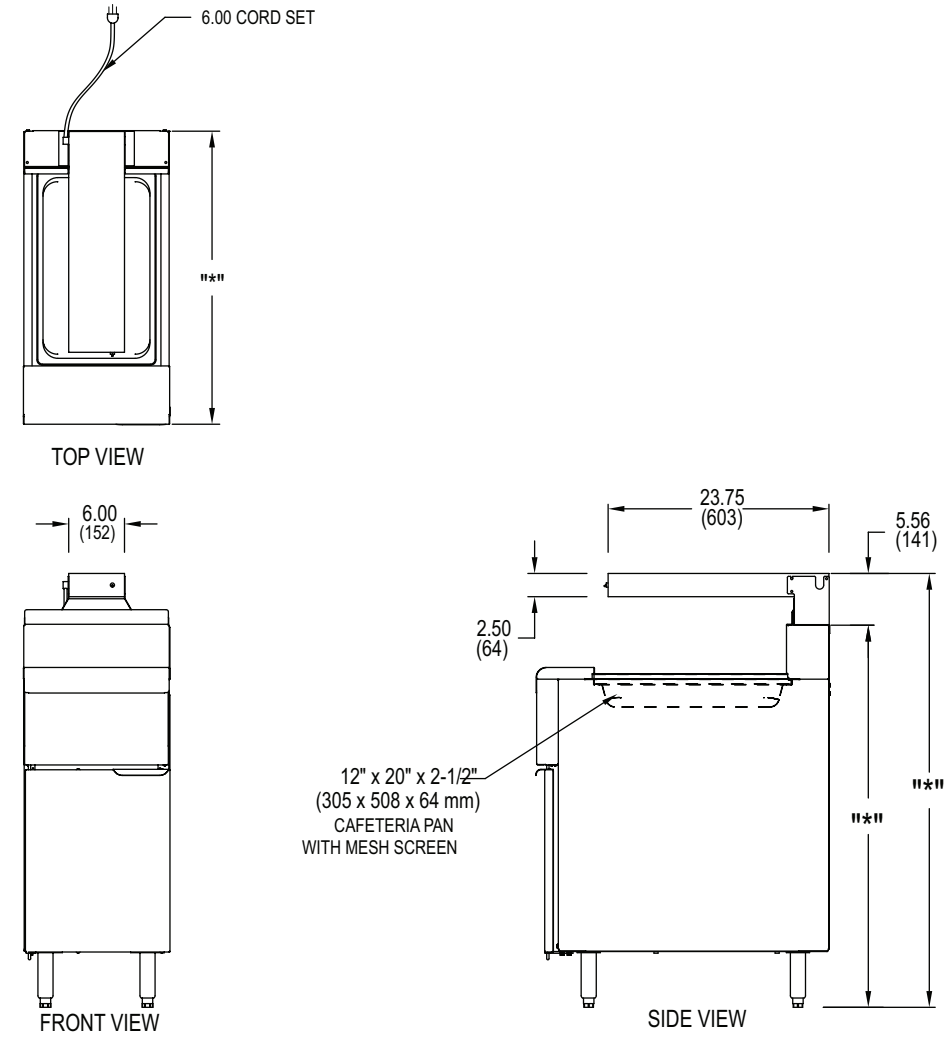
www.frymaster.com
Bulletin No. 818-0061
Revised 6/26/13

Manitowoc

Food Warmers/Holding Stations/Spreader Cabinets

Frymaster

Food Warmers/Holding Stations/Spreaders



DIMENSIONS

DESCRIPTION	HEIGHT	WIDTH	LENGTH
Food warmer Food warmer (CE)	2-1/2″ (6.4 cm) 2-1/4″ (5.7 cm)	6″ (15.4 cm)	23-3/4″ (60.3 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

Model #_____

CSI Section 11400

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

Manitowoc

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)

☐ CR-1 ☐ CRM-1 [1 Burner]	☐ CR-2 ☐ CRM-2 [2 Burners]	☐ CR-3 ☐ CRM-3 [3 Burners]	☐ CR-4 ☐ CRM-4 [4 Burners]	☐ CR-5 ☐ CRM-5 [5 Burners]	☐ CR-6 ☐ 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]

THE MONTAGUE COMPANY • 1830 Stearman Avenue, Hayward, CA 94545 • 800 345-1830 • Fax: 510 785-3342 • montaguecompany.com

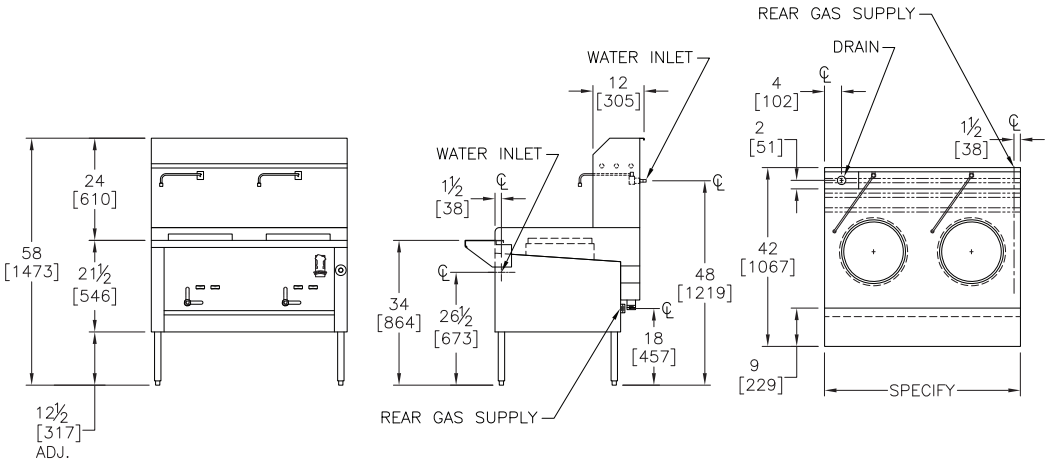
Item No. _____

Project _____

Quantity _____

LEGEND™ Heavy-Duty Gas Custom Chinese Ranges: Modular Base (CRM) or Cabinet Base (CR)

Dimensions in brackets are millimeters



OPTIONS GUIDE:

Jet Burners:

☐ ___ ea. 20 Jet,80,000 BTU/hr (23.4 kW) in lieu of 2-ring 53,000BTU/hr (15.5kW) 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

1. 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.
2. An adequate ventilation system is required. Refer to National Fire Protection Association Standard No. 96, "Vapor Removal from Cooking Equipment."
3. This appliance is intended for commercial use by professionally trained personnel. NOT intended for Residential Use.
4. **Specify installation elevation:** _____ if above 2000 feet (610m).
5. 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.
5. 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
6. DRAIN CONNECTION REQUIRED: 2" NPT connection positioned left (Optional right side).
7. 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:	☐ Natural	☐ Propane			
Manifold Pressure:	4.0" WC	10.0" WC			
Model:	Burner Selection:		QTY:	Shipping Weight	Shipping Class
CRM-____ **CR- ____**	53,000 BTU/hr (15.5kW) 2-Ring 107,000 BTU/hr (31.4kW) 3-Ring 80,000 BTU/hr (23.4kW) Jet Burner 120,000 BTU/hr (35.2kW) Jet Burner		____ ____ ____ ____	Approx. 150 lbs (68 kg) per foot of unit width.	All Models Class 85
Entry Clearance: 31-1/4" (794mm) uncrated [All Models]					
TOTAL OUTPUT: _____ **BTU/HR (**_____ **kW)** **TOTAL BURNERS:** _____					

Due to continuous product improvements, specifications are subject to change without notice.

THE MONTAGUE COMPANY
1830 Stearman Avenue, Hayward, CA 94545
800 345-1830 • Fax: 510 785-3342
www.montaguecompany.com

AutoQuotes The KCL CADalog

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.

Project Name:

Model Specified:

Location:

Item No: **Quantity:**

AIA #: **SIS #:**

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.

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

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.)	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)

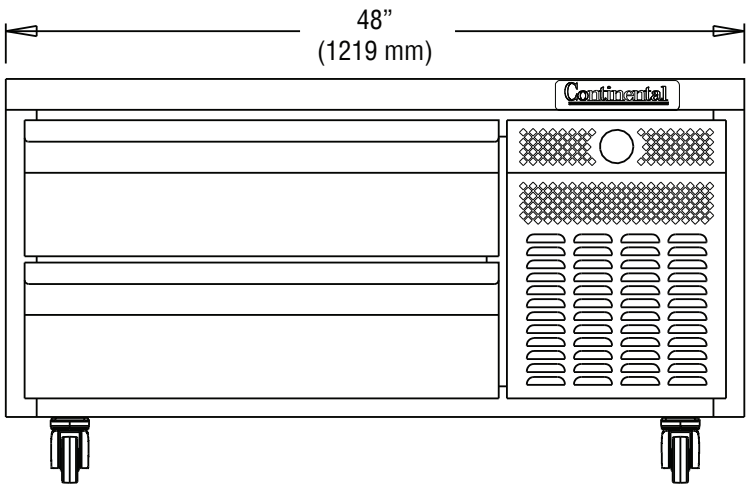
TOP WEIGHT CAPACITY

Max. Top Weight Capacity (lbs.)	775 (352 kg)

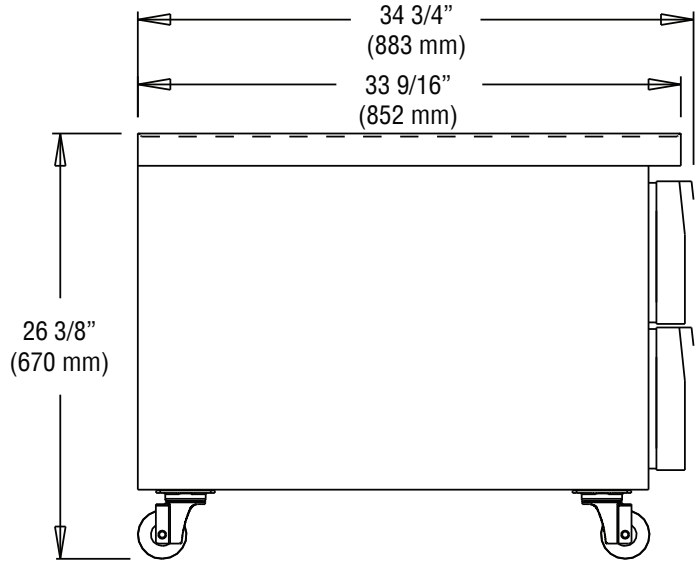
** Rating @ +25°F evaporator, 90°F ambient*
Figures in parentheses reflect metric equivalents rounded to the nearest whole unit.

Equipped with one NEMA-5-15P Plug
(varies by country)

Model Plan Views

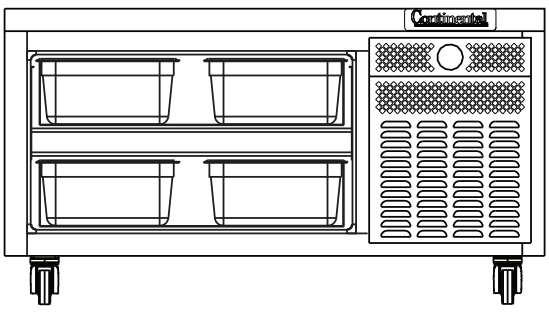


FRONT VIEW



SIDE VIEW

Shown with (4) 12 x 20 x 6 pans (not furnished)



DRAWER PAN CONFIGURATION

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.

Intertek

MADE IN THE U.S.A.

DL48G (3/8/17)

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.

Project Name:

Model Specified:

Location:

Item No: **Quantity:**

AIA #: **SIS #:**

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.

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

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.)	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 (2089 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')	5.2 (2.6)
10 ft. Cord/Plug [attached]	Yes (No)

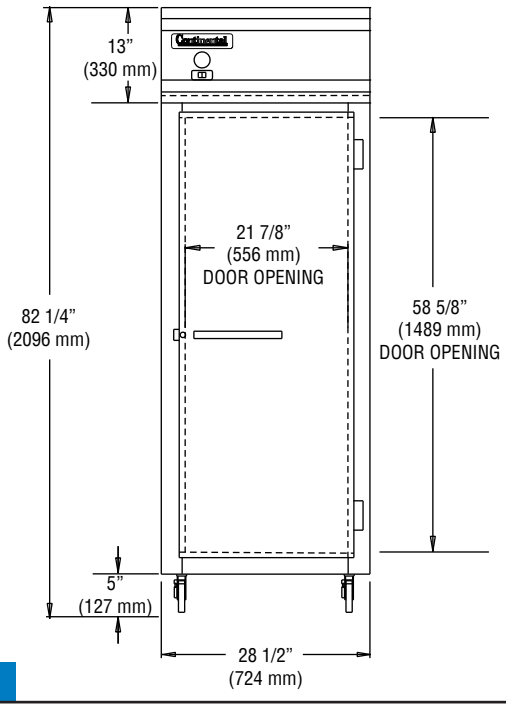
SHIPPING DATA

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)

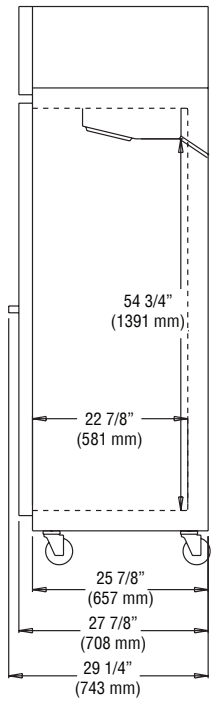
** Rating @ -15°F evaporator, 90°F ambient*
Figures in parentheses reflect metric equivalents rounded to the nearest whole unit.

Equipped with one NEMA-5-15P Plug
(varies by country)

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.

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.

