Technical Specifications

For construction contracts greater than $20,000

Campus Security Upgrades Project
SU-100824

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February 25, 2025

SUNY Purchase College
735 Anderson Hill Road
Purchase, New York 10577-1402
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SECTION 02070 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Demolition and removal of selected portions of a building or structure.

1.2 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.

B. Remove and Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner.

C. Remove and Reinstall: Detach items from existing construction, prepare for reuse, and reinstall where indicated.

D. Existing to Remain: Existing items of construction that are not to be permanently removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.3 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.4 FIELD CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.

1. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

E. Storage or sale of removed items or materials on-site is not permitted.

F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1. Maintain fire-protection facilities in service during selective demolition operations.

1.5 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 PEFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

B. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

1. Comply with requirements for existing services/systems interruptions specified in Division 01 Section "Summary."

3.3 PREPARATION

A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Comply with requirements for access and protection specified in Division 01 Section "Temporary Facilities and Controls."

B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

3.4 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
2. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
3. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
4. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
5. Dispose of demolished items and materials promptly.

B. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition[**and cleaned**] and reinstalled in their original locations after selective demolition operations are complete.

3.5 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site.

1. Do not allow demolished materials to accumulate on-site.

2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
4. Comply with requirements specified in Division 01 Section "Construction Waste Management and Disposal."

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.6 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 024119

SECTION 038213 - CONCRETE CORE DRILLING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Core drilling of concrete

B. Control of drilling water

1.02 RELATED TECHNICAL SPECIFICATIONS SECTIONS

A. Section 02070, Selective Demolition.

1.03 REFERENCES

A. Occupational Safety and Health Administration – Safety and Health Standards Digest, Construction Industry (OSHA).

1.04 DEFINITIONS

A. Owner – Legal owner of the structure being cut and consequently, the owner of the holes or openings created by the coring contractor.

B. Contracting agency – The contractor hired directly or indirectly by the owner that is sub-letting the coring requirements to a coring contractor.

C. Coring contractor – The contractor hired to perform the actual coring operation. 1.4.4. Slurry – The liquid material comprised of water and cuttings generated when the owner's structure is cored using a water coolant.

D. Embedment – Objects within the coring area that could be damaged during core drilling. Example of embedment are reinforcing rod and cable and utilities such as electrical power and telephone lines.

E. Holes and openings – the voids resulting from the core drilling or coring operations of the coring contractor. Ownership of the holes or openings rests with the owner or contracting agency; not with the coring contractor.

1.05 SUBMITTALS

A. General: Refer to Technical Specifications Section 013300 – Submittal Procedures, submittal requirements and procedures.

B. Coring Procedures: Submit a concrete coring procedure, which shall include the following:

1. Proposed coring methods.

2. Equipment to be used includes coring equipment and rebar locating equipment.

3. Methods to control drilling water and spoils.

C. Remedial Procedures when Reinforcement is Cut: Coring operations shall terminate immediately when reinforcement is cut. The Contractor shall submit to the SUNY Purchase Facilities for approval of the procedure proposed to repair the cut reinforcement and to prevent further cutting of reinforcement.

1.06 QUALITY ASSURANCE

A. Codes and Standards: Comply with all applicable Federal, State and Local Codes and Safety Regulations. Work practices and worker health and safety shall conform to the New York State Occupational Safety and Health Construction Safety Orders.

B. Construction Tolerances: The deviation in alignment of cored holes from that shown on the Construction Drawings shall not be more than 1/2 inch per 10 feet of cored hole length with a maximum deviation of not more than 3 inches.

C. It is recommended that a pre-job meeting be held with the owner or contracting agency to determine the following information relating to steel reinforcing or other embedments:
1. Are there steel reinforcing or other embedments within the structure to be cut?
2. What is the size and location of the steel reinforcing or other embedments?
3. Is it permissible to cut the steel reinforcing or other embedments in the course of the drilling operation?
4. Is it possible to lay out the holes in such a way that minimizes or avoids the cutting of the steel reinforcing or other embedments?
5. After drilling begins is it permissible to move the hole to stop splitting steel reinforcing or embedments?
Any scaffolding required shall be designed, provided by and erected by competent personnel.

D. It is the owner or contracting agency's responsibility to provide protection to persons and property from potential water or slurry damage. The coring contractor shall not be deemed an owner or generator of slurry and the owner and contracting agency shall protect the coring contractor from all loss and expense associated with such claims.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Water for core drilling operations shall be from the local domestic water supply or shall not contain more than 1,000 parts per million of chlorides as Cl, nor more than 1,300 parts per million of sulfates as SO_4, nor shall the water contain any impurities in a sufficient amount that would cause discoloration of the concrete or produce etching of the surface.

PART 3 - EXECUTION

3.01 CORE DRILLING

A. Coring concrete shall consist of coring holes through reinforced concrete members as shown on the Contract Documents.

B. The holes shall be cored by methods that will not shatter or damage the concrete adjacent to the holes.

C. Water from core drilling operations shall not be permitted to fall on public traffic, to flow across shoulders or lanes occupied by public traffic, or to flow into gutters or other drainage facilities.

END OF SECTION

SECTION 061000 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Framing with dimension lumber.
2. Wood blocking and nailers.
3. Plywood backing panels.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.

1.3 INFORMATIONAL SUBMITTALS

A. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.

B. Evaluation Reports: For the following, from ICC-ES:

1. Wood-preservative-treated wood.
2. Fire-retardant-treated wood.
3. Engineered wood products.
4. Shear panels.
5. Power-driven fasteners.
6. Powder-actuated fasteners.
7. Expansion anchors.
8. Metal framing anchors.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Certified Wood: Materials shall be produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship**.**

1. Dimension lumber framing.
2. Miscellaneous lumber.

B. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. Provide dressed lumber, S4S, unless otherwise indicated.

C. Maximum Moisture Content of Lumber: 19 percent for 2-inch nominal (38-mm actual) thickness or less, no limit for more than 2-inch nominal (38-mm actual) thickness unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application: Treat all rough carpentry unless otherwise indicated.

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, furring, and similar concealed members in contact with masonry or concrete.
3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
4. Wood framing members that are less than 18 inches (460 mm) above the ground in crawlspaces or unexcavated areas.
5. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet (3.2 m) beyond the centerline of the burners at any time during the test.

1. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
2. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.

C. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Kiln-dry plywood after treatment to a maximum moisture content of 15 percent.

D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.

E. Application: Treat the following:

1. Concealed blocking.
2. Framing for non-load-bearing partitions.
3. Framing for non-load-bearing exterior walls.
4. Plywood backing panels.

2.4 DIMENSION LUMBER FRAMING

A. Non-Load-Bearing Interior Partitions: **Construction or No. 2** grade.

1. Application: **All interior partitions**.
2. Species:

a. Mixed southern pine; SPIB.
b. Northern species; NLGA.
c. Eastern softwoods; NeLMA.
d. Western woods; WCLIB or WWPA.

B. Framing Other Than Non-Load-Bearing Interior Partitions: **Construction or No. 2** grade.

1. Application: Framing other than **interior partitions**.
2. Species:

a. Hem-fir (north); NLGA.
b. Southern pine; SPIB.
c. Douglas fir-larch; WCLIB or WWPA.
d. Spruce-pine-fir; NLGA.
e. Douglas fir-south; WWPA.
f. Hem-fir; WCLIB or WWPA.

g. Douglas fir-larch (north); NLGA.

2.5 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.
3. Furring.
4. Grounds.

2.6 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: DOC PS 1, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch (19-mm) nominal thickness.

1. Plywood shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.7 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Power-Driven Fasteners: NES NER-272.

C. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.

2.8 METAL FRAMING ANCHORS

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. Cleveland Steel Specialty Co.
2. KC Metals Products, Inc.
3. Simpson Strong-Tie Co., Inc.
4. USP Structural Connectors.

B. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those of products of manufacturers listed. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis

and demonstrated by comprehensive testing performed by a qualified independent testing agency.

C. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 (Z180) coating designation.

1. Use for interior locations unless otherwise indicated.

D. Hot-Dip, Heavy-Galvanized Steel Sheet: ASTM A 653/A 653M; structural steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 (Z550) coating designation; and not less than 0.036 inch (0.9 mm) thick.

1. Use for wood-preservative-treated lumber and where indicated.

2.9 MISCELLANEOUS MATERIALS

A. Sill-Sealer Gaskets: Glass-fiber-resilient insulation, fabricated in strip form, for use as a sill sealer; 1-inch (25-mm) nominal thickness, compressible to 1/32 inch (0.8 mm); selected from manufacturer's standard widths to suit width of sill members indicated.

B. Sill-Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch (6.4 mm) thick, selected from manufacturer's standard widths to suit width of sill members indicated.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

B. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

C. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.

D. Install fire-retardant treated plywood backing panels with classification marking of testing agency exposed to view.

E. Metal Framing Anchors: Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.

F. Do not splice structural members between supports unless otherwise indicated.

G. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

H. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

I. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. NES NER-272 for power-driven fasteners.
2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
3. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.