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-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, 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
❑ DI-QSCHP-1	1
❑ DI-QSCHP-2	2
❑ DI-QSCHP-3	3
❑ 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

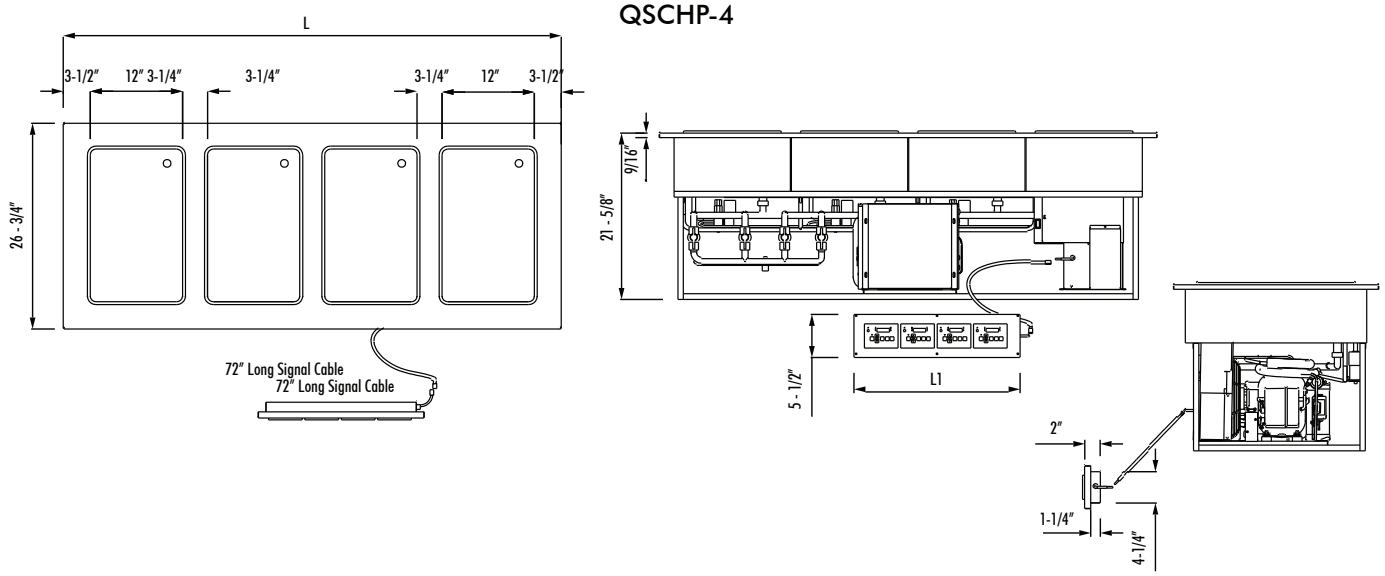
T 770 478 8803
F 770 471 3715
W lowtempind.com

REV 11/11/16

U.L. Sanitation Classified to NSF Standards

Hot-Cold-Freeze Drop-Ins

QuickSwitch LTI Serving Technology



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 11/2" 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)= ½" 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.

REV 11/11/16

Changing how food is served.

LTI, Inc.
P.O. Box 795
Jonesboro, GA 30237

T 770 478 8803
F 770 471 3715
W lowtempind.com

ANSI/NSF169

U.L. Sanitation Classified to NSF Standards

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

ITEM NO: _____
PROJECT: _____
DATE: _____

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

	Lengths include end panels
□ GP441RR	51"L x 51-3/4"D x 43"H
□ GP641RR	75-3/8"L x 51-3/4"D x 43"H
□ GP841RR	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	□ Laminated (non-premium) Confirm pattern/grain direction	□ Laminated (premium) Confirm pattern/grain direction □ Stainless steel
INTERIOR COLOR	□ Black	□ Stainless steel □ White
LOWER FRONT PANEL COLOR	□ Painted - Black	□ Stainless steel
BASE	□ Casters w/ levelers (n/a w/ remote ref.)	□ 6"H legs (n/a w/ remote ref.)
END PANEL LEFT	□ Full end panel w/mirror interior	□ No end panel (for same case to case connect)
END PANEL RIGHT	□ Full end panel w/mirror interior	□ No end panel (for same case to case connect)
REAR STORAGE	□ Non-refrigerated rear storage (w/o doors)	□ Non-refrigerated rear storage (w/doors) □ Refrigerated rear storage (w/doors)
REAR WORK LEDGE	□ White Sanalite®	□ Stainless steel
SNEEZE GUARD POSTS	□ Black	□ Silver
SNEEZE GUARD	□ Clear glass with top serving shelf	□ No sneeze guard (to be supplied by others in the field)
ELECTRICAL CONNECT	□ 6' straight blade power cord (self-cont.)	□ 6' locking power cord (self-cont.) □ Electrical leads (remote)
REFRIGERATION	□ Breeze™ w/EnergyWise s/c refrigeration	□ NOTE: Remote only available w/rail base w/shims. N/A w/ levelers, casters or legs. □ Note: Remote doesn't incl Conds unit. Floor drain reqd. □ Remote w/thermostat, solenoid & TXV
MISCELLANEOUS		□ Second year parts & labor warranty (excludes compressor)
ACCESSORIES		□ Additional non-lighted metal shelf □ Clean Sweep® coil cleaner (n/a w/remote) □ Night curtain, retractable, non-locking □ Removable wire security cover, locking

Structural Concepts
888 E. Porter Rd.
Muskegon, MI 49441
Ph. 231-798-8888
Fx. 231-798-4960
www.structuralconcepts.com

Note: Information is subject to change at any time.
Visit www.structuralconcepts.com for the most current specs.

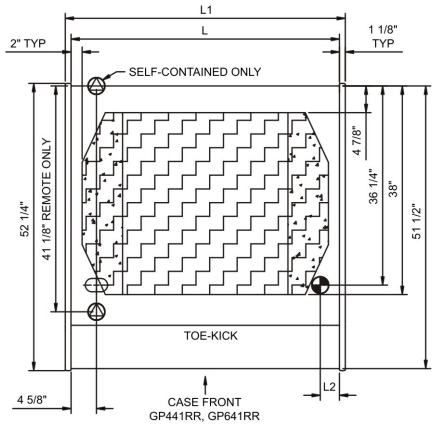
Revised 6/27/2017 20029101

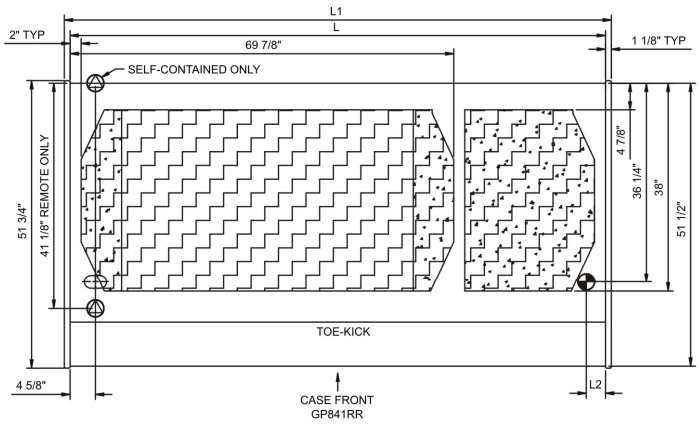
Fusion

Product Specifications

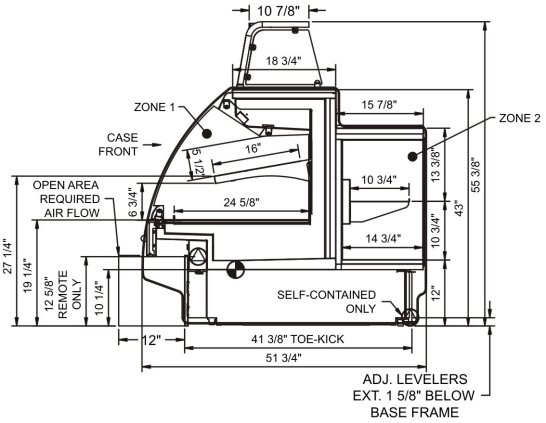
Intended Environment:	Type I - Designed to operate in ambient conditions of 75°F with 55% relative humidity unless noted otherwise in system information below.	
Zone	**Intended Product To Be Displayed**	**Warmest Avg Prod Temp ° F**
All	Packaged / unpackaged refrigerated products	40

PLAN VIEW





SIDE VIEW



NOTE: ALL DIMENSIONS APPROXIMATE

- ELECTRICAL JUNCTION BOX (SUPPLIED WITH 6" LEADS OR POWER CORD).
- LOCATION OF DRAIN TUBE FOR REMOTE REF. ONLY (SUPPLIED WITH $^{3}/_{4}$" OR $1^{1}/_{2}$" PVC TUBE).
- 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".

Structural Concepts
888 E. Porter Rd.
Muskegon, MI 49441
Ph. 231-798-8888
Fx. 231-798-4960
www.structuralconcepts.com

Note: Information is subject to change at any time.
Visit www.structuralconcepts.com for the most current specs.

Revised 6/27/2017 20029101

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, 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"					

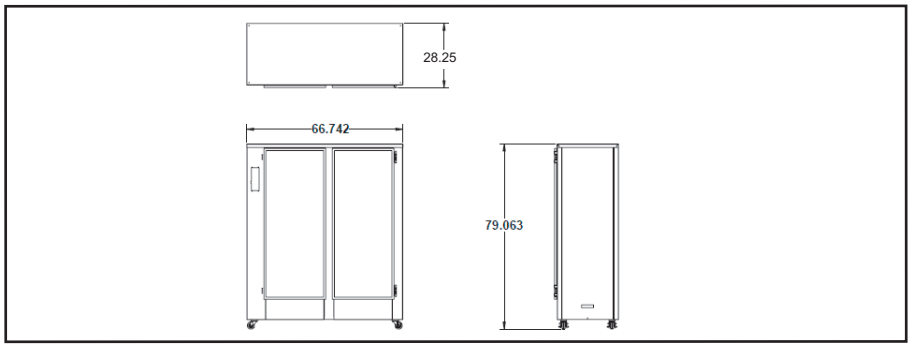
WASTE

	INDIRECT SIZE	DIRECT SIZE
1	3/8"	

CARTER-HOFFMANN

GARDENCHEF™
HERB & MICRO GREEN GROWING CABINETS


GC42



Model Number	Growing Flat Capacity		Shelf Spacing		Inside Working Height		Overall Dimensions Height		Depth		Width		Caster Diameter		Shipping Weight	
	10"x20" Flats	Zones	in	mm	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 inclus an integrated electronic ballast, 6400°K lamp with a nano-tech reflector for maximum reflection. Light's imitate the suns' 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

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 gan save time and money while controlling the supply of greens available for your menu. Suitable for trditional 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

GC42

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.

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.

1551 McCormick Avenue, Mundelein, Illinois 60060
Tel (847)362-5500 ▪ (800) 323-9793 ▪ Fax (847) 367-8981
www.carter-hoffmann.com

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.

Project Name:

Model Specified:

Location:

Item No: **Quantity:**

AIA #: **SIS #:**

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.

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)

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.)	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 (2089 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)

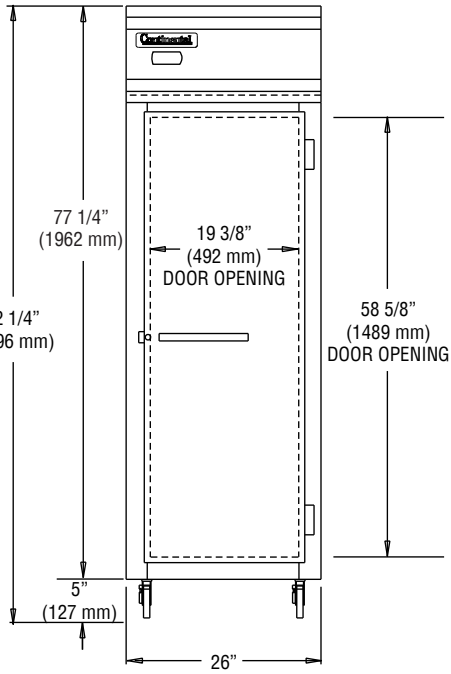
SHIPPING DATA

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)

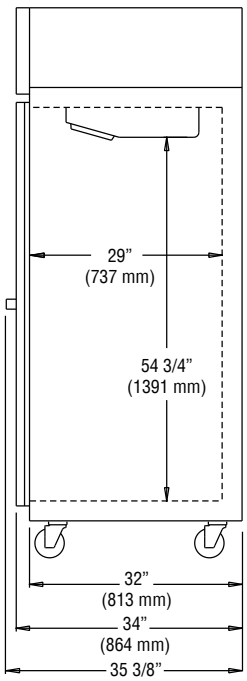
** Rating @ -15°F evaporator, 90°F ambient*
Figures in parentheses reflect metric equivalents rounded to the nearest whole unit.

Equipped with one NEMA-5-15P Plug
(varies by country)

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.

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.

Intertek

MADE IN THE U.S.A.

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	Casters, 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**					

Oasis®

Product Specifications

ITEM NO: _____
PROJECT: _____
DATE: _____

Refrigerated Self-Service Case 24"D

MODEL SHOWN: B32

	Lengths include end panels
□ B32	34-1/2"L x 24"D x 82-3/8"H
□ B42	45-1/2"L x 24"D x 82-3/8"H
□ B62	66-3/8"L x 24"D x 82-3/8"H
□ B82	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 refrig. 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	□ Laminated (non-premium) Confirm pattern/grain direction	□ Laminated (premium) Confirm pattern/grain direction □ Stainless steel (includes lower front panel)
INTERIOR COLOR	□ Black	□ Stainless steel
LWR LOUVERED FRNT PANEL	□ Painted - Black	□ Stainless steel (w/stainless ext. only)
BASE	□ Casters w/ levelers (n/a w/ remote ref.)	□ Levelers (only) □ Seismic levelers (Q4695)
END PANEL LEFT	□ Full end panel w/mirror interior (metal edge matches interior color)	□ Cutaway end panel (vinyl edge matches interior color) □ No end panel w/ synchronized defrost
END PANEL RIGHT	□ Full end panel w/mirror interior (metal edge matches interior color)	□ Cutaway end panel (vinyl edge matches interior color) □ No end panel w/ synchronized defrost
HEADER STYLE	□ Flat	□ Curved header
UPPER FRONT PANEL	□ Flat front panel	□ Black slatwall (flat front only) □ Curved front panel
SHELVING	□ Metal shelves, non-lighted	□ Metal shelves, lighted (LED 4000K)
ELECTRICAL CONNECT	□ 6' power cord (base exit)	□ 6' power cord (top exit)
REFRIGERATION	□ Breeze™ w/EnergyWise s/c refrigeration	□ Breeze™ w/ EnergyWise s/c refrigeration (w/ floor drain) □ Note: Remote doesn't incl Conds unit. Floor drain reqd. □ Remote w/thermostat, solenoid & TXV
MISCELLANEOUS		□ Second year parts & labor warranty (excludes compressor)
ACCESSORIES		□ Clean Sweep® coil cleaner (n/a w/remote) □ Night curtain, retractable, non-locking □ Price tag moulding (matches interior color) □ Solid security cover, removable, locking

Structural Concepts
888 E. Porter Rd.
Muskegon, MI 49441
Ph. 231-798-8888
Fx. 231-798-4960
www.structuralconcepts.com

Note: Information is subject to change at any time.
Visit www.structuralconcepts.com for the most current specs.

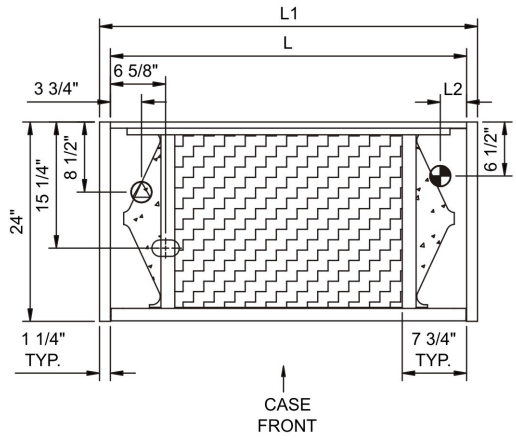
Revised 8/22/2017 20031827

Oasis®

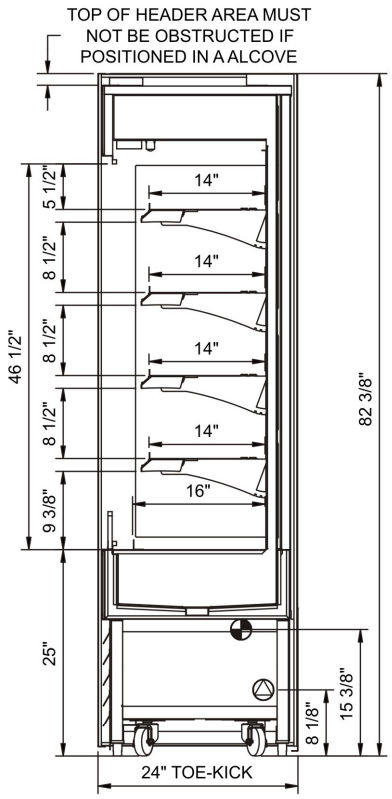
Product Specifications

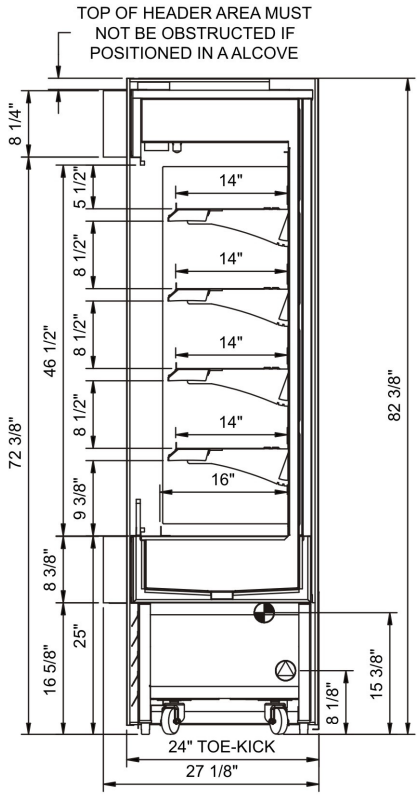
Intended Environment:	Type I - Designed to operate in ambient conditions of 75°F with 55% relative humidity unless noted otherwise in system information below.	
Zone	**Intended Product To Be Displayed**	**Warmest Avg Prod Temp ° F**
All	Packaged refrigerated products	40

PLAN VIEW



SIDE VIEW





NOTE: ALL DIMENSIONS APPROXIMATE

- ELECTRICAL JUNCTION BOX (SUPPLIED WITH 6" LEADS OR POWER CORD).
- LOCATION OF DRAIN TUBE FOR REMOTE REF. ONLY (SUPPLIED WITH $\frac{3}{4}$" OR 1$\frac{1}{2}$" PVC TUBE).
- 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.

Structural Concepts
888 E. Porter Rd.
Muskegon, MI 49441
Ph. 231-798-8888
Fx. 231-798-4960
www.structuralconcepts.com

Note: Information is subject to change at any time.
Visit www.structuralconcepts.com for the most current specs.

Revised 8/22/2017 20031827

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.

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.

Agency Listings

c UL us LISTED — NSF — FC

Cover is not NSF.

This device complies with Part 18 FCC Rules.

Due to continued product improvement, please consult www.vollrath.com for current product specifications.

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

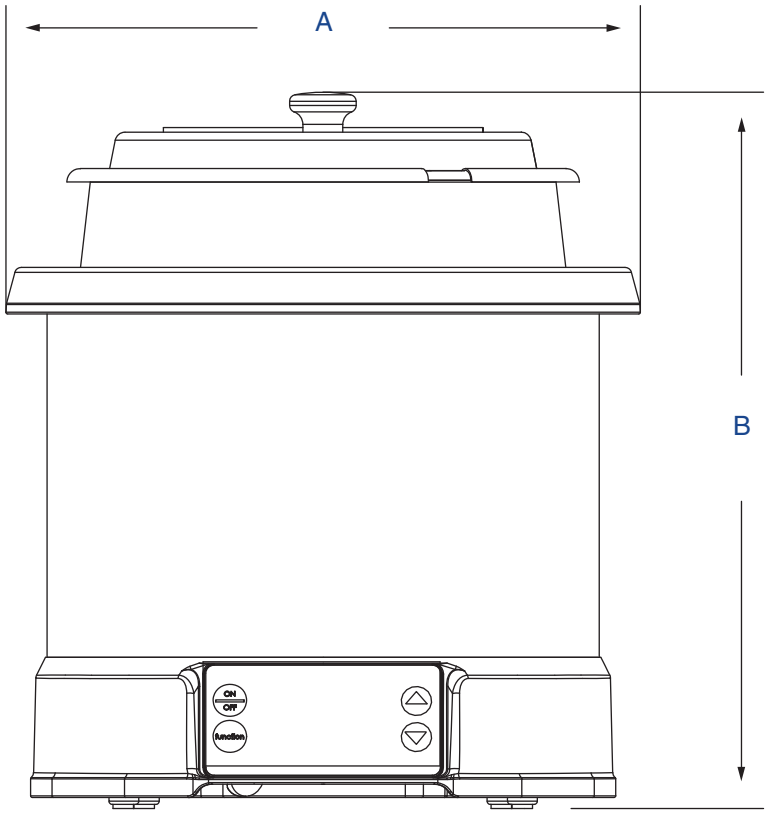
Outperform every day.™
www.vollrath.com

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 (A) Width	Dimensions (B) Height	Well Depth IN (CM)	Voltage	Watts	Amps	Plug	Shipping Dimensions IN (CM)	Shipping Weight LB (KG)
7470110	7 (6.6)	11⅞ (30.3)	13½ (34.2)	6⅞ (17.6)	120V	800W	6.7A	NEMA 5-15P	14¾ x 14¾ v 15 (37.3 x 37.3 x 38.1)	11.4 (5.2)
7470140	7 (6.6)	11⅞ (30.3)	13½ (34.2)	6⅞ (17.6)	120V	800W	6.7A	NEMA 5-15P	14¾ x 14¾ v 15 (37.3 x 37.3 x 38.1)	11.4 (5.2)
74110110	11 (10.4)	13⅞ (35.3)	13½ (34.2)	6⅞ (17.6)	120V	800W	6.7A	NEMA 5-15P	14¾ x 14¾ v 15 (37.3 x 37.3 x 38.1)	13.4 (6.1)
74110140	11 (10.4)	13⅞ (35.3)	13½ (34.2)	6⅞ (17.6)	120V	800W	6.7A	NEMA 5-15P	14¾ x 14¾ v 15 (37.3 x 37.3 x 38.1)	13.4 (6.1)

Receptacle

120V

NEMA 5-15R

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

Outperform every day.™

www.vollrath.com

 Form Number L35920 3/3/14
Printed in USA

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.

Project Name:

Model Specified:

Location:

Item No: **Quantity:**

AIA #: **SIS #:**

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.

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.

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.)	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)

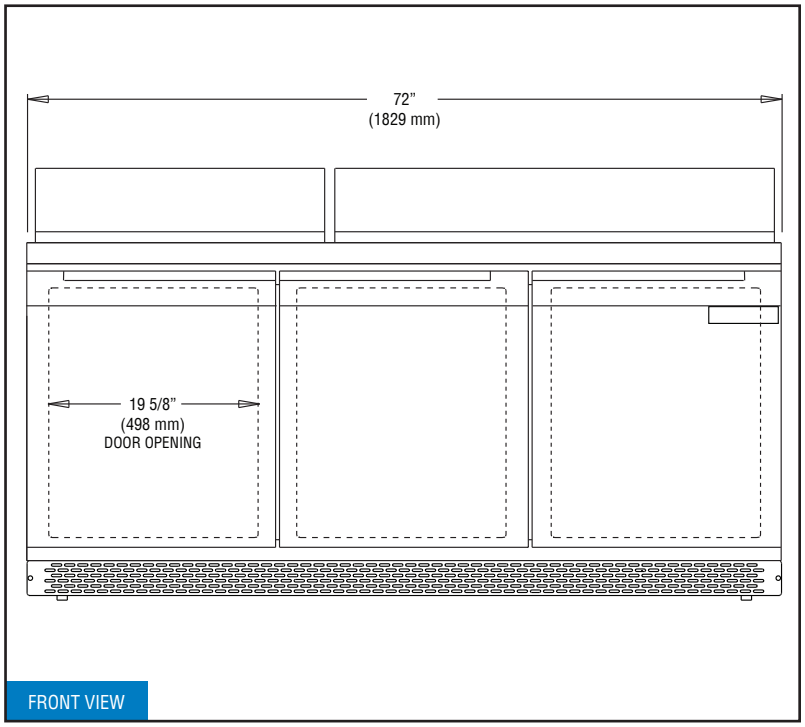
SHIPPING DATA

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)

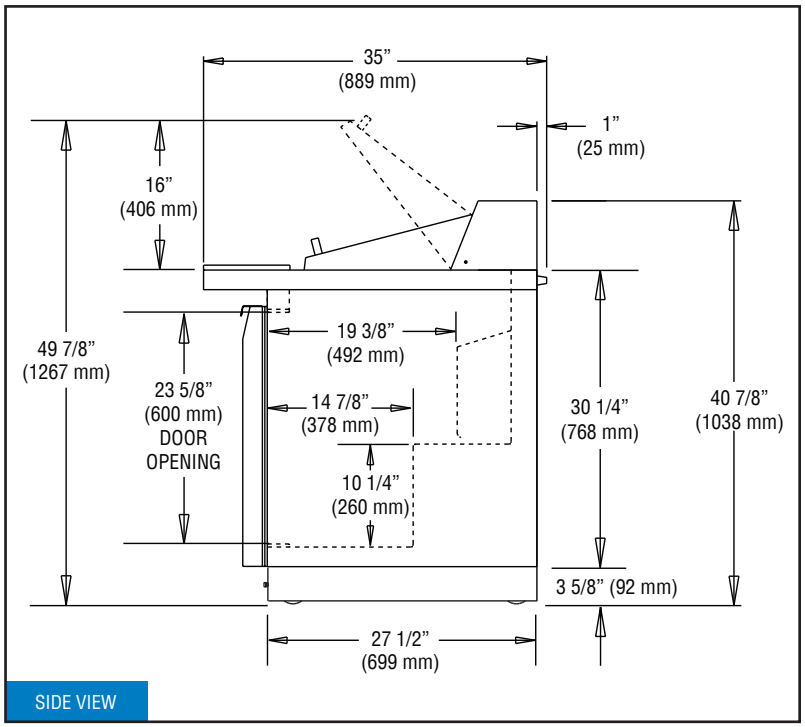
** Rating @ +25°F evaporator, 90°F ambient*
Figures in parentheses reflect metric equivalents rounded to the nearest whole unit.

Equipped with one NEMA-5-15P Plug
(varies by country)

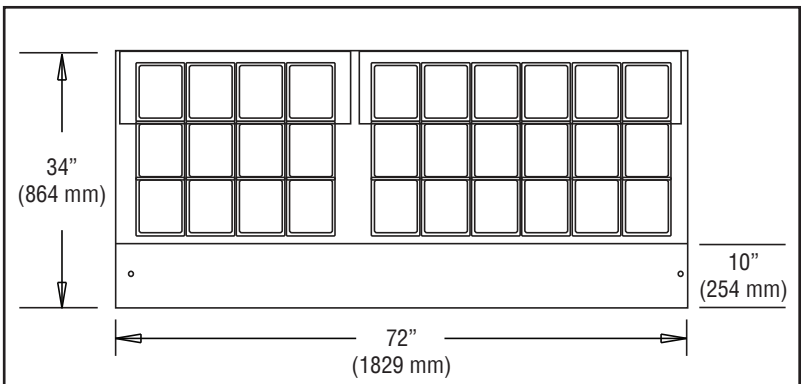
Model Plan Views



FRONT VIEW



SIDE VIEW



PAN TOP CONFIGURATION

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.