3.2 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061000

SECTION 078400 - FIRESTOPPING

PART 1 GENERAL

1.01 REFERENCES

A. UL 263 Fire Tests of Building Construction and Materials.

B. UL 1479 Fire Tests of Through-Penetration Firestops.

C. UL 2079 Standard for Safety Tests for Fire Resistance of Building Joint Systems.

D. ASTM E 119 Methods of Fire Tests of Building Construction and Materials.

E. ASTM E 814 Method of Fire Tests of Through-Penetration Fire Stops.

1.02 DEFINITIONS

A. UL Fire Resistance Directory: Product directory published yearly, with supplements, by Underwriters Laboratories Inc., containing listings and classifications in effect as of the published date for product categories covered by UL.

B. Inchcape Directory of Listed Products: Product directory published yearly by Inchcape Testing Services containing listings which reflect certifications granted for materials, products, systems and equipment which have been tested by Inchcape Testing Services to recognized governing standards.

C. Omega Point Laboratories Listings Directory: Product Directory published yearly by Omega Point Laboratories, Inc. containing listed building products, materials, and assemblies which have been tested by Omega Point Laboratories to recognized governing standards.

D. Factory Mutual Approval Guide: Product directory published yearly, with supplements, by Factory Mutual Research Corp., containing listed building products, materials, and assemblies which have been tested by Factory Mutual Research Corp., to recognized governing standards.

E. F Rating: Prohibits flame passage through the system and requires acceptable hose stream test performance.

F. T Rating: Prohibits flame passage through the system and requires the maximum temperature rise on the unexposed surface of the wall or floor assembly, on the penetrating item and on the fill material not to exceed 325 degrees F above ambient and requires acceptable hose stream test performance.

G. Company Field Advisor: An employee of the Company which lists and markets the primary components of the system under their name who is certified in

writing by the Company to be technically qualified in design, installation, and servicing of the required products or an employee of an organization certified by the foregoing Company to be technically qualified in design, installation and servicing of the required products. Personnel involved solely in sales do not qualify.

1.03 DESIGN REQUIREMENTS

A. Devices and materials shall meet the hourly fire resistance ratings required by the Project as determined by UL 263, UL 1479, UL 2079, ASTM E 119 or ASTM E 814 and be listed and detailed in the UL Fire Resistance Directory, Inchcape Directory of Listed Products, Factory Mutual Approval Guide, or the Omega Point Laboratories Listings Directory.
   1. Exception: Where no listed designs exist that meet the requirements of a specific project condition, submit details and manufacturer's written recommendations for a design meeting the requirements. Include evidence of engineering judgment and extrapolation from listed designs.

1.04 SUBMITTALS

A. Submittals Package: Submit the following items specified below the same time as a package:
   1. Product Data.
   2. Samples.
   3. Quality Control Submittals.
   4. Firestop Schedule.

B. Product Data: Catalog sheets, specifications and installation instructions for each firestop device and material.
   1. Indicate design number for each firestop proposed to be used which is detailed in the UL Fire Resistance Directory, Inchcape Directory of Listed Products, Factory Mutual Approval Guide, or the Omega Point Laboratories Listings Directory.
   2. State the specific locations where each firestop system is proposed to be installed.

C. Samples: One of each product if requested.

D. Quality Control Submittals:
   1. Design Data: Show details and include engineering information and manufacturer's written recommendations required under Design Requirements Article for each proposed firestop if other than a design detailed in the UL Fire Resistance Directory, Inchcape Directory of Listed Products, Factory Mutual Approval Guide, or the Omega Point Laboratories Listings Directory.
      a. State the specific locations where each firestop is proposed to be installed.
   2. Installer's Qualifications Data:
      a. Name of each person who will be performing the Work and their employer's name, business address and telephone number.

b. Names and addresses of 3 similar projects that each person has worked on during the past 5 years.

3. Company Field Advisor Data:
   a. Name, business address and telephone number of Company Field Advisor secured for the required services.
   b. Certified statement from the Company listing the qualifications of the Company Field Advisor and listing of services and each product specifically listed for this Project for which Company Field Advisor is given authorization by the Company to render advice.

E. Firestop Schedule: Submit schedule itemizing the following:
1. Manufacturer's product reference numbers and/or drawing numbers.
2. UL, Inchcape Testing Services, Factory Mutual Research Corp., or Omega Point Lab design number.
3. Location of firestop material.
4. Penetrating Item Description/Limits: Material, size, insulated or uninsulated, and combustibility.
5. Maximum allowable annular space or maximum size opening.
6. Wall type construction.
7. Floor type construction.
8. Hourly Fire resistance rating of wall or floor.
9. F rating.
10. T rating, if available.

NOTE: Firestop Schedule is for information only and will not be acted on for approval. Refer to Sample Firestop Schedule bound in Appendix.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: The persons installing the firestopping and their supervisor shall be personally experienced in firestop work and shall have been regularly employed by a company installing firestopping for a minimum of 3 years.

B. Pre-Installation Conference: Before the firestop work is scheduled to commence, a conference will be called by the Owner's Representative at the Site for the purpose of reviewing the Contract Documents and discussing requirements for the Work. The conference shall be attended by related trade Contractors (if any), their qualified firestopping installers, and associated firestopping manufacturer's Company Field Advisors.

C. Container/Package Labels: Include manufacturer's name and identifying product number, date of manufacturer, lot number, shelf life (if applicable), qualified testing and inspecting agency classification marking, curing time, and mixing instructions for multi-component materials.

D. Company Field Advisor: Secure the services of a Company Field Advisor for the following:
1. Render advice regarding suitability of firestopping materials and methods.

2. Assist in completing firestop schedule.
3. Attend pre-installation conference.

E. Field-Constructed Sample Installations: Prior to installing firestopping, erect sample installations for each type through-penetration firestop system indicated in the Firestop Schedule to verify selections made and to establish standard of quality and performance by which the firestopping work will be judged.
1. Build sample installations to comply with the following requirements, using materials indicated for final installations.
a. Locate sample installations on site at locations where directed.
b. Obtain Owner's Representative's acceptance of sample installations before start of firestopping installation.
c. Retain and maintain sample installations during construction in an undisturbed condition.
d. Accepted sample installations in an undisturbed condition at time of substantial completion of Project may become part of completed firestopping work.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver firestopping materials to the Site in original, new unopened containers or packages bearing manufacturer's printed labels.

B. Store and handle firestopping materials to prevent deterioration or damage due to moisture, temperature changes, contaminants, etc.

1.07 PROJECT CONDITIONS

A. Environmental Requirements:
1. Temperature: Do not install firestopping materials when ambient or substrate temperatures are outside limits permitted by manufacturer of firestopping materials.
2. Humidity and Moisture: Do not install the Work of this Section under conditions that are detrimental to the application, curing, and performance of the materials.
3. Ventilation: Provide sufficient ventilation wherever firestopping materials are installed in enclosed spaces. Follow manufacturer's recommendations.

1.08 SEQUENCING AND SCHEDULING

A. Leave exposed those firestopping installations that are to be concealed behind other construction until the Owner's Representative has examined each installation.

PART 2 PRODUCTS

2.01 FIRESTOPPING-GENERAL

A. Through-Penetration Firestop Devices, Forming Materials, And Fill, Void or Cavity Materials: As listed in the UL Fire Resistance Directory, Inchcape Directory of Listed Products, Factory Mutual Approval Guide, or the Omega Point Laboratories Listings Directory.
   1. For firestopping exposed to moisture, furnish products that do not deteriorate when exposed to this condition.
   2. For firestopping systems exposed to view, furnish products with flame-spread values of less than 25 and smoke developed values less than 50, as determined per ASTM E 84.
   3. For penetrations for piping services below ambient temperature, furnish moisture-resistant through-penetration firestop systems.
   4. For penetrations involving insulated piping, furnish through-penetration firestop systems not requiring removal of insulation.

B. Accessories: Components required to install fill materials as recommended by the firestopping manufacturer for particular approved fire rated system.

C. Identification Labels:
   1. Furnished by fire stopping manufacturer of suitable material for permanent field identification of through-penetration firestops.
   2. Identify the following:
      a. “WARNING - FIRESTOP MATERIAL”.
      b. Company Name.
      c. Product Catalog number.
      d. F rating.
      e. T rating, if available.
   3. Field fabricated labels are not acceptable.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine existing through-penetrations of floors, walls, partitions, ceilings and roofs in the Work areas.

B. Examine existing junctures, control joints, and expansion joints in the Work areas.

C. Where firestopping is missing or not intact, submit a written report to the Owner’s Representative describing the existing conditions.

3.02 PREPARATION

A. Clean out openings immediately before installation of through-penetration firestopping. Comply with recommendations of firestopping manufacturer and the following requirements:
   1. Remove foreign materials from surfaces of openings, and from penetrating items that could interfere with adhesion of firestopping.

2. Clean opening and penetrating items to produce clean, sound surfaces capable of developing optimum bond with firestopping. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form release agents from concrete.

B. Clean out openings, and juncture, control, and expansion joints immediately before installation of firestopping. Comply with recommendations of firestopping manufacturer and the following requirements:
1. Remove foreign materials from surfaces of openings and joint substrates, and from penetrating items that could interfere with adhesion of firestopping.
2. Clean opening joint substrates to produce clean, sound surfaces capable of developing optimum bond with firestopping. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form release agents from concrete.

C. Protection:
1. Protect surfaces adjacent to through-penetration firestops with non-staining removable masking tape or other suitable covering to prevent firestopping from contacting adjoining surfaces that will remain exposed upon completion of Work and that would otherwise be permanently stained or damaged by such contact or that would be caused by cleaning methods used to remove smears from firestopping materials.

D. Substrate Priming:
1. Prime substrates in accordance with the firestopping manufacturer's printed installation instructions using recommended products and methods.
2. Do not allow primer to spill or migrate onto adjoining exposed surfaces.

3.03 INSTALLATION OF THROUGH PENETRATION FIRESTOPS

A. Use through-penetration firestop devices, forming materials, and fill, void or cavity materials to form through-penetration firestops to prevent the passage of flame, and limit temperature rise of the unexposed surface as detailed in the UL Fire Resistance Directory, Inchcape Directory of Listed Products, Factory Mutual Approval Guide, or the Omega Point Laboratories Listings Directory.
1. Where applicable design is not detailed in the Directories, use forming materials and fill, void or cavity material to form through-penetration firestop in accordance with approved printed details and installation instructions from the company producing the forming materials and fill, void or cavity material.
2. If the construction type(s) of the building cannot be determined, provide firestopping with fire resistance ratings as specified in the Building Code of New York State, Tables 720.1(1), 720.1(2), 720.1(3), and 302.3.2.

B. Provide through-penetration firestop systems with F ratings that shall equal or exceed the fire resistance rating of the penetrated building construction.

C. Provide through-penetration firestop systems with T ratings, in addition to F ratings, at floors where the following conditions exist:

1. Where firestop systems protect penetrations located outside the wall cavities.
2. Where firestop systems protect penetrations located outside fire resistive shaft enclosures.
3. Through-penetration firestop systems protecting floor penetrations require a T-rating of at least 1 hour, but not less than the required floor fire-resistance rating.

D. Firestop through-penetrations of floors, walls, partitions, ceilings, and roofs.

E. Firestop through-penetrations associated with the new Work.

F. Firestop through-penetration of partitions identified on the Construction Work Drawings as smoke partitions and fire rated assemblies.

G. Firestop through-penetrations of floors, walls, partitions, ceilings, and roofs in accordance with the fire resistance rating assigned to the walls, partitions, floors, ceilings, and roofs on the Construction Work Drawings.

H. In areas where through-penetration items have been installed before the construction work, firestop the through-penetration items after the construction work has been completed. Furnish drawings or written information to the Construction Work Contractor covering the provisions to be made in the construction work to enable firestopping of the through-penetration items.

I. Permanently affix label at each firestop. Use adhesive compatible with surface construction at firestop location.

3.04 INSTALLATION OF JUNCTION, CONTROL, AND EXPANSION JOINT FIRESTOPS

A. Use joint treatment materials to form firestop to prevent the passage of flame and limit temperature rise of the unexposed surface, as detailed in the UL Fire Resistance Directory, Inchcape Directory of Listed Products, Factory Mutual Approval Guide or the Omega Point Laboratories Listings Directory.
1. Where applicable design is not detailed in the Directories, use forming materials and fill, void or cavity material to form firestop in accordance with approved printed details and installation instructions from the company producing the forming materials and fill, void or cavity material.
2. If the construction type(s) of the building cannot be determined, provide firestopping with fire resistance ratings as specified in the Building Code of New York State, Tables 720.1(1), 720.1(2), 720.1(3), and 302.3.2.

B. Firestop junctures, control joints, and expansion joints associated with the new Work.

C. Permanently affix labels every 10 feet along each firestop. Use adhesive compatible with surface construction at firestop location.

3.05 CLEANING

A. Clean off excess fill materials and sealants adjacent to penetrations by methods and cleaning materials recommended by manufacturers of firestopping products and of products in which penetrations occur.

B. Remove masking tape as soon as practical so as not to disturb the firestopping's bond with substrate.

C. Protect firestopping during and after curing period from contact with contaminating substances, or damage resulting from adjacent Work.

D. Cut out and remove damaged or deteriorated firestopping immediately, and install new materials as specified in firestop schedule.

END OF SECTION

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Silicone joint sealants.
2. Urethane joint sealants.
3. Latex joint sealants.
4. Preformed joint sealants.
5. Acoustical joint sealants.

1.2 PRECONSTRUCTION TESTING

A. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates. Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

1.3 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples: For each kind and color of joint sealant required.

C. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

1.4 INFORMATIONAL SUBMITTALS

A. Product test reports.

B. Preconstruction compatibility and adhesion test reports.

C. Preconstruction field-adhesion test reports.

D. Field-adhesion test reports.

E. Warranties.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM C 1021 to conduct the testing indicated.

B. Preinstallation Conference: Conduct conference at Project site.

1.6 WARRANTY

A. Special Installer's Warranty: Manufacturer's standard form in which Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer's standard form in which joint-sealant manufacturer agrees to furnish joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Architectural Sealants: 250 g/L.
2. Sealant Primers for Nonporous Substrates: 250 g/L.
3. Sealant Primers for Porous Substrates: 775 g/L.

B. Low-Emitting Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

1. Suitability for Immersion in Liquids. Where sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247. Liquid used for testing sealants is deionized water, unless otherwise indicated.

D. Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

E. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

2.2 SILICONE JOINT SEALANTS

A. Mildew-Resistant Silicone Joint Sealant [SS-1]: ASTM C 920.

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. BASF Building Systems.
    b. Dow Corning Corporation.
    c. GE Advanced Materials - Silicones.
    d. Pecora Corporation.
    e. Tremco Incorporated.

2. Type: Single component (S).
3. Grade: nonsag (NS).
4. Class: 50.
5. Uses Related to Exposure: Nontraffic (NT).

2.3 URETHANE JOINT SEALANTS

A. Urethane Joint Sealant [US -1]: ASTM C 920.

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. BASF Building Systems.
    b. Bostik, Inc.
    c. Pecora Corporation.
    d. Sika Corporation; Construction Products Division.
    e. Tremco Incorporated.

2. Type: Single component (S).
3. Grade: nonsag (NS).
4. Class: 50.
5. Uses Related to Exposure: Nontraffic (NT).

2.4 PREFORMED JOINT SEALANTS

A. Preformed Foam Joint Sealant [PS-1]: Manufacturer's standard preformed, precompressed, open-cell foam sealant manufactured from urethane foam with minimum density of 10 lb/cu. ft. (160 kg/cu. m) and impregnated with a nondrying, water-repellent agent. Factory produce in precompressed sizes in roll or stick form to fit joint widths indicated; coated on one side with a pressure-sensitive adhesive and covered with protective wrapping.

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. Dayton Superior Specialty Chemicals.
b. EMSEAL Joint Systems, Ltd.
c. Sandell Manufacturing Co.
d. Schul International, Inc.

2.5 JOINT SEALANT BACKING

A. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin) or any type, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

B. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer.

2.6 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions.

1. Remove laitance and form-release agents from concrete.

2. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.2 INSTALLATION

A. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

B. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

C. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

D. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

E. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.

F. Acoustical Sealant Installation: Comply with ASTM C 919 and with manufacturer's written recommendations.

G. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.3 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

1. Extent of Testing: Test completed and cured sealant joints as follows:

a. Perform 10 tests for the first 1000 feet (300 m) of joint length for each kind of sealant and joint substrate.
b. Perform 1 test for each 1000 feet (300 m) of joint length thereafter or 1 test per each floor per elevation.

2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

B. Evaluation of Field-Adhesion Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.4 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces SS-1.

1. Joint Locations:

a. Control and expansion joints in unit masonry.
b. Joints between metal panels.
c. Joints between different materials listed above.
d. Perimeter joints between materials listed above and frames of doors and windows.
e. Control and expansion joints in ceilings and other overhead surfaces.

2. Joint Sealant: Silicone.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

B. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces SS-1.

1. Joint Locations:

a. Control and expansion joints on exposed interior surfaces of exterior walls.
b. Perimeter joints of exterior openings where indicated.
c. Vertical joints on exposed surfaces of interior walls and partitions.
d. Perimeter joints between interior wall surfaces and frames of interior doors and windows.

2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

END OF SECTION 079200

SECTION 081113 – EXTERIOR HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Standard hollow metal Doors and Frames

B. Related Sections:
1. Division 08 Section 087100 Finish Hardware for door hardware for hollow metal doors.
2. Division 09 Sections Exterior Painting Interior Painting for field painting hollow metal doors and frames.

1.3 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings.

B. Standard Hollow Metal Work: Hollow metal work fabricated according to ANSI/SDI A250.8.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, Fire Rating and finishes.