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 # _____

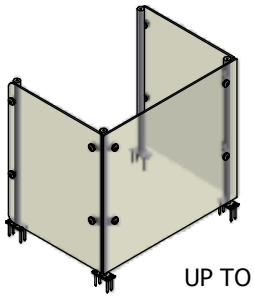
GLASS:

- ☐ 1/4" Clr Temp - Std
- ☐ Frosted

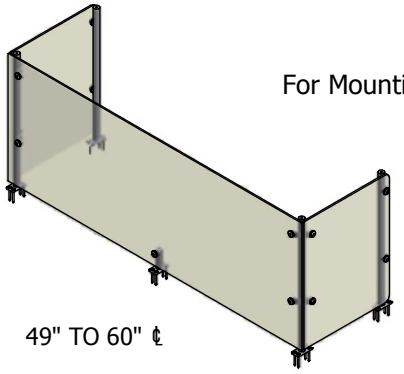
OPTIONS(*):

- ☐ End Panel - LT
- ☐ End Panel - RT
- ☐ Light Fixture
- ☐ Warmer
- ☐ Shelf Kit

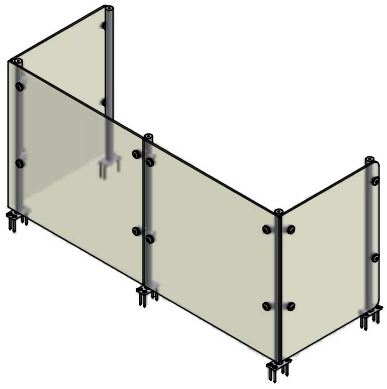
(*) Not all options available on all models
Contact factory for specific information
For Mounting Options see Mounting Hardware Guide



UP TO 48" ℄



49" TO 60" ℄



OVER 60" ℄

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

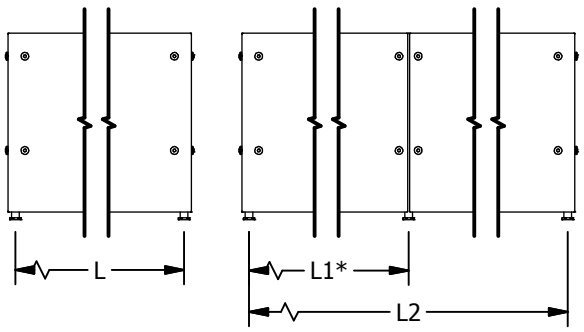
5.35.12.4 Minimum horizontal distance between the front inside edge of displayed food and the bottom leading edge of the shield s 1.5 inches

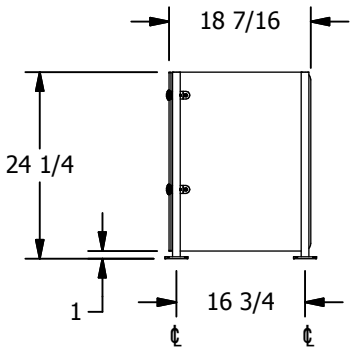
5.35.6 A vertical barrier (end shield) shall be provided at each end of a foodshield. The vertical barrier shall be a minimum of 18 inches deep (front to back) beginning at the bottom leading edge of the foodshield. The minimum height of the vertical barrier shall be equal to the overall height of the 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)

Versa-Gard,LLC - 1094 Parkway Industrial Park Drive, Buford, GA 30518

02/28/11

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

Item #: _____

Project: _____

Qty: _____

AIA#: _____

W x D x H
16 9/16" x 24 1/8" x 31 11/16"

SD-270
16 1/2" x 24" x 35 3/16"

DCM-270BAH
Air-Cooled
Shown with optional
SD-270 Stand

*SD-270 door is reversible

Features

- **Durable stainless steel exterior**
- **Advanced CleanCycle24™ design** (ADVANCED 24 CleanCycle)
- **Stainless steel auger with greaseless bearing**

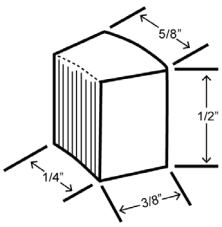
- Up to 282 lbs. of ice production per 24 hours
- Built-in storage capacity of 0.3ft³/10 lbs.*
- CleanCycle12 - Every 12 hours,unit performs 20 minute purge to rid itself of impurities
- 2 second flush cycle every hour
- Easy to chew, cubelet ice
- Flush cycle removes sediment for cleaner ice
- Protected 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.

		ICE PRODUCTION			WATER USAGE		ELECTRICAL						
Condenser	Model	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	Heat Rejection BTU/hr.	Shipping Weight	ENERGY STAR®
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

- 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

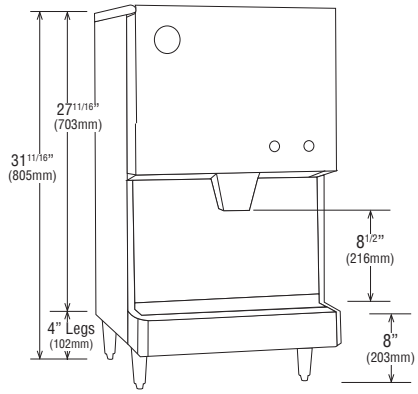
DCM-270BAH

SANITARY CUBELET ICE MACHINE/DISPENSER

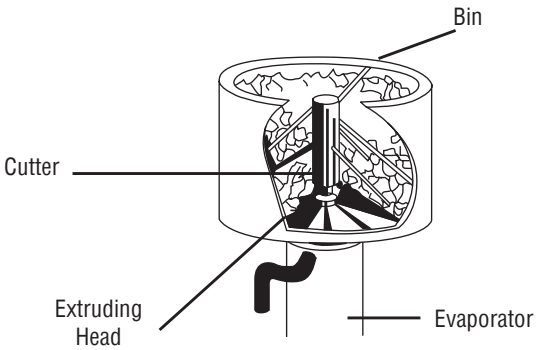
DCM-270BAH
08/14/17
Item # 13116

inch
[mm]

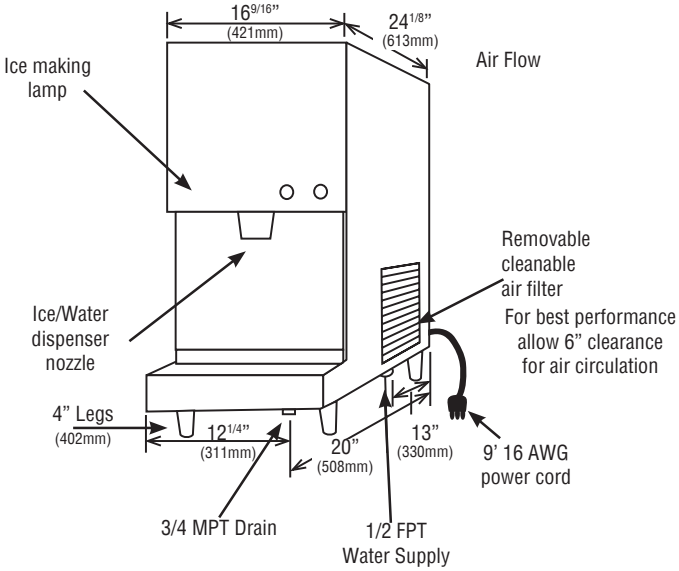
FRONT VIEW



AIR-COOLED



SIDE VIEW



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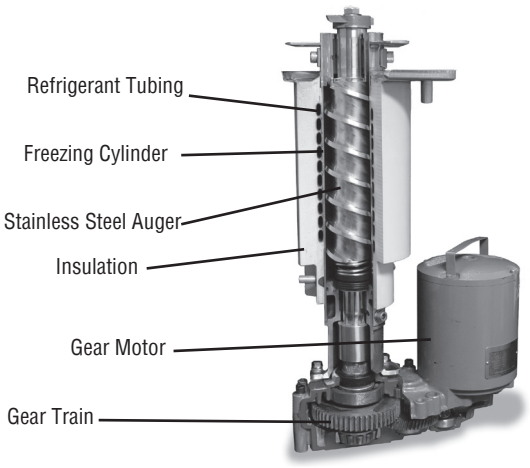
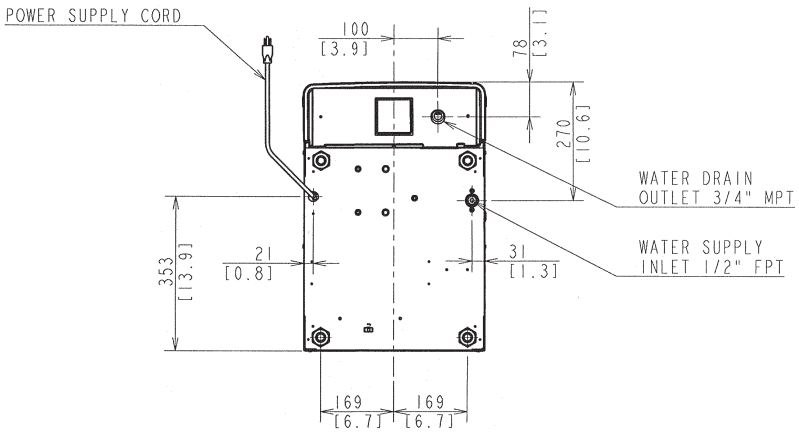


EVAPORATOR

REAR VIEW



AIR-COOLED

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*

DOE 2017 Energy Efficiency Compliant

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

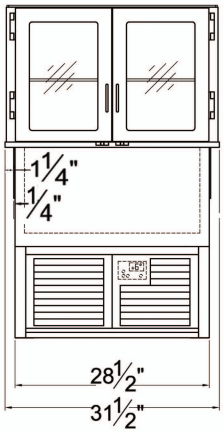
RPI INDUSTRIES, INC. v1.13

VIENNA COLD DISPLAY

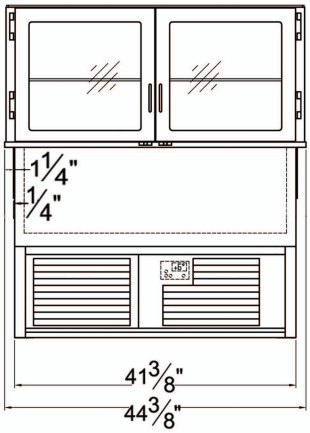
PROJECT:_____

TOLL FREE: 800-525-3692

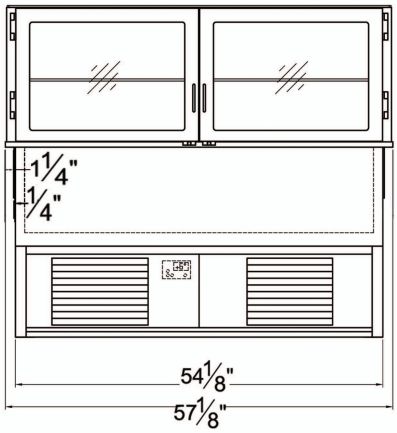
MODEL # VICD-SQ INS SQUARED GLASS



VICD2-(A)-R-SQ-SC INS

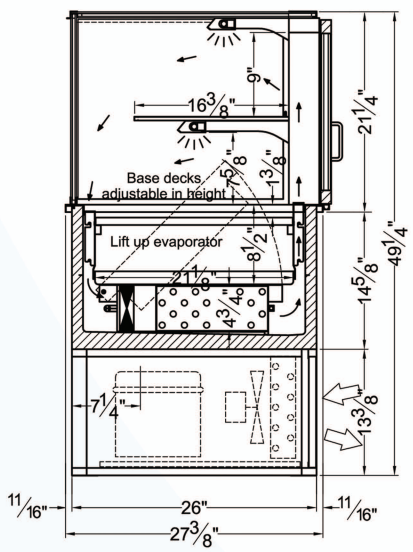


VICD3-(A)-R-SQ-SC INS

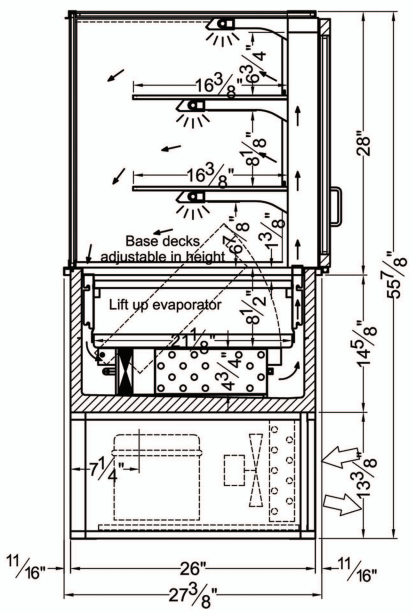


VICD4-(A)-R-SQ-SC INS

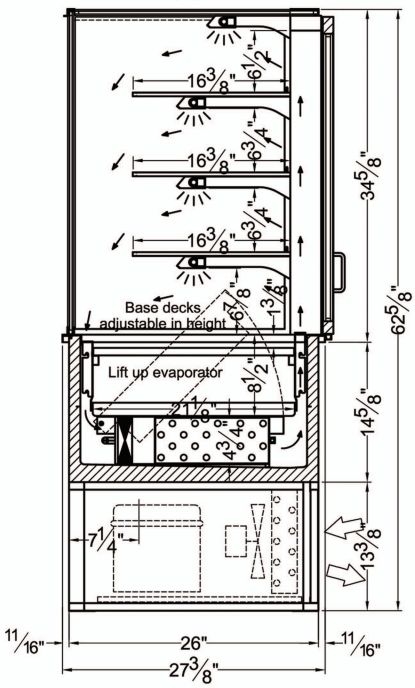
VICD(A)-20-R-SQ-SC INS



VICD(A)-27-R-SQ-SC INS



VICD(A)-34-R-SQ-SC INS



UNITS SHOWN WITH "REAR AIR BREATHING" OPTION

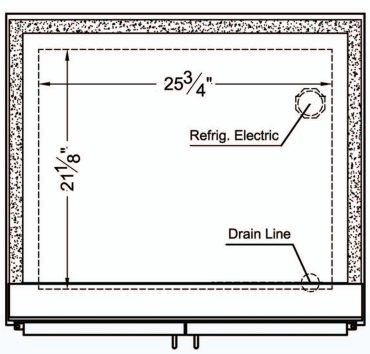
LARGEST DIMENSION REPRESENTS OUTSIDE FLANGE

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.