B. Shop Drawings: Include the following:

1. Elevations of each door design.
2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of anchorages, joints, field splices, and connections.
7. Details of accessories.
8. Details of moldings, removable stops, and glazing.
9. Details of conduit and preparations for power, signal, and control systems.

C. Samples for Verification:
1. If requested, for each type of exposed finish required, prepared on Samples of not less than 3 by 5 inches (75 by 125 mm).

2. If requested, for the following items, prepared on Samples about 12 by 12 inches (305 by 305 mm) to demonstrate compliance with requirements for quality of materials and construction:

a. Doors: Show vertical-edge, top, and bottom construction; core construction; and hinge and other applied hardware reinforcement. Include separate section showing glazing if applicable.
b. Frames: Show profile, corner joint, floor and wall anchors, and silencers. Include separate section showing fixed hollow metal panels and glazing if applicable.

D. Other Action Submittals:

1. Schedule: Provide a schedule of hollow metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with door hardware schedule.

1.5 INFORMATIONAL SUBMITTALS

A. Oversize Construction Certification: For assemblies required to be fire rated and exceeding limitations of labeled assemblies.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each type of hollow metal door and frame assembly.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain hollow metal work from single source from single manufacturer.

B. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated.

1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use non-vented plastic.

1. Provide additional protection to prevent damage to finish of factory-finished units.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch high wood blocking. Do not store in a manner that traps excess humidity.

1. Provide minimum 1/4-inch (6-mm) space between each stacked door to permit air circulation.

1.8 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before Submittal and fabrication.

1.9 COORDINATION

A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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. Ceco Door Products; an Assa Abloy Group company.
2. Curries Company; an Assa Abloy Group company.
3. Firedoor Corporation.
4. Fleming Door Products Ltd.; an Assa Abloy Group company.
5. Mesker Door Inc.
6. Steelcraft; an Ingersoll-Rand company.

2.2 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum **A60** metallic coating.

C. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 40Z (12G) coating designation; mill phosphatized.

1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.

D. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

E. Glazing: Comply with requirements in Division 08 Section "Glazing."

2.3 STANDARD HOLLOW METAL DOORS

A. General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8.

1. Design: Flush Panel
2. Core Construction: Polyurethane,

   a. Fire Door Core: As required to provide fire-protection ratings indicated.
   b. Thermal-Rated (Insulated) Doors: Where indicated, provide doors fabricated with thermal-resistance value .07-U factor when tested according to ASTM C 1363. Using a Polyurethane Core.

      1) Locations: Exterior Doors

3. Vertical Edges for Single-Acting Doors: Beveled Edge.
   a. Beveled Edge: 1/8 inch in 2 inches.
   b. All seams to be stich welded, filled and finished smooth.

4. Top and Bottom Edges: Closed with flush or inverted 16 gage, end closures or channels of same material as face sheets welded in place for a seamless top and bottom.
5. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."

B. Exterior Doors:
1. Fabricate exterior doors with 2 outer stretcher-leveled A60-galvenized steel sheets Not less than 18 gage seamless hollow construction, 1 ¾” thick, beveled both edges.

2. Reinforce inside of doors with the following:
   1. Solid block polyurethane with a minimum .07-U factor. That fills the entire door cavity and is chemically bonded to all surfaces.

C. Interior Doors:
1. Fabricate interior doors with 2 outer stretcher-leveled A60-galvenized steel sheets Not less than 18 gage seamless hollow construction, 1 ¾” thick, beveled both edges.

2. Reinforce inside of doors with Solid block polyurethane with a minimum .24-U factor. That fills the entire door cavity and is chemically bonded to all surfaces.

D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

E. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

2.4 STANDARD HOLLOW METAL FRAMES

A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

B. Exterior Frames: Fabricated from metallic-coated steel sheet not less than 16 gage.

1. Full welded unit construction, with corners mitered and continuously welded full depth and width of frame, unless otherwise specified or shown.
2. Knock-down type frames will not be accepted

C. Interior Frames: Fabricated from cold-rolled steel sheet not less than 16 gage

1. Full welded unit construction, with corners mitered and continuously welded full depth and width of frame, unless otherwise specified or shown.
2. Knock-down type frames will not be accepted

D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as frames.

2.5 FRAME ANCHORS

A. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
3. Compression Type for Drywall Slip-on Frames: Adjustable compression anchors.
4. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch-diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.

B. Floor Anchors: Formed from same material as frames, not less than 0.042 inch thick, and as follows:

1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at finish floor surface.

2.6 HOLLOW METAL PANELS

A. Provide hollow metal panels of same materials, construction, and finish as specified for adjoining hollow metal work.

2.7 STOPS AND MOLDINGS

A. Moldings for Glazed Lites in Doors: Minimum 0.032 inch thick, fabricated from same material as door face sheet in which they are installed.

B. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch high unless otherwise indicated.

C. Loose Stops for Glazed Lites in Frames: Minimum 0.032 inch thick, fabricated from same material as frames in which they are installed.

D. Terminated Stops: Where indicated on interior door frames, terminate stops 6 inches above finish floor with a 45 degree angle cut, and close open end of stop with steel sheet closure. Cover opening in extension of frame with welded-steel filler plate, with welds ground smooth and flush with frame.

2.8 FABRICATION

A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117, ANSI/NAAMM-HMMA 861.

C. Hollow Metal Doors:

1. Exterior Doors: Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
2. Glazed Lites: Factory cut openings in doors.
3. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted.

D. Hollow Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.

1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.

2. Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
3. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
4. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
5. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
6. Jamb Anchors: Provide number and spacing of anchors as follows:

    a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

        1) Two anchors per jamb up to 60 inches high.
        2) Three anchors per jamb from 60 to 90 inches high.
        3) Four anchors per jamb from 90 to 120 inches high.
        4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.

    b. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

        1) Three anchors per jamb up to 60 inches high.
        2) Four anchors per jamb from 60 to 90 inches high.
        3) Five anchors per jamb from 90 to 96 inches high.
        4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
        5) Two anchors per head for frames above 42 inches wide and mounted in metal-stud partitions.

    c. Compression Type: Not less than two anchors in each jamb.
    d. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.

7. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Keep holes clear during construction.

    a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
    b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

E. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.

F. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."

1. Locate hardware as indicated, or if not indicated, according to [**ANSI/SDI A250.8**] [**ANSI/NAAMM-HMMA 861**].
2. Reinforce doors and frames to receive non-templated, mortised and surface-mounted door hardware.-
3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

G. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.

1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow metal work.
2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
4. Provide loose stops and moldings on inside of hollow metal work.
5. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.

2.9 STEEL FINISHES

A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

C. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness to the following tolerances:

1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
2. Alignment: Plus or minus 1/16 inch measured at jambs on a horizontal line parallel to plane of wall.
3. Twist: Plus or minus 1/16 inch measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
4. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.

C. Drill and tap doors and frames to receive non-templated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11, HMMA 840.

1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.

    a. At fire-protection-rated openings, install frames according to NFPA 80.
    b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
    c. Install frames with removable glazing stops located on secure side of opening.
    d. Install door silencers in frames before grouting.
    e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
    f. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
    g. Field apply bituminous coating to backs of frames that are filled with grout containing antifreezing agents.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.

a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.

3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
5. Concrete Walls: Solidly fill space between frames and concrete with grout. Take precautions, including bracing frames, to ensure that frames are not deformed or damaged by grout forces.
6. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
7. In-Place Gypsum Board Partitions: Secure frames in place with post-installed expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
8. Ceiling Struts: Extend struts vertically from top of frame at each jamb to overhead structural supports or substrates above frame unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction. Provide adjustable wedged or bolted anchorage to frame jamb members.
9. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:

a. Squareness: Plus or minus 1/16 inch measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
b. Alignment: Plus or minus 1/16 inch measured at jambs on a horizontal line parallel to plane of wall.
c. Twist: Plus or minus 1/16 inch measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
d. Plumbness: Plus or minus 1/16 inch measured at jambs at floor.

C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Standard Steel Doors:

a. Jambs and Head: 1/8 inch plus or minus 1/16 inch
b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch
c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch
d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch .

2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

D. Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.

1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow metal work immediately after installation.

C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

D. Metallic-Coated Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION 081113

SECTION 081113 – INTERIOR HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Standard hollow metal Doors and Frames

B. Related Sections:
1. Division 08 Section 087100 Finish Hardware for door hardware for hollow metal doors.
2. Division 09 Sections Exterior Painting Interior Painting for field painting hollow metal doors and frames.

1.3 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings.

B. Standard Hollow Metal Work: Hollow metal work fabricated according to ANSI/SDI A250.8.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, Fire Rating and finishes.

B. Shop Drawings: Include the following:

1. Elevations of each door design.
2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of anchorages, joints, field splices, and connections.
7. Details of accessories.
8. Details of moldings, removable stops, and glazing.
9. Details of conduit and preparations for power, signal, and control systems.

C. Samples for Verification:
1. If requested, for each type of exposed finish required, prepared on Samples of not less than 3 by 5 inches (75 by 125 mm).