Electrical & Plumbing locations

CALL TOLL FREE: 800-525-3692 (609-714-2330)
FAX: 609-714-2331 www.rpiindustries.com
220 ROUTE 70, MEDFORD, NJ 08055

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		

EAGLE GROUP®
Profit from the Eagle Advantage®

Specification Sheet

Item No.: _____
Project No.: _____
S.I.S. No.: _____

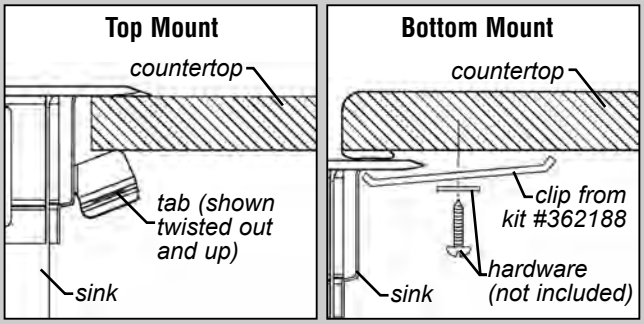
Short Form Specifications

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.

Countertop Drop-In Sinks with Self Rim Design*

MODELS:

❑ ***SR10-14-5-1***	❑ ***SR18-24-13.5-1***	❑ ***SR16-19-13.5-2***
❑ ***SR10-14-9.5-1***	❑ ***SR19-16-8-1***	❑ ***SR18-24-13.5-2***
❑ ***SR12-14-9.5-1***	❑ ***SR19-16-13.5-1***	❑ ***SR22-22-13.5-2***
❑ ***SR14-10-5-1***	❑ ***SR20-12-6.5-1***	❑ ***SR24-24-13.5-2***
❑ ***SRU14-10-5-1***	❑ ***SR22-22-13.5-1***	❑ ***SR10-14-9.5-3***
❑ ***SR14-10-9.5-1***	❑ ***SR24-18-13.5-1***	❑ ***SR12-14-9.5-3***
❑ ***SR14-12-9.5-1***	❑ ***SR24-24-13.5-1***	❑ ***SR14-16-9.5-3***
❑ ***SR14-16-9.5-1***	❑ ***SR10-14-9.5-2***	❑ ***SR16-19-8-3***
❑ ***SR16-14-9.5-1***	❑ ***SR12-14-9.5-2***	❑ ***SR16-19-13.5-3***
❑ ***SR16-19-8-1***	❑ ***SR14-16-9.5-2***	❑ ***SR18-24-13.5-3***
❑ ***SR16-19-13.5-1***	❑ ***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△ (add suffix "-FE")
❑ P-trap (#300789)

△ Electronic-Eye Faucets are available for One-Compartment Sinks only.

Certifications / Approvals

NSF

AutoQuotes

KCL

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

EG20.39 Rev. 08/17

Spec sheets available for viewing, printing or downloading from our online literature library at *www.eaglegrp.com*

Countertop Drop-In Sinks with Self Rim Design

EAGLE GROUP®
Profit from the Eagle Advantage®

Item No.: _____
Project No.: _____
S.I.S. No.: _____

NOTE: width = front-to-back, length = side-to-side

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 12¾″	483 x 324	17⅝″ x 11¼″	448 x 286	14 13⁄16″ x 10 13⁄16″	376 x 275	10	4.5	20
SR10-14-9.5-1	14″ x 10″ x 9½″	356 x 254 x 241	18⅛″ x 12¾″	480 x 324	17½″ x 11¼″	445 x 286	14 13⁄16″ x 10 13⁄16″	376 x 275	12	5.4	18
SR12-14-9.5-1	14″ x 12″ x 9½″	356 x 305 x 241	19″ x 14¾″	483 x 375	17⅝″ x 13¼″	448 x 337	14⅜″ x 12⅝″	321 x 314	14	6.4	20
SR14-10-5-1	10″ x 14″ x 5″	254 x 356 x 127	15″ x 16¾″	381 x 426	13⅝″ x 15¼″	346 x 387	10 13⁄16″ x 14 13⁄16″	275 x 376	10	4.5	20
SRU14-10-5-1 ■	10″ x 14″ x 5″	254 x 356 x 127	15″ x 16¾″	381 x 426	13⅝″ x 15¼″	346 x 387	n/a		12	5.4	20
SR14-10-9.5-1	10″ x 14″ x 9½″	254 x 356 x 241	15″ x 16⅝″	381 x 422	13⅝″ x 15⅛″	346 x 384	10 13⁄16″ x 14 13⁄16″	275 x 376	12	5.4	18
SR14-12-9.5-1	12″ x 14″ x 9½″	305 x 356 x 241	17″ x 16¾″	432 x 426	15⅝″ x 15¼″	397 x 387	12⅜″ x 14⅜″	314 x 365	14	6.4	20
SR14-16-9.5-1	16″ x 14″ x 9½″	406 x 356 x 241	21″ x 16¾″	533 x 425	19⅝″ x 15¼″	499 x 387	16⅝″ x 14⅜″	422 x 372	23	10.4	20
SR16-14-9.5-1	14″ x 16″ x 9½″	356 x 406 x 241	19″ x 18¾″	483 x 476	17⅝″ x 17¼″	448 x 438	14⅝″ x 16⅝″	372 x 422	23	10.4	20
SR16-19-8-1	20″ x 16″ x 8″	508 x 406 x 203	24¾″ x 18½″	629 x 470	23⅜″ x 17″	594 x 432	20⅝″ x 16⅝″	524 x 422	26	11.8	18
SR16-19-13.5-1	20″ x 16″ x 13½″	508 x 406 x 343	24¾″ x 18½″	629 x 470	23⅜″ x 17″	594 x 432	20⅝″ x 16⅝″	524 x 422	28	12.7	18
SR18-24-13.5-1	24″ x 18″ x 13½″	610 x 457 x 343	28¾″ x 20½″	730 x 521	27⅜″ x 19″	695 x 483	24⅝″ x 18⅝″	626 x 473	32	14.5	18
SR19-16-8-1*	16″ x 20″ x 8″	406 x 508 x 203	20¾″ x 22½″	527 x 572	19⅜″ x 21″	492 x 533	16⅝″ x 20⅝″	422 x 524	24	10.9	18
SR19-16-13.5-1*	16″ x 20″ x 13½″	406 x 508 x 343	20¾″ x 22½″	527 x 572	19⅜″ x 21″	492 x 533	16⅝″ x 20⅝″	422 x 524	25	11.3	18
SR20-12-6.5-1	12″ x 20″ x 6½″	305 x 508 x 165	17″ x 22¾″	432 x 578	15⅝″ x 21¼″	397 x 540	12⅛″ x 20⅛″	310 x 511	28	12.7	20
SR22-22-13.5-1*	22″ x 22″ x 13½″	559 x 559 x 343	27″ x 24¾″	686 x 629	25⅝″ x 23¼″	651 x 591	see template **		34	15.4	18
SR24-18-13.5-1*	18″ x 24″ x 13½″	457 x 610 x 343	22¾″ x 26½″	578 x 673	21⅜″ x 25″	543 x 635	18⅝″ x 24⅝″	473 x 626	32	14.5	18
SR24-24-13.5-1*	24″ x 24″ x 13½″	610 x 610 x 343	28¾″ x 26½″	730 x 673	27⅜″ x 25″	695 x 635	24 11⁄16″ x 24 11⁄16″	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 9½″	356 x 254 x 241	18⅛″ x 24¾″	480 x 629	17½″ x 23¼″	445 x 591	14 13⁄16″ x 23″	376 x 584	25	11.3	18
SR12-14-9.5-2	14″ x 12″ x 9½″	356 x 305 x 241	19″ x 28¾″	483 x 730	17⅝″ x 27¼″	448 x 692	14⅜″ x 26⅝″	365 x 676	27	12.2	20
SR14-16-9.5-2	16″ x 14″ x 9½″	406 x 356 x 241	21″ x 32¾″	525 x 832	19⅝″ x 31¼″	499 x 794	16⅝″ x 30⅝″	422 x 778	42	19.1	20
SR16-19-8-2	20″ x 16″ x 8″	508 x 406 x 203	24¾″ x 36¼″	527 x 921	23⅜″ x 34¾″	594 x 883	20⅝″ x 34¼″	524 x 870	48	21.8	18
SR16-19-13.5-2	20″ x 16″ x 13½″	508 x 406 x 343	24¾″ x 36¼″	527 x 921	23⅜″ x 34¾″	594 x 883	20⅝″ x 34¼″	524 x 870	52	23.6	18
SR18-24-13.5-2	24″ x 18″ x 13½″	610 x 457 x 343	28¾″ x 40¼″	730 x 1022	27⅜″ x 38¾″	695 x 984	24⅝″ x 38½″	626 x 978	56	24.9	18
SR22-22-13.5-2	22″ x 22″ x 13½″	559 x 559 x 343	27″ x 48¾″	686 x 1238	25⅝″ x 47¼″	651 x 1200	see template **		57	25.9	18
SR24-24-13.5-2	24″ x 24″ x 13½″	610 x 610 x 343	28¾″ x 52⅛″	730 x 1324	27⅜″ x 50⅝″	695 x 1286	24 13⁄16″ x 50¼″	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 9½″	356 x 254 x 241	18⅛″ x 36¾″	480 x 933	17½″ x 35¼″	445 x 895	14 13⁄16″ x 35″	376 x 889	37	16.8	18
SR12-14-9.5-3	14″ x 12″ x 9½″	356 x 305 x 241	19″ x 42¾″	483 x 1086	17⅝″ x 41¼″	448 x 1031	14⅜″ x 40⅝″	331 x 1032	39	17.6	20
SR14-16-9.5-3	16″ x 14″ x 9½″	406 x 356 x 241	21″ x 48¾″	533 x 1238	19⅝″ x 47¼″	498 x 1200	16⅝″ x 46⅝″	422 x 1184	66	29.9	20
SR16-19-8-3	20″ x 16″ x 8″	508 x 406 x 203	24¾″ x 54″	629 x 1372	23¾″ x 52½″	594 x 1334	20⅝″ x 52¼″	524 x 1327	72	32.7	18
SR16-19-13.5-3	20″ x 16″ x 13½″	508 x 406 x 343	24¾″ x 54″	629 x 1372	23¾″ x 52½″	594 x 1334	20⅝″ x 52¼″	524 x 1327	77	34.9	18
SR18-24-13.5-3*	24″ x 18″ x 13½″	610 x 457 x 343	28¾″ x 60″	730 x 1524	27¾″ x 58½″	695 x 1486	24⅝″ x 58¼″	626 x 1480	82	37.2	18

** These sinks utilize a #301440 faucet with 14″ (356mm) swivel spout.*

Optional Deck Mount Faucets

#313306 T&S faucet

description	Standard model #	T&S model #
gooseneck faucet, 4″ (102mm) center, for single bowls	***302004***	***313308***
8″ (203mm) spout, 4″ (102mm) center, for single and double bowls	***301248***	***313306***
12″ (305mm) spout, 4″ (102mm) center, for triple bowls	***300490***	***313303***
14″ (356mm) spout, 8″ (203mm) center, for triple bowls	***301440***	***313307***
8″ (203mm) spout, 4″ (102mm) center, for single and double bowls, w/spray arm	—	***377430***
8″ (203mm) spout, 8″ (203mm) center, for single and double bowls, w/spray arm	—	***303560****
12″ (305mm) spout, 8″ (203mm) center, for triple bowls, w/spray arm	—	***303561****
14″ (356mm) spout, 8″ (203mm) center, for triple bowls, w/spray arm	—	***303562****

** Faucets with spray arm require special faucet holes.*

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
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Foodservice Division: Phone 800-441-8440 • MHC/Retail Display Divisions: Phone 800-637-5100

Rev. 08/17

Spec sheets available for viewing, printing or downloading from our online literature library at *www.eaglegrp.com*

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 Refrigerator

Designer Line REFRIGERATORS

SANDWICH UNIT MIGHTY TOP FRONT BREATHER

Utilizing Environmentally Safe, CFC-free R-134a Refrigerant

DL60-24M-FB

Models Available

- DL27-12M-FB
- DL48-12M-FB
- DL48-18M-FB
- DL60-12M-FB
- DL60-18M-FB
- DL60-24M-FB
- DL72-18M-FB
- DL72-27M-FB
- DL72-30M-FB

Standard Features

- 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
- 3⅝" 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

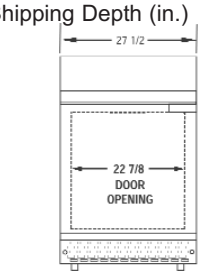
Door shells are constructed of heavy-gauge stainless steel and are internally braced and urethane-foam-insulated for rigidity. Door corners are of welded construction and polished. Replaceable snap-in door gaskets are self adjusting, heavy-duty, magnetic type. Door handles and hinges are chrome-plated and non-corrosive. Hinges are spring loaded, heavy duty, self-closing.

Designer Line
REFRIGERATORS

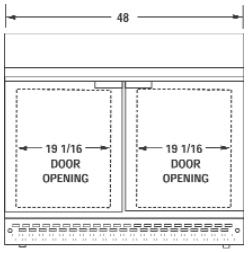
CHARACTERISTICS

DIMENSIONAL DATA

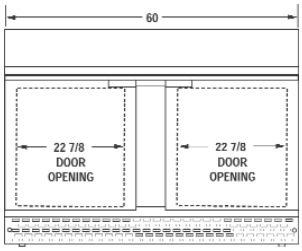
	MODEL DL27-12M-FB	MODEL DL48-12M-FB	MODEL DL48-18M-FB	MODEL DL60-12M-FB	MODEL DL60-18M-FB	MODEL DL60-24M-FB	MODEL DL72-18M-FB	MODEL DL72-27M-FB	MODEL DL72-30M-FB
Net Capacity (cu. ft.)	7.4	13.4	13.4	17.0	17.0	17.0	20.6	20.6	20.6
1/6 Size Pans (4" Deep)	12	12	18	12	18	24	18	27	30
Width, Overall (in.)	27 1/2	48	48	60	60	60	72	72	72
Depth, Overall (Incl. Hdls.) (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



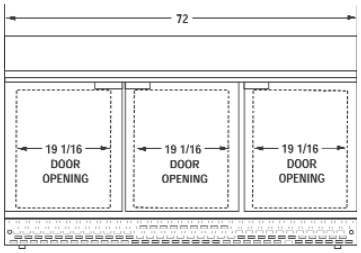
DL27-12M-FB Front View



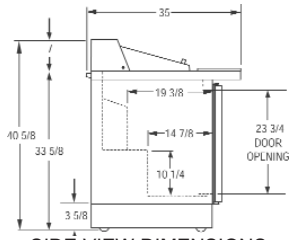
DL48-12M,18M-FB Front View



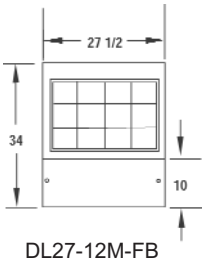
DL60-12M, 18M, 24M-FB Front View



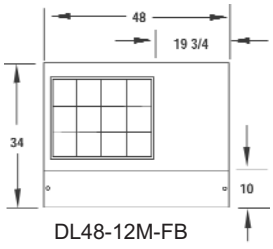
DL72-18M, 27M, 30M-FB Front View



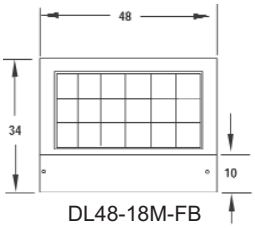
SIDE VIEW DIMENSIONS



DL27-12M-FB



DL48-12M-FB



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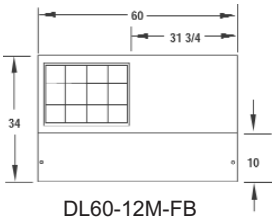

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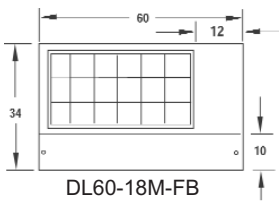

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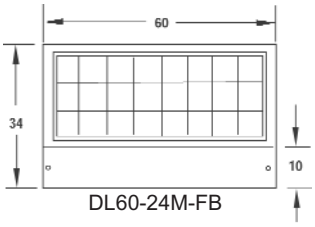

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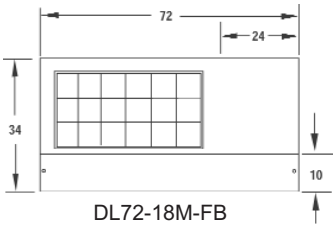

DL72-18M-FB

Continental Refrigerator
A Division of National Refrigeration & A/C Products, Inc.
539 Dunksferry Road Bensalem, PA 19020
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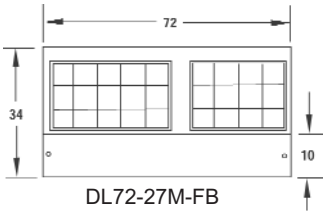

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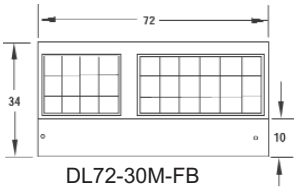


DL72-30M-FB

DLREF305

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.

Project Name:

Model Specified:

Location:

Item No: **Quantity:**

AIA #: **SIS #:**

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.

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.

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.)	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)

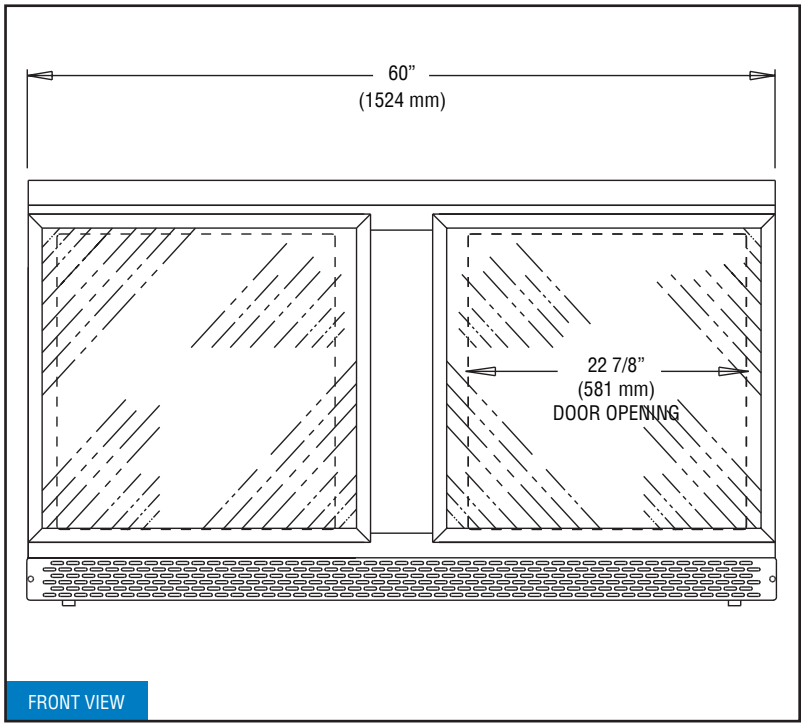
SHIPPING DATA

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)

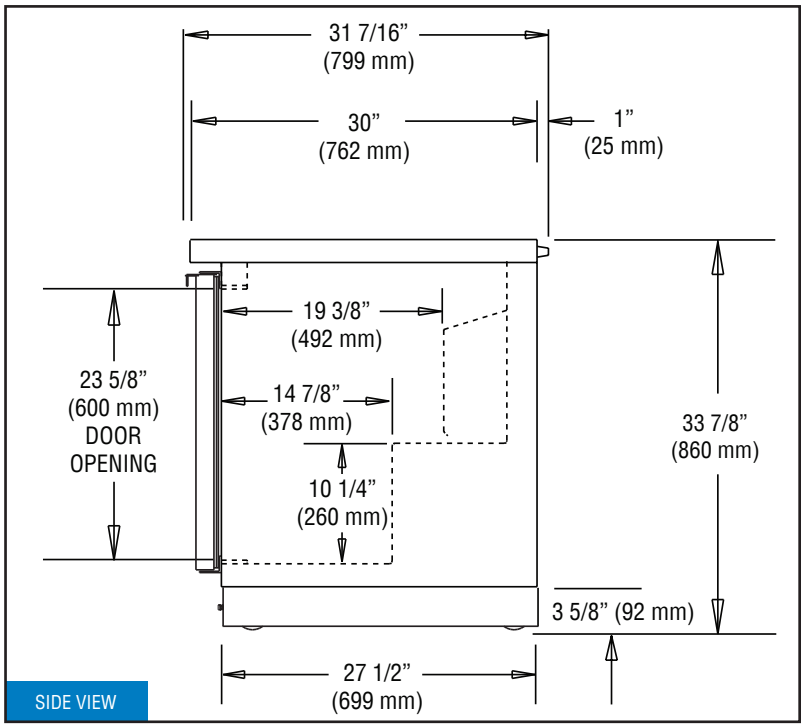
** Rating @ +25°F evaporator, 90°F ambient*
Figures in parentheses reflect metric equivalents rounded to the nearest whole unit.

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 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.

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

(HSPP2RPRS) 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		The following are included in the purchase of Electrolux Professional - SPEEDELIGHT units. 1.) Start-up performed by a Factory Authorized Agent 2.) Platinum Warranty: 2 years parts & 1 year labor (Warranty activated upon completion of mandatory Factory Authorized Agent start-up) 3.) Performance Check: 12th month performance maintenance check 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" × 8 7/16"(215 x215 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.

6-30P

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 inteaction (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

Cooking Sandwich Press
SpeeDelight with adjustable tube, ribbed removable teflon upper plate

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 SpeeDelight 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

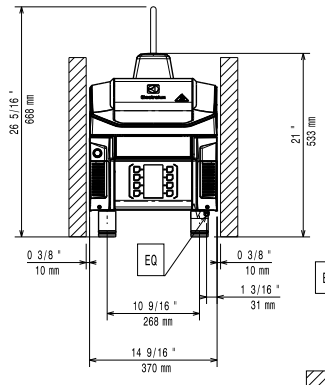
• 1 of Glass saver for SpeeDelight	PNC 653527
• 1 of Cleaning brush for SpeeDelight	PNC 653623
• 1 of 4x1qt "GREASE EXPRESS" detergent bottles for High Speed Sandwich Press	PNC 653624
• 1 of Spatula for SpeeDelight	PNC 653625
• 1 of SpeeDelight Spacer Stop Kit for Rear Ventilation	PNC 653794

Optional Accessories

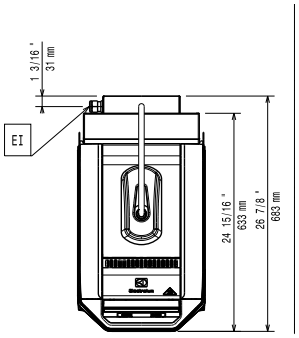
• Glass saver for SpeeDelight	PNC 653527 ❑
• Cleaning brush for SpeeDelight	PNC 653623 ❑
• 4x1qt "GREASE EXPRESS" detergent bottles for High Speed Sandwich Press	PNC 653624 ❑
• Spatula for SpeeDelight	PNC 653625 ❑
• Special scraper for HSG Panini	PNC 653690 ❑
• 16 ounce Spray Bottle for detergent for High Speed Sandwich Press	PNC 653695 ❑
• Removable ribbed teflon plate for SpeeDelight	PNC 653787 ❑
• Four (4) Rubber Feet 1 1/32" (26mm)	PNC 653792 ❑
• Four (4) Rubber Feet 1 37/64" (40mm)	PNC 653793 ❑
• SpeeDelight Spacer Stop Kit for Rear Ventilation	PNC 653794 ❑

Cooking Sandwich Press SpeeDelight with adjustable tube, ribbed removable teflon upper plate

Front

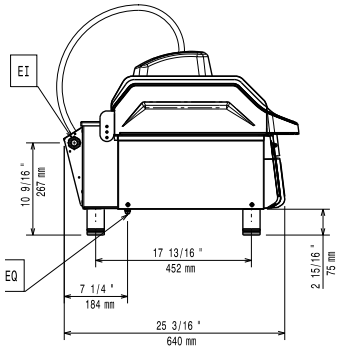


Top



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 ½" (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 ft³ (0.24 m³)

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 # _____

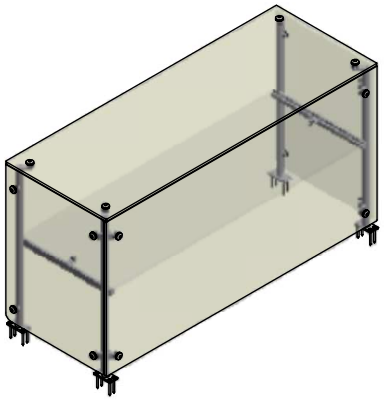
GLASS (Clear Tempered):

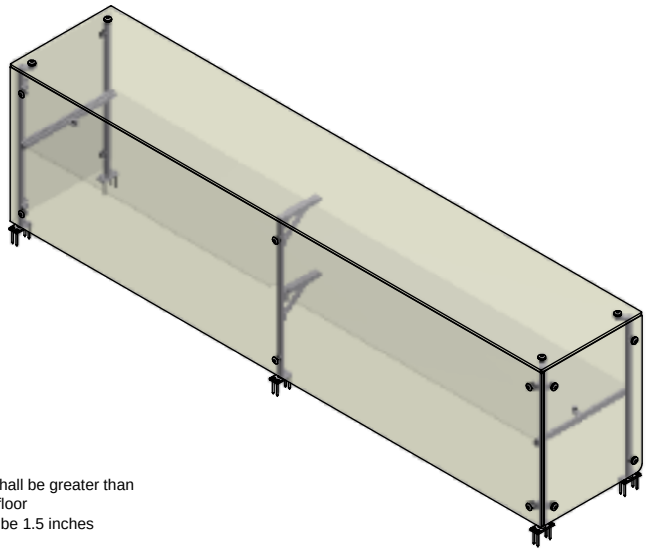
- ☐ 1/4" Front - Std
- ☐ 3/8" Front
- ☐ 1/2" Front
- ☐ Frosted
- ☐ 3/8" Top - Std
- ☐ 1/2" Top

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

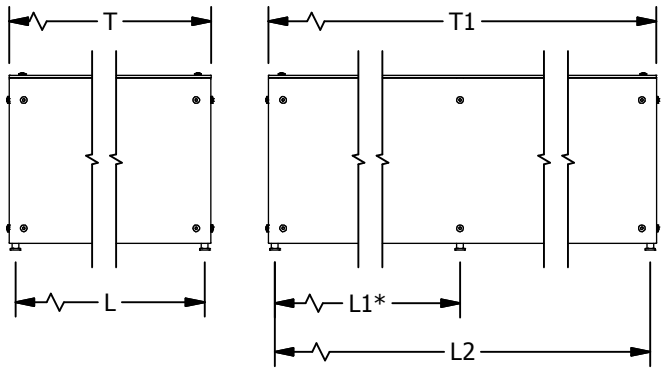
5.35.12.3 Maximum distance between the vertical glass and horizontal glass is 3/4 inch

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.

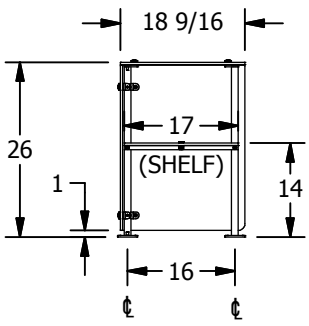
(2) End Panels per unit unless otherwise specified. End panels are 1/4" clear tempered glass unless otherwise specified.