2. If requested, for the following items, prepared on Samples about 12 by 12 inches (305 by 305 mm) to demonstrate compliance with requirements for quality of materials and construction:

a. Doors: Show vertical-edge, top, and bottom construction; core construction; and hinge and other applied hardware reinforcement. Include separate section showing glazing if applicable.
b. Frames: Show profile, corner joint, floor and wall anchors, and silencers. Include separate section showing fixed hollow metal panels and glazing if applicable.

D. Other Action Submittals:

1. Schedule: Provide a schedule of hollow metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with door hardware schedule.

1.5 INFORMATIONAL SUBMITTALS

A. Oversize Construction Certification: For assemblies required to be fire rated and exceeding limitations of labeled assemblies.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each type of hollow metal door and frame assembly.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain hollow metal work from single source from single manufacturer.

B. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated.

1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use non-vented plastic.

1. Provide additional protection to prevent damage to finish of factory-finished units.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch high wood blocking. Do not store in a manner that traps excess humidity.

1. Provide minimum 1/4-inch (6-mm) space between each stacked door to permit air circulation.

1.8 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before Submittal and fabrication.

1.9 COORDINATION

A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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. Ceco Door Products; an Assa Abloy Group company.
2. Curries Company; an Assa Abloy Group company.
3. Firedoor Corporation.
4. Fleming Door Products Ltd.; an Assa Abloy Group company.
5. Mesker Door Inc.
6. Steelcraft; an Ingersoll-Rand company.

2.2 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum **A60** metallic coating.

C. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 40Z (12G) coating designation; mill phosphatized.

1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.

D. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

E. Glazing: Comply with requirements in Division 08 Section "Glazing."

2.3 STANDARD HOLLOW METAL DOORS

A. General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8.

1. Design: Flush Panel
2. Core Construction: Polyurethane,

   a. Fire Door Core: As required to provide fire-protection ratings indicated.
   b. Thermal-Rated (Insulated) Doors: Where indicated, provide doors fabricated with thermal-resistance value .07-U factor when tested according to ASTM C 1363. Using a Polyurethane Core.

      1) Locations: Exterior Doors

3. Vertical Edges for Single-Acting Doors: Beveled Edge.
   a. Beveled Edge: 1/8 inch in 2 inches.
   b. All seams to be stich welded, filled and finished smooth.

4. Top and Bottom Edges: Closed with flush or inverted 16 gage, end closures or channels of same material as face sheets welded in place for a seamless top and bottom.
5. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."

B. Exterior Doors:
1. Fabricate exterior doors with 2 outer stretcher-leveled A60-galvenized steel sheets Not less than 18 gage seamless hollow construction, 1 ¾” thick, beveled both edges.

2. Reinforce inside of doors with the following:
   1. Solid block polyurethane with a minimum .07-U factor. That fills the entire door cavity and is chemically bonded to all surfaces.

C. Interior Doors:
1. Fabricate interior doors with 2 outer stretcher-leveled A60-galvenized steel sheets Not less than 18 gage seamless hollow construction, 1 ¾” thick, beveled both edges.

2. Reinforce inside of doors with Solid block polyurethane with a minimum .24-U factor. That fills the entire door cavity and is chemically bonded to all surfaces.

D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

E. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

2.4 STANDARD HOLLOW METAL FRAMES

A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

B. Exterior Frames: Fabricated from metallic-coated steel sheet not less than 16 gage.

1. Full welded unit construction, with corners mitered and continuously welded full depth and width of frame, unless otherwise specified or shown.
2. Knock-down type frames will not be accepted

C. Interior Frames: Fabricated from cold-rolled steel sheet not less than 16 gage

1. Full welded unit construction, with corners mitered and continuously welded full depth and width of frame, unless otherwise specified or shown.
2. Knock-down type frames will not be accepted

D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as frames.

2.5 FRAME ANCHORS

A. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
3. Compression Type for Drywall Slip-on Frames: Adjustable compression anchors.
4. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch-diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.

B. Floor Anchors: Formed from same material as frames, not less than 0.042 inch thick, and as follows:

1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at finish floor surface.

2.6 HOLLOW METAL PANELS

A. Provide hollow metal panels of same materials, construction, and finish as specified for adjoining hollow metal work.

2.7 STOPS AND MOLDINGS

A. Moldings for Glazed Lites in Doors: Minimum 0.032 inch thick, fabricated from same material as door face sheet in which they are installed.

B. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch high unless otherwise indicated.

C. Loose Stops for Glazed Lites in Frames: Minimum 0.032 inch thick, fabricated from same material as frames in which they are installed.

D. Terminated Stops: Where indicated on interior door frames, terminate stops 6 inches above finish floor with a 45 degree angle cut, and close open end of stop with steel sheet closure. Cover opening in extension of frame with welded-steel filler plate, with welds ground smooth and flush with frame.

2.8 FABRICATION

A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117, ANSI/NAAMM-HMMA 861.

C. Hollow Metal Doors:

1. Exterior Doors: Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
2. Glazed Lites: Factory cut openings in doors.
3. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted.

D. Hollow Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.

1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.

2. Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
3. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
4. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
5. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
6. Jamb Anchors: Provide number and spacing of anchors as follows:

    a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

        1) Two anchors per jamb up to 60 inches high.
        2) Three anchors per jamb from 60 to 90 inches high.
        3) Four anchors per jamb from 90 to 120 inches high.
        4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.

    b. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

        1) Three anchors per jamb up to 60 inches high.
        2) Four anchors per jamb from 60 to 90 inches high.
        3) Five anchors per jamb from 90 to 96 inches high.
        4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
        5) Two anchors per head for frames above 42 inches wide and mounted in metal-stud partitions.

    c. Compression Type: Not less than two anchors in each jamb.
    d. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.

7. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Keep holes clear during construction.

    a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
    b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

E. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.

F. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."

1. Locate hardware as indicated, or if not indicated, according to [**ANSI/SDI A250.8**] [**ANSI/NAAMM-HMMA 861**].
2. Reinforce doors and frames to receive non-templated, mortised and surface-mounted door hardware.-
3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

G. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.

1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow metal work.
2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
4. Provide loose stops and moldings on inside of hollow metal work.
5. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.

2.9 STEEL FINISHES

A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

C. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness to the following tolerances:

1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
2. Alignment: Plus or minus 1/16 inch measured at jambs on a horizontal line parallel to plane of wall.
3. Twist: Plus or minus 1/16 inch measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
4. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.

C. Drill and tap doors and frames to receive non-templated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11, HMMA 840.

1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.

    a. At fire-protection-rated openings, install frames according to NFPA 80.
    b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
    c. Install frames with removable glazing stops located on secure side of opening.
    d. Install door silencers in frames before grouting.
    e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
    f. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
    g. Field apply bituminous coating to backs of frames that are filled with grout containing antifreezing agents.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.

a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.

3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
5. Concrete Walls: Solidly fill space between frames and concrete with grout. Take precautions, including bracing frames, to ensure that frames are not deformed or damaged by grout forces.
6. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
7. In-Place Gypsum Board Partitions: Secure frames in place with post-installed expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
8. Ceiling Struts: Extend struts vertically from top of frame at each jamb to overhead structural supports or substrates above frame unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction. Provide adjustable wedged or bolted anchorage to frame jamb members.
9. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:

a. Squareness: Plus or minus 1/16 inch measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
b. Alignment: Plus or minus 1/16 inch measured at jambs on a horizontal line parallel to plane of wall.
c. Twist: Plus or minus 1/16 inch measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
d. Plumbness: Plus or minus 1/16 inch measured at jambs at floor.

C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Standard Steel Doors:

a. Jambs and Head: 1/8 inch plus or minus 1/16 inch
b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch
c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch
d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch .

2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

D. Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.

1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow metal work immediately after installation.

C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

D. Metallic-Coated Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION 081113

SECTION 081116 – EXTERIOR ALUMINUM DOORS AND FRAMES

PART 1 GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

A. Finish Hardware and Thresholds: Section 087100.

B. Glass and Glazing: Section 088100.

1.02 SUBMITTALS

A. Shop Drawings: Show details of each frame type, elevation and construction for each door type, conditions at openings, location and installation requirements for finish hardware (including cutouts and reinforcements), details of connections, and anchorage and accessory items.
   1. Include a schedule of doors and frames using the same reference numbers for details and openings as those on the Contract Drawings.

B. Product Data: Catalog sheets, specifications, and installation instructions for each type door and frame specified.

C. Samples:
   1. Frames: Corner sample of each type, 18 x 18 inches, with mortises, reinforcements, and specified finish.
   2. Doors: Corner sample of each type showing construction, 18 x 18 inches, with mortises, reinforcements, and specified finish.
   3. Color Samples: Manufacturer's standard colors showing maximum variation of each color. Submit actual production sections large enough to establish the allowable color shade range.