L / L1 - 48" Max (1/4" Glass)
- 60" Max (3/8" Glass)
- 66" Max (1/2" Glass)

T - 60" Max (3/8" Glass)

T1 - 96" Max in a Single Section



(* - Middle support is centered unless L1 dimension is specified)

Versa-Gard,LLC - 1094 Parkway Industrial Park Drive, Buford, GA 30518

03/21/13

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	0-6-DFEA-F	Doorway Facade Extension, arched, flat 6'
Wood Stone	1	0-6-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

MT. BAKER 6'
STONE HEARTH OVEN

Job Name	
Model	WS-MS-6
Item#	

WS-MS-6 model with optional Stainless Steel Mantle shown.

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.

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			

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.

Intertek ANSI Z83.11b-2009 CSA 1.8b-2009

Intertek ANSI/NSF STD 4

t. 360.650.1111
tf. 800.988.8103
f. 360.650.1166

Wood Stone Corporation
1801 W. Bakerview Rd.
Bellingham, WA 98226 USA
info@woodstone-corp.com
woodstone-corp.com

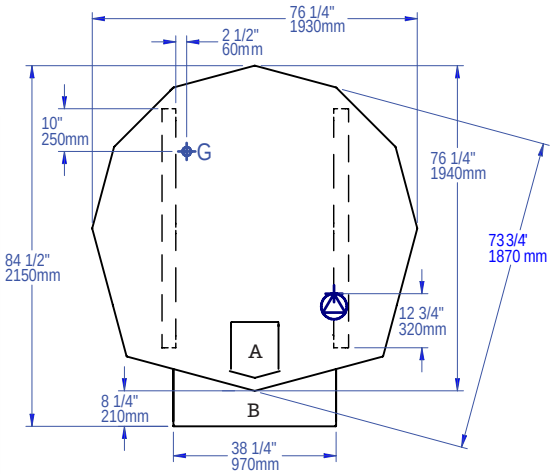
REVISED: SUMMER 2015

Wood Stone

MT. BAKER 6'
STONE HEARTH OVEN • WS-MS-6

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
G	Gas Connection
	Must Be Left Removable for Service
	AIR INTAKE: Do Not Facade or Cover Over

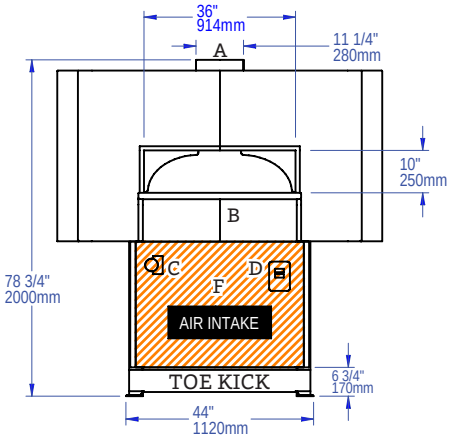
PLAN VIEW



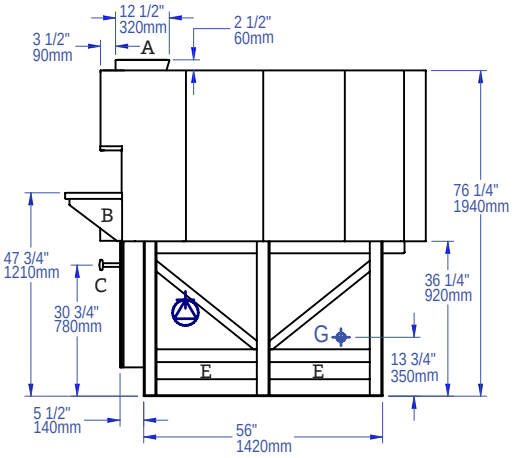
FACADE INFORMATION

- 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.

FRONT VIEW



SIDE VIEW



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

Intertek ANSI Z83.11b-2009 CSA 1.8b-2009

Intertek ANSI/NSF STD 4

t. 360.650.1111
tf. 800.988.8103
f. 360.650.1166

Wood Stone Corporation
1801 W. Bakerview Rd.
Bellingham, WA 98226 USA
info@woodstone-corp.com
woodstone-corp.com

REVISED: SUMMER 2015

An ongoing program of product improvement may require us to change specifications without notice.

Wood Stone

OVEN-MOUNTED EXHAUST HOODS

Wood Stone

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.

Flat Face Hood

Curved Face Hood

AVAILABLE OPTIONS

SPARK ARRESTOR FILTERS

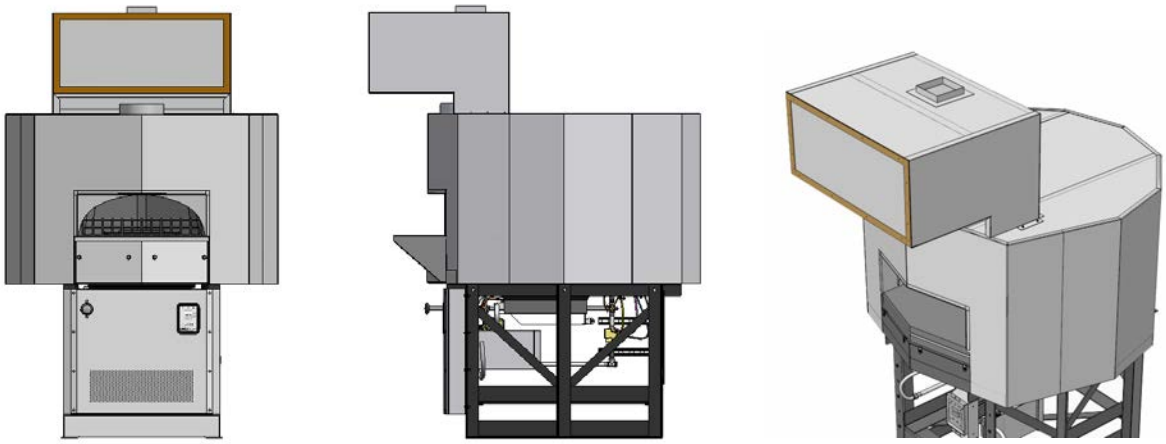
Hood filters required for solid fuel applications.

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.

Intertek

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Wood Stone

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 Enervex 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
	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"
DEPTH	Flat Face	29"	33"	33"	38"	38"	33"	33"	33"	33"	33"
DEPTH	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

Intertek

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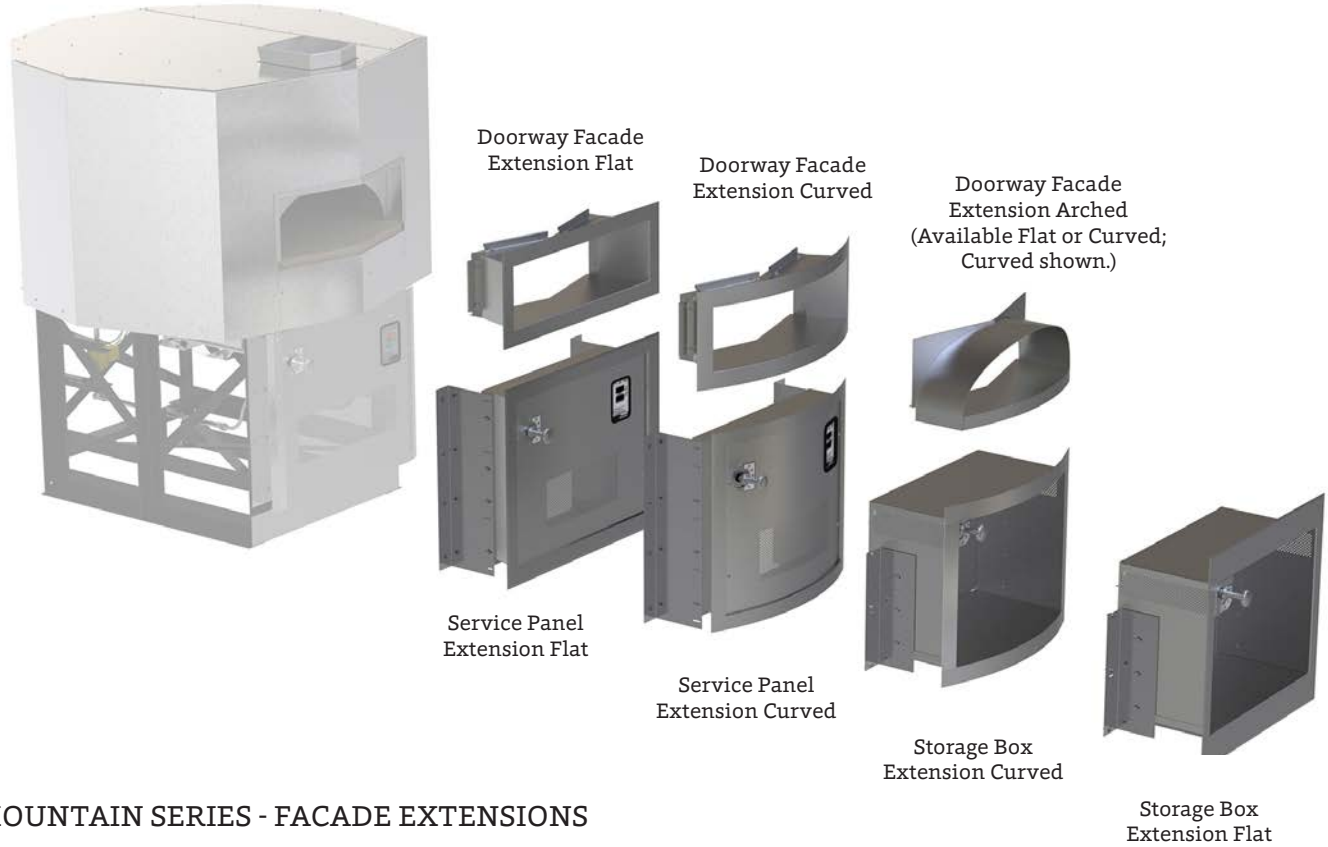
Wood Stone

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.

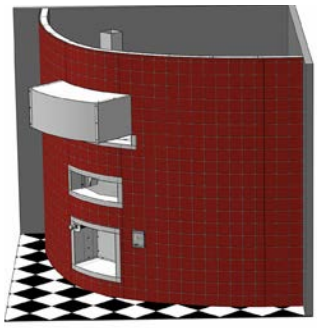
Additionally, there's an arched doorway extension which mirrors the traditional stone hearth oven design.

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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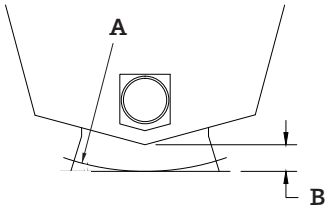
REVISED: SUMMER 2015

Wood Stone

Wood Stone

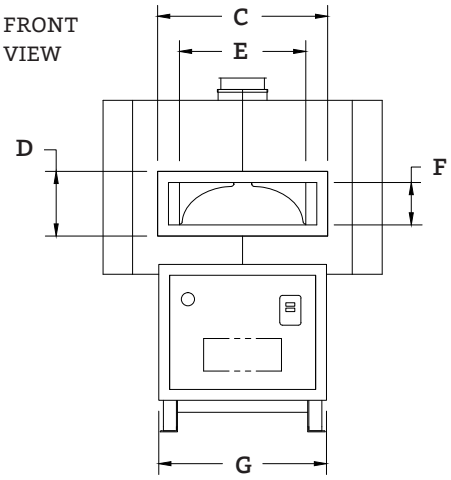
MOUNTAIN SERIES FACADE EXTENSIONS

PLAN VIEW

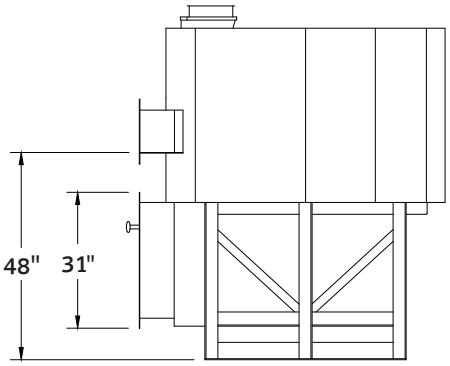


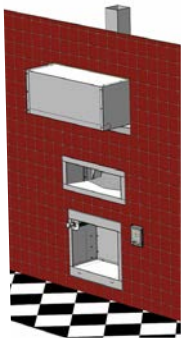
- The addition of granite on the mantle increases dimension (F) by .75" below the doorway.
- Curved Face Extensions are available in large or small radius styles, except for the WS-MS-4, which only has a small radius option.
- WS-MS-4 models with Underfloor IR burners do not have a Storage Box Extension option.
- Double Door and Viewing Window options (not available on WS-MS-4 models) affect some dimensions. Call for details.

FRONT VIEW



SIDE VIEW





Doorway Facade and Storage Box Flat Extensions and Flat Face Hood shown.

	Extensions		Radius of Curved Extension A	Oven Face to Extension Face B	Upper Extension: Doorway Frame [1] Width (C) x Height (D) C	D	Upper Extension: Doorway Opening Width (E) x Height (F) E	F	Lower Extension: Width of Service Panel or Box Frame 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 ± 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

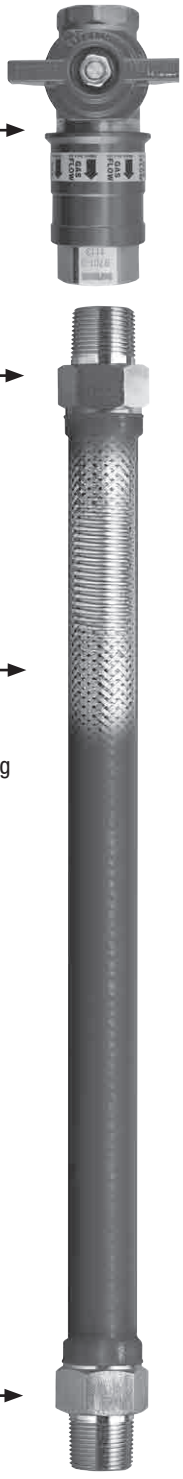
Job Name _____
Job Location _____
Engineer _____
Approval _____

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 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

USA: Export, PA • Tel. (724) 733-4800 • Fax: (724) 733-4808 • www.dormont.com

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"	

Delfield

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.