PART 2 PRODUCTS

2.01 MATERIALS

A. Aluminum:
   1. Extruded Shapes: 6063 alloy, T5 temper.
   2. Rolled Shapes: 6061 alloy, T6 temper.
   3. Sheet, and Shapes Formed of Sheet: 1100 alloy, H14 temper.
   4. Color Anodized Aluminum: 5005 alloy of temper for required shapes.

B. Steel Subframes: ASTM A 36 plates, shapes and bars.

C. Reinforcement: Manufacturer's standard formed or fabricated steel units, of shapes, plates or bars; galvanized after reinforcement fabrication, ASTM A 123.

D. Fasteners: Aluminum, non-magnetic stainless steel, or other non-corrosive metal fasteners compatible with aluminum door components and other items to be

fastened; Phillips flat-head screws for exposed fasteners (if any), finished to match fastened item.

1. Do not use exposed fasteners except for necessary application of surface mounted hardware. Use concealed screws when required for application of glazing stops.

E. Inserts: Cast iron, malleable iron, 12 gage galvanized steel, ASTM A 153, for required anchorage to concrete or masonry Work.

F. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488, conducted by a qualified independent test agency.
   a. Carbon Steel: Zinc-Plated; ASTM B 633, Class Fe/Zn 5.
   b. Stainless Steel: Bolts, Alloy Group 1 or 2; ASTM F593, Nuts; ASTM F 594.

G. Machine Screws for Steel Subframes: ASME B18.6.3.

H. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

I. Compression Weatherstripping: Replaceable stripping of either molded neoprene gaskets complying with ASTM D 2000, Designation 2BC415 to 3BC620, or molded PVC gaskets complying with ASTM D 2287.

J. Sliding Weatherstripping: Replaceable stripping of wool, polypropylene or nylon woven pile, with nylon fabric and aluminum strip backing, complying with AAMA 701.1.

K. Sealants and Gaskets: Manufacturer's standard for the fabrication, assembly and installation of the Work; guaranteed by the manufacturer to remain permanently elastic, non-shrinking, non-migrating and weatherproof.

L. Glazing Gaskets: Stripping of molded neoprene complying with ASTM D 2000, Designation 2BC415 to 3BC620, or molded PVC complying with ASTM D 2287, or molded closed-cell neoprene complying with ASTM C 509, Type II, for glazing factory-installed glass and panels, and for gaskets which are factory-installed in a "captive" assembly of glazing stops.

2.02 FABRICATION

A. Frames:
   1. Fabricate door frames, and frames combining transoms, sidelights, and panel framing of formed or extruded aluminum not less than 0.125 inch thick.
   3. Door Stops: Manufacturer's standard integral extruded shapes.
   5. Glazing Beads: Manufacturer's standard integral extruded shapes.

6. Subframes: Fabricate subframe assemblies and accessories, as shown, of materials specified herein.

B. Glazed Doors:
1. Fabricate stiles and rails of extruded aluminum tubular shapes, 1/8 inch min wall thickness, not less than 3 ½" inches wide. Attach extrusions together by means of concealed mechanical fasteners and concealed welding.
2. Glazing Beads: Manufacturer's standard extruded shapes.

3. Door Edges: Lock stile edge of single acting doors shall be beveled 1/8 inch in 2 inches. Double acting doors shall have 4 inch radius rounded edges. Meeting stile edges of pairs of single acting doors shall be "V" beveled or rounded, as indicated.

C. Finish Hardware Preparation: Attach concealed reinforcements and cut mortises of sizes required and where located by the approved hardware schedule, for the proper installation of finish hardware.
1. Reinforcements: 1/4 inch thick aluminum.
2. Install reinforcements within mortises at the depths required to bring the hardware surfaces flush with the door and jamb surfaces.
3. Extend reinforcements for hinges, pivots, floor hinges, 4 inches above and below mortises on side jambs and door edges.
4. Reinforce all doors not mortised for concealed door closers on both sides for surface door closer application; and all frames on both sides for closer arm application.

2.03 FINISHES

A. Preparation: After fabrication of doors and frames, but before lamination of panels (if any), prepare the aluminum surfaces for finishing in accordance with the Aluminum Association recommendations and standards. Process all components of each assembly simultaneously to attain complete uniformity of color.

B. Finish exposed aluminum door and frame components as follows:

1. Natural Anodized Finish: NAAMM AA-M21C22A41, (minimum thickness of 0.7 mils), natural aluminum color.
2. Colored Anodized Finish: NAAMM AA-M21C22A42 heavy colored, (minimum thickness of 0.7 mils), integral color anodized finish.
3. Color: As listed on door schedule

PART 3 EXECUTION

3.01 INSTALLATION

A. Securely anchor sub-framing to supporting structures, plumb and level and properly prepared to receive aluminum doors and frames.

B. Protect areas of frames and panels to be in contact with sealants and surfaces of glazing rebates and glazing beads with protective, strippable tape. Do not apply lacquer to such areas. Remove tape immediately before application of caulking or glazing compound.

C. Paint aluminum surfaces in contact with masonry and incompatible metals with bituminous paint.

D. Door Installation: Fit doors accurately in their frames, with the following clearances:
1. Jambs and Head: 3/32 inch.
2. Meeting Edges, Pairs of Doors: 1/8 inch.
3. Bottom; no Threshold or Carpet: 3/8 inch.
4. Bottom, at Threshold or Carpet: 1/8 inch.

3.02 PROTECTION

A. Provide protective covering to protect aluminum doors and frames from damage or defacement after erection.

3.03 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating finish hardware items just prior to final inspection. Leave Work in complete and proper operating condition.

B. When directed, or just prior to final inspection remove protective coverings and clean aluminum surfaces with products specifically formulated for aluminum and known to be compatible with finishes specified herein.

END OF SECTION

SECTION 081116 – INTERIOR ALUMINUM DOORS AND FRAMES

PART 1 GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

A. Finish Hardware and Thresholds: Section 087100.

B. Glass and Glazing: Section 088100.

1.02 SUBMITTALS

A. Shop Drawings: Show details of each frame type, elevation and construction for each door type, conditions at openings, location and installation requirements for finish hardware (including cutouts and reinforcements), details of connections, and anchorage and accessory items.
   1. Include a schedule of doors and frames using the same reference numbers for details and openings as those on the Contract Drawings.

B. Product Data: Catalog sheets, specifications, and installation instructions for each type door and frame specified.

C. Samples:
   1. Frames: Corner sample of each type, 18 x 18 inches, with mortises, reinforcements, and specified finish.
   2. Doors: Corner sample of each type showing construction, 18 x 18 inches, with mortises, reinforcements, and specified finish.
   3. Color Samples: Manufacturer's standard colors showing maximum variation of each color. Submit actual production sections large enough to establish the allowable color shade range.

PART 2 PRODUCTS

2.01 MATERIALS

A. Aluminum:
   1. Extruded Shapes: 6063 alloy, T5 temper.
   2. Rolled Shapes: 6061 alloy, T6 temper.
   3. Sheet, and Shapes Formed of Sheet: 1100 alloy, H14 temper.
   4. Color Anodized Aluminum: 5005 alloy of temper for required shapes.

B. Steel Subframes: ASTM A 36 plates, shapes and bars.

C. Reinforcement: Manufacturer's standard formed or fabricated steel units, of shapes, plates or bars; galvanized after reinforcement fabrication, ASTM A 123.

D. Fasteners: Aluminum, non-magnetic stainless steel, or other non-corrosive metal fasteners compatible with aluminum door components and other items to be fastened; Phillips flat-head screws for exposed fasteners (if any), finished to match fastened item.
1. Do not use exposed fasteners except for necessary application of surface mounted hardware. Use concealed screws when required for application of glazing stops.

E. Inserts: Cast iron, malleable iron, 12 gage galvanized steel, ASTM A 153, for required anchorage to concrete or masonry Work.

F. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488, conducted by a qualified independent test agency.
a. Carbon Steel: Zinc-Plated; ASTM B 633, Class Fe/Zn 5.
b. Stainless Steel: Bolts, Alloy Group 1 or 2; ASTM F593, Nuts; ASTM F 594.

G. Machine Screws for Steel Subframes: ASME B18.6.3.

H. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

I. Compression Weatherstripping: Replaceable stripping of either molded neoprene gaskets complying with ASTM D 2000, Designation 2BC415 to 3BC620, or molded PVC gaskets complying with ASTM D 2287.

J. Sliding Weatherstripping: Replaceable stripping of wool, polypropylene or nylon woven pile, with nylon fabric and aluminum strip backing, complying with AAMA 701.1.

K. Sealants and Gaskets: Manufacturer's standard for the fabrication, assembly and installation of the Work; guaranteed by the manufacturer to remain permanently elastic, non-shrinking, non-migrating and weatherproof.

L. Glazing Gaskets: Stripping of molded neoprene complying with ASTM D 2000, Designation 2BC415 to 3BC620, or molded PVC complying with ASTM D 2287, or molded closed-cell neoprene complying with ASTM C 509, Type II, for glazing factory-installed glass and panels, and for gaskets which are factory-installed in a "captive" assembly of glazing stops.