980 S. Isabella Rd.
Mt. Pleasant, Michigan 48858

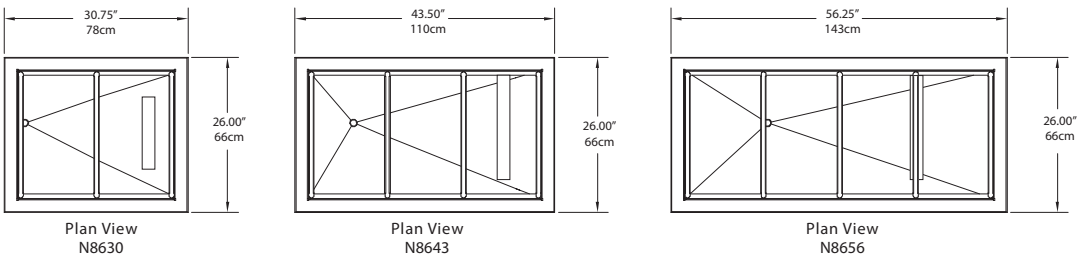
Phone: 800-733-8948 or 989-773-7981
Fax: 800-669-0619

www.delfield.com

Manitowoc

N8600: Drop-In Self-Contained Hot & Cold Combination Pan

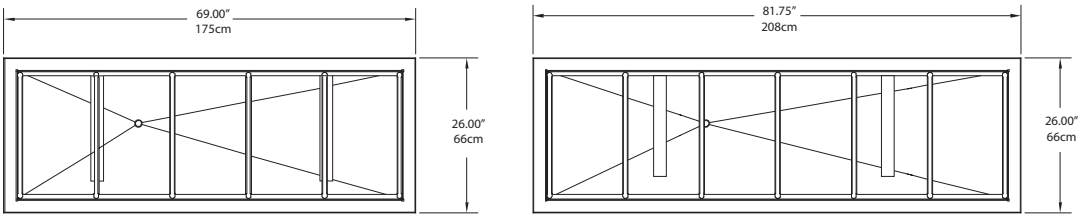
Delfield



Plan View
N8630

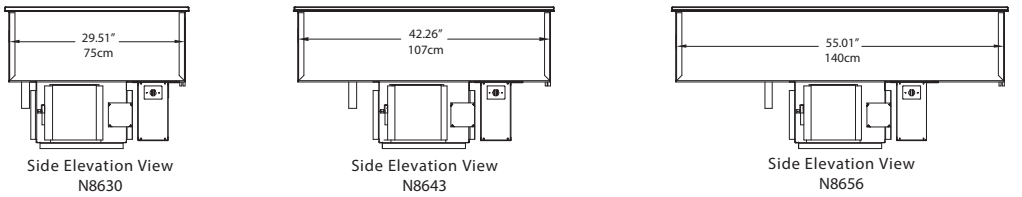
Plan View
N8643

Plan View
N8656



Plan View
N8669

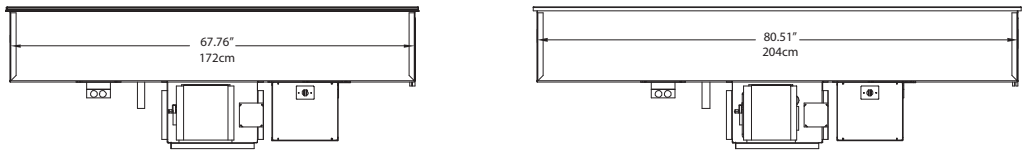
Plan View
N8681



Side Elevation View
N8630

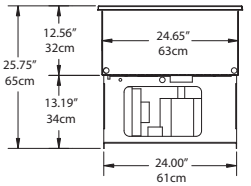
Side Elevation View
N8643

Side Elevation View
N8656

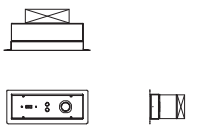


Side Elevation View
N8669

Side Elevation View
N8681



End Elevation
All Models



Remote Control Detail
Cutout Dimensions
12.25″x4.25″x7.00″
(31cm x 11cm x 18cm)

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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Manitowoc

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.**

Project Name:

Model Specified:

Location:

Item No: **Quantity:**

AIA #: **SIS #:**

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*

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.*

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.)	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)

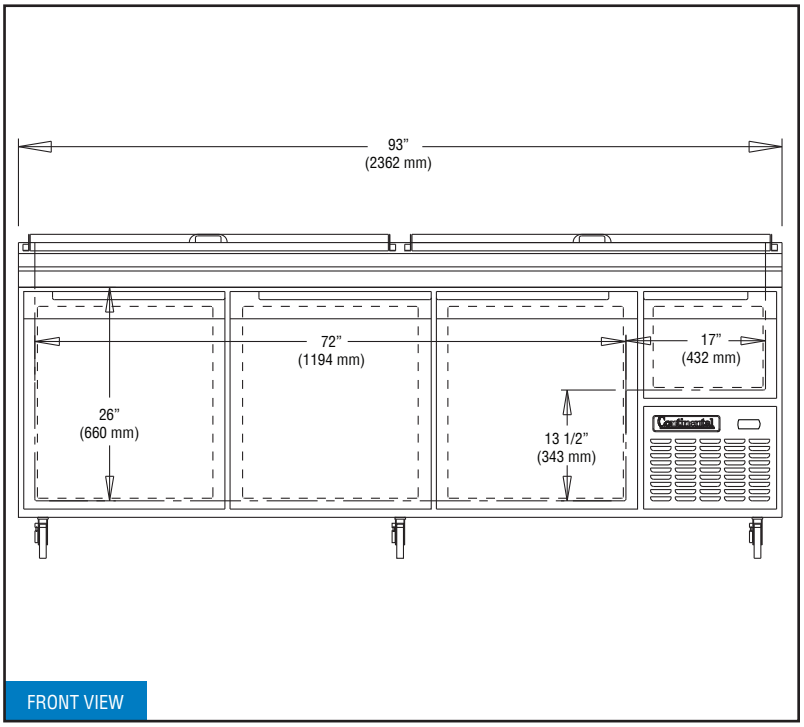
SHIPPING DATA

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)

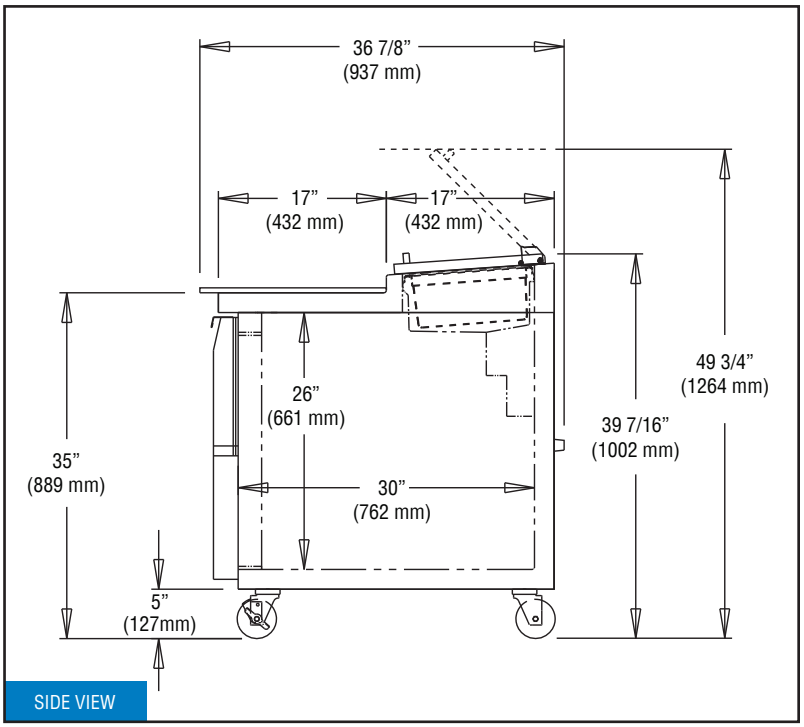
** Rating @ +25°F evaporator, 90°F ambient*
Figures in parentheses reflect metric equivalents rounded to the nearest whole unit.

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 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.

Intertek

MADE IN THE U.S.A.

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

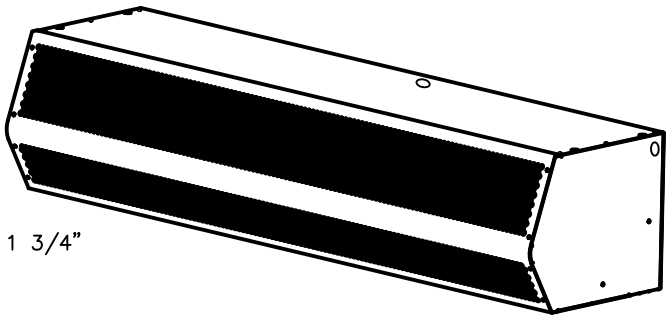
	VOLTS	CYCLE	PHASE	CONN	AFF	NEMA	AMPS	KW	HP	MCA	MOCP
1	115	60	1						(2) 1/2		

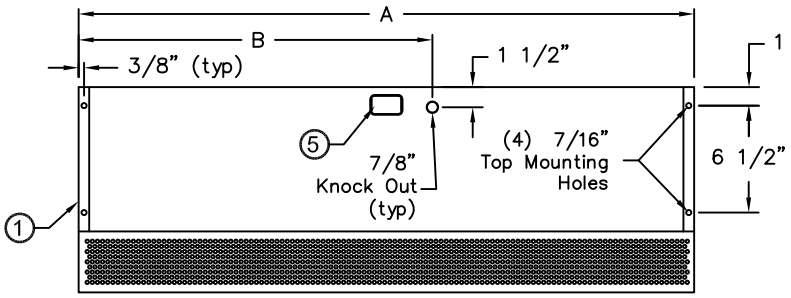
atmosphere is everything
14716 S. Broadway • Gardena, CA 90248 • USA
TEL:(310) 532-1555 • (800) 421-1266 • FAX:(310) 324-3030
Web Site: www.marsair.com • E-mail:info@marsair.com

PROJECT		OPTIONS/ITEMS
TITLE		
COMMENTS		DATE 3/22/16 / PAGE
		REV. NO
MODEL NO. STD2 Series	DRAWING NO STD2U–F	DRAWN BY BH / CHECKED BY / FILE NAME

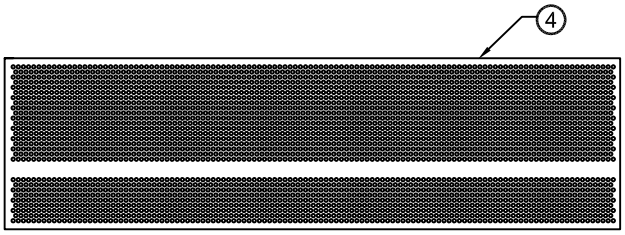
Unheated Drawing

STD2
(Standard 2) Series

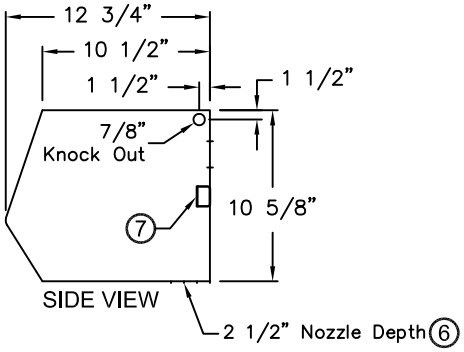




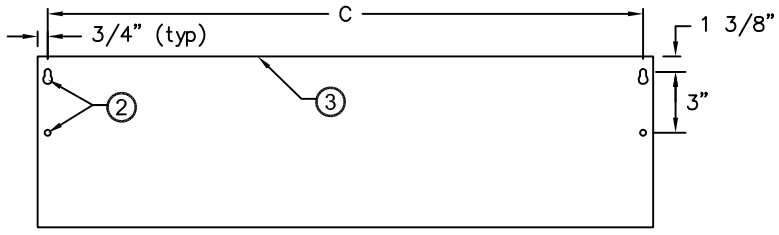
TOP VIEW



FRONT VIEW



SIDE VIEW



REAR VIEW

amca CERTIFIED RATINGS — AIR PERFORMANCE — AIR MOVEMENT AND CONTROL ASSOCIATION INTERNATIONAL, INC.

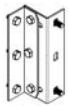
Note: Models STD260-2, STD264-2, STD278-2, STD296-3 & STD2108-2 are not AMCA Certified

ETL LISTED c US — Intertek

8 Recommended Accessories


Control Panels


Door Limit Switches


Brackets

*- 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

Notes:

1. This product is designed to meet the National Electric Code (NEC), ETL Listed (UL 507 and CSA 22.2) and AMCA 211 Certified.
2. (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.
3. 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.
4. Cabinet has sufficient strength for fastening to wall on both ends without intermediate support.
5. 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".
6. 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.
7. Circuit protection as per NEC by others.
8. 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.

STD2 (Standard 2) Series

Unheated

Model Lengths 36” – 144”

atmosphere is everything

14716 S. BROADWAY, GARDENA, CA 90248 ● Ph: (310)532-1555 Fax: (310)-532-3030 ● www.marsair.com

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

Electrical Data (FLA)	Unit Voltage (Voltage Code)						
	Single Phase			Three Phase			
	115v/1Ø (A)	208/230v/1Ø (D)	277v/1Ø (L)	208/230v/3Ø (G)	460v/3Ø (H)	575v/3Ø (I)	380v/3Ø/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

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

EXAMPLE

STD2 72 - 2 U H - OB

- Series: Standard 2
- LENGTH OF UNIT
- # OF MOTORS
- U = UNHEATED
- VOLTAGE CODE
- COLOR

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.

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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