2.02 FABRICATION

A. Frames:
1. Fabricate door frames, and frames combining transoms, sidelights, and panel framing of formed or extruded aluminum not less than 0.125 inch thick.
3. Door Stops: Manufacturer's standard integral extruded shapes.

5. Glazing Beads: Manufacturer's standard integral extruded shapes.
6. Subframes: Fabricate subframe assemblies and accessories, as shown, of materials specified herein.

B. Glazed Doors:
1. Fabricate stiles and rails of extruded aluminum tubular shapes, 1/8 inch min wall thickness, not less than 3 ½" inches wide. Attach extrusions together by means of concealed mechanical fasteners and concealed welding.
2. Glazing Beads: Manufacturer's standard extruded shapes.

3. Door Edges: Lock stile edge of single acting doors shall be beveled 1/8 inch in 2 inches. Double acting doors shall have 4 inch radius rounded edges. Meeting stile edges of pairs of single acting doors shall be "V" beveled or rounded, as indicated.

C. Finish Hardware Preparation: Attach concealed reinforcements and cut mortises of sizes required and where located by the approved hardware schedule, for the proper installation of finish hardware.
1. Reinforcements: 1/4 inch thick aluminum.
2. Install reinforcements within mortises at the depths required to bring the hardware surfaces flush with the door and jamb surfaces.
3. Extend reinforcements for hinges, pivots, floor hinges, 4 inches above and below mortises on side jambs and door edges.
4. Reinforce all doors not mortised for concealed door closers on both sides for surface door closer application; and all frames on both sides for closer arm application.

2.03 FINISHES

A. Preparation: After fabrication of doors and frames, but before lamination of panels (if any), prepare the aluminum surfaces for finishing in accordance with the Aluminum Association recommendations and standards. Process all components of each assembly simultaneously to attain complete uniformity of color.

B. Finish exposed aluminum door and frame components as follows:

1. Natural Anodized Finish: NAAMM AA-M21C22A41, (minimum thickness of 0.7 mils), natural aluminum color.
2. Colored Anodized Finish: NAAMM AA-M21C22A42 heavy colored, (minimum thickness of 0.7 mils), integral color anodized finish.
3. Color: As listed on door schedule

PART 3 EXECUTION

3.01 INSTALLATION

A. Securely anchor sub-framing to supporting structures, plumb and level and properly prepared to receive aluminum doors and frames.

B. Protect areas of frames and panels to be in contact with sealants and surfaces of glazing rebates and glazing beads with protective, strippable tape. Do not apply lacquer to such areas. Remove tape immediately before application of caulking or glazing compound.

C. Paint aluminum surfaces in contact with masonry and incompatible metals with bituminous paint.

D. Door Installation: Fit doors accurately in their frames, with the following clearances:
1. Jambs and Head: 3/32 inch.
2. Meeting Edges, Pairs of Doors: 1/8 inch.
3. Bottom; no Threshold or Carpet: 3/8 inch.
4. Bottom, at Threshold or Carpet: 1/8 inch.

3.02 PROTECTION

A. Provide protective covering to protect aluminum doors and frames from damage or defacement after erection.

3.03 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating finish hardware items just prior to final inspection. Leave Work in complete and proper operating condition.

B. When directed, or just prior to final inspection remove protective coverings and clean aluminum surfaces with products specifically formulated for aluminum and known to be compatible with finishes specified herein.

END OF SECTION

SECTION 081416 – EXTERIOR FLUSH WOOD DOORS

PART 1 GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

A. Hollow Metal Frames: Section 081103.

B. Finish Hardware: Section 087100.

C. Glass and Glazing: Section 088100.

D. Painting (Site Finishing Doors): Section 099101.

1.02 REFERENCES

A. Standards: Unless otherwise specified, comply with the applicable requirements of the "Architectural Woodwork Standards" (First Edition-2009) (AWS).

1.03 SUBMITTALS

A. Shop Drawings: Show details, elevation, and construction for each door type, location and installation requirements for Finish Hardware (including cutouts and reinforcements), and accessory items.
   1. Include a schedule of doors using the same reference numbers for details and openings as those on the Contract Drawings.

B. Product Data: Catalog sheets, specifications, and installation instructions for each type door specified.

C. Samples:
   1. 12 x 12-inch corner sample of each door type, with panel (if any).
      a. Factory Finished Doors: Include shop finish on samples.

D. Quality Control Submittals:
   1. Affidavit required under Quality Assurance Article.

1.04 QUALITY ASSURANCE

A. Certifications: Affidavit by door manufacturer certifying that each door meets the specified requirements and standards.

B. Fire Rated Doors: Carry metal label, fastened on hinge edge with drive screws, indicating fire class/rating certified by an independent testing agency.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Factory Finished Doors: Deliver doors in factory applied plastic bags or heavy paper protective cartons. Mark packaging with sufficient identification to insure proper door location.

B. Comply with manufacturer's storage instructions.

1.06 PROJECT CONDITIONS

A. Environmental Requirements: Do not store doors within the building or install doors until after completion of cast-in-place concrete, masonry, plastering, gypsum board and tile Work, and until after the building has dried out.

PART 2 PRODUCTS

2.01 MATERIALS

A. Lumber: Comply with applicable AWS species requirements for door type and grade.
1. Exposed Surfaces: As indicated on the Drawings or specified. Furnish matching exposed surface material on both faces and both edges of each door unless otherwise indicated.

2. Fire Rated Doors: Exposed faces to match non-fire rated doors in same building area.

B. Wood Veneers: Comply with applicable AWS species requirements for door type and grade.

C. Glue: Type I waterproof adhesives for bonding faces and crossbands to core, for both exterior and interior door fabrication.

D. Water-Repellent Preservative Treatment Materials for Exterior Doors: Comply with National Wood Window And Door Association's Standard NWWDA I.S.4.

E. Flashing For Exterior Doors: Flexible, non-corrosive, sheet metal.

H. Metal Louvers:
1. Steel: 20 gage minimum; galvanized and factory primed for paint finish.
2. Natural Anodized Aluminum: Extruded aluminum, with natural anodized finish complying with NAAMM AA-C22A31 (0.4 mil minimum thickness).
3. Color Anodized Aluminum: Extruded aluminum, with color anodized finish complying with NAAMM AA-C22A32 (0.4 mil minimum thickness). Color as selected.

I. Fire Rated Louvers: Door manufacturer's listed, fusible link, self- closing type.

2.02 FABRICATION

A. Heavy Duty Wood Interior Door:
1. Product: 8500-ME (5-ply - Particle Core). Lifetime Warranty.
a. Core: Particleboard. Solid particleboard. Density of 28-32 lb per cubic foot. Complies with ANSI A208-1 standards (LD-1/LD-2).
b. Fire Rating: 20-minutes, in compliance with NFPA 80.
2. Stiles: 1/8 inch (3 mm) thick veneer, longitudinally laminated by hot pressing with type 1 structural glue, as per ASTM-D5456-93 (LVL), including a 7/8 inch (22 mm) piece of hardwood, matched with faces, for a total width of 4-3/16 inches (107 mm).
3. Top and bottom rails: 1/8 inch (3 mm) thick veneer, longitudinally laminated by hot pressing with type 1 structural glue, as per ASTM-D5456-93 (LVL), for a total width of 3-5/16 inches (85 mm).
4. Stiles and Rails: Bonded to core. 7. Lock Block: Integrated. 8. Glue: Type1 PVA Cross-link. 9. Faces: Refer to Door Characteristics.

2.03 FACTORY FINISHING, PREFITTING, AND PREPARATION FOR HARDWARE

A. Factory Finishing: Prefinish wood doors at the factory or finishing shop as follows:
1. Comply with AWS factory finishing recommendations including final sanding requirements.
2. Finishing System: Comply with the requirements of the following AWS Finish System:
a. Transparent Finish: System No. 5 - Conversion Varnish, Premium Grade.
1) Sheen: Dull satin; 15 to 20 degrees.
2) Stain Color: To match existing doors
b. Opaque Finish: System No. 3 - Standard Lacquer, Custom Grade finish requirements for wood grain characteristics of exposed wood species.

B. Factory Prefitting and Premachining for Hardware: Prefit doors scheduled or indicated to receive factory finishing. Premachine these doors for hardware.
1. Comply with AWS clearance requirements for prefitting. Machine doors for hardware requiring cutting of doors. Comply with finish hardware schedule, door frame shop drawings, and hardware templates to insure proper fit and alignment of doors and hardware.
2. Verify hardware mortises in steel frames in the field to verify dimensions and proper alignment prior to proceeding with factory machining of doors.

PART 3 EXECUTION

3.01 PREPARATION

A. Condition doors to average prevailing humidity in installation area prior to hanging.

B. Prepare doors to receive scheduled mortise hardware. Coordinate doors with the finish hardware schedule and with the door frame shop drawings for proper location of mortise hardware. Machine doors for hardware.

3.02 INSTALLATION

A. Install the Work of this Section in accordance with manufacturer's printed installation instructions, except as shown or specified otherwise.

B. Fit doors to prepared frames for proper fit. Allow 3/32-to-1/8-inch clearance at head and both jambs. Trim doors when necessary by planning. Slightly chamfer edge of lock stiles. Bevel lock stile as follows:
1. Non-fire Rated Doors: 1/8 inch in 2 inches.
2. Fire Rated Doors: 1/16 inch in 2 inches.

C. Prefit Doors: Do not alter prefit factory finished doors.

D. Fire Rated Doors: Install doors in corresponding fire rated frames in accordance with the requirements of NFPA No. 80.

E. Factory Finished Doors: Field touch-up and restore finishes damaged during installation.

END OF SECTION

SECTION 081416 – INTERIOR FLUSH WOOD DOORS

PART 1 GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

A. Hollow Metal Frames: Section 081103.

B. Finish Hardware: Section 087100.

C. Glass and Glazing: Section 088100.

D. Painting (Site Finishing Doors): Section 099101.

1.02 REFERENCES

A. Standards: Unless otherwise specified, comply with the applicable requirements of the "Architectural Woodwork Standards" (First Edition-2009) (AWS).

1.03 SUBMITTALS

A. Shop Drawings: Show details, elevation, and construction for each door type, location and installation requirements for Finish Hardware (including cutouts and reinforcements), and accessory items.
   1. Include a schedule of doors using the same reference numbers for details and openings as those on the Contract Drawings.

B. Product Data: Catalog sheets, specifications, and installation instructions for each type of door specified.

C. Samples:
   1. 12 x 12-inch corner sample of each door type, with panel (if any).
      a. Factory Finished Doors: Include shop finish on samples.

D. Quality Control Submittals:
   1. Affidavit required under Quality Assurance Article.

1.04 QUALITY ASSURANCE

A. Certifications: Affidavit from door manufacturer certifying that each door meets the specified requirements and standards.

B. Fire Rated Doors: Carry metal label, fastened on hinge edge with drive screws, indicating fire class/rating certified by an independent testing agency.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Factory Finished Doors: Deliver doors in factory applied plastic bags or heavy paper protective cartons. Mark packaging with sufficient identification to insure proper door location.

B. Comply with manufacturer's storage instructions.

1.06 PROJECT CONDITIONS

A. Environmental Requirements: Do not store doors within the building or install doors until after completion of cast-in-place concrete, masonry, plastering, gypsum board and tile Work, and until after the building has dried out.

PART 2 PRODUCTS

2.01 MATERIALS

A. Lumber: Comply with applicable AWS species requirements for door type and grade.
1. Exposed Surfaces: As indicated on the Drawings or specified. Furnish matching exposed surface material on both faces and both edges of each door unless otherwise indicated.

2. Fire Rated Doors: Exposed faces to match non-fire rated doors in same building area.

B. Wood Veneers: Comply with applicable AWS species requirements for door type and grade.

C. Glue: Type I waterproof adhesives for bonding faces and crossbands to core, for both exterior and interior door fabrication.

D. Water-Repellent Preservative Treatment Materials for Exterior Doors: Comply with National Wood Window And Door Association's Standard NWWDA I.S.4.

E. Flashing For Exterior Doors: Flexible, non-corrosive, sheet metal.

H. Metal Louvers:
1. Steel: 20 gage minimum; galvanized and factory primed for paint finish.
2. Natural Anodized Aluminum: Extruded aluminum, with natural anodized finish complying with NAAMM AA-C22A31 (0.4 mil minimum thickness).
3. Color Anodized Aluminum: Extruded aluminum, with color anodized finish complying with NAAMM AA-C22A32 (0.4 mil minimum thickness). Color as selected.

I. Fire Rated Louvers: Door manufacturer's listed, fusible link, self- closing type.

2.02 FABRICATION

A. Heavy Duty Wood Interior Door:
1. Product: 8500-ME (5-ply - Particle Core). Lifetime Warranty.
a. Core: Particleboard. Solid particleboard. Density of 28-32 lb per cubic foot. Complies with ANSI A208-1 standards (LD-1/LD-2).
b. Fire Rating: 20-minutes, in compliance with NFPA 80.
2. Stiles: 1/8 inch (3 mm) thick veneer, longitudinally laminated by hot pressing with type 1 structural glue, as per ASTM-D5456-93 (LVL), including a 7/8-inch (22 mm) piece of hardwood, matched with faces, for a total width of 4-3/16 inches (107 mm).
3. Top and bottom rails: 1/8 inch (3 mm) thick veneer, longitudinally laminated by hot pressing with type 1 structural glue, as per ASTM-D5456-93 (LVL), for a total width of 3-5/16 inches (85 mm).
4. Stiles and Rails: Bonded to core. 7. Lock Block: Integrated. 8. Glue: Type1 PVA Cross-link. 9. Faces: Refer to Door Characteristics.

2.03 FACTORY FINISHING, PREFITTING, AND PREPARATION FOR HARDWARE

A. Factory Finishing: Prefinish wood doors at the factory or finishing shop as follows:
1. Comply with AWS factory finishing recommendations including final sanding requirements.
2. Finishing System: Comply with the requirements of the following AWS Finish System:
a. Transparent Finish: System No. 5 - Conversion Varnish, Premium Grade.
1) Sheen: Dull satin; 15 to 20 degrees.
2) Stain Color: To match existing doors
b. Opaque Finish: System No. 3 - Standard Lacquer, Custom Grade finish requirements for wood grain characteristics of exposed wood species.

B. Factory Prefitting and Premachining for Hardware: Prefit doors scheduled or indicated to receive factory finishing. Premachine these doors for hardware.
1. Comply with AWS clearance requirements for prefitting. Machine doors for hardware requiring cutting of doors. Comply with finish hardware schedule, door frame shop drawings, and hardware templates to insure proper fit and alignment of doors and hardware.
2. Verify hardware mortises in steel frames in the field to verify dimensions and proper alignment prior to proceeding with factory machining of doors.

PART 3 EXECUTION

3.01 PREPARATION

A. Condition doors to average prevailing humidity in installation area prior to hanging.

B. Prepare doors to receive scheduled mortise hardware. Coordinate doors with the finish hardware schedule and with the door frame shop drawings for proper location of mortise hardware. Machine doors for hardware.

3.02 INSTALLATION

A. Install the Work of this Section in accordance with manufacturer's printed installation instructions, except as shown or specified otherwise.

B. Fit doors to prepared frames for proper fit. Allow 3/32-to-1/8-inch clearance at head and both jambs. Trim doors when necessary by planning. Slightly chamfer edge of lock stiles. Bevel lock stile as follows:
1. Non-fire Rated Doors: 1/8 inch in 2 inches.
2. Fire Rated Doors: 1/16 inch in 2 inches.

C. Prefit Doors: Do not alter prefit factory finished doors.

D. Fire Rated Doors: Install doors in corresponding fire rated frames in accordance with the requirements of NFPA No. 80.

E. Factory Finished Doors: Field touch-up and restore finishes damaged during installation.

END OF SECTION

SECTION 087100 - FINISH HARDWARE

PART 1 GENERAL

1.1 REFERENCES

A. NFPA 80 Fire Doors and Windows (2013).

B. NFPA 101 Life Safety Code (2015).

C. Building Code of New York State (2016).

D. ICC/ANSI A117.1-2017 Accessible and Usable Buildings and Facilities.

E. ANSI/BHMA Standard A156.1 Butts and Hinges (2016).

F. ANSI/BHMA Standard A156.4 Door Controls – Closers (2013).

G. ANSI/BHMA Standard A156.6 Architectural Door Trim (2015).

H. ANSI/BHMA Standard A156.7 Template Hinge Dimensions (2016).

I. ANSI/BHMA Standard A156.8 Door Controls – Overhead Stops and Holders (2015).

J. ANSI/BHMA Standard A156.13 Mortise Locks and Latches Series 1000 (2017).

K. ANSI/BHMA Standard A156.16 Auxiliary Hardware (2018).

L. ANSI/BHMA Standard A156.18 Materials and Finishes (2016).

M. ANSI/BHMA Standard A156.22 Door Gasketing Systems (2017).

N. ANSI/BHMA Standard A156.26 Continuous Hinges (2017).

O. DHI - Door and Hardware Institute.

P. NAAM Standard HMMA 800-96- Hollow Metal Manufacturers Association.

Q. NAAM Standard HMMA 831-13 Recommended Hardware Locations for Custom Hollow Metal Doors and Frames.

R. 2010 Standards for State and Local Government Facilities: Title II.

1.2 DEFINITIONS

A. Architectural Hardware Consultant (AHC): A Door and Hardware Institute certified expert in complex architectural openings requiring advanced knowledge of model building codes and safety standards, ADA requirements, access control knowledge and installation expertise.

B. Architectural Hardware Distributor: A company that regularly purchases architectural hardware from manufacturers and specializes in the sale, service and support of that hardware to contractors and/or end users.

C. Company Field Advisor(s): Hardware manufacturers' representatives who are certified in writing by manufacturer to be technically qualified in design, installation, and servicing of products.

D. Installation Supervisor: Designated supervisor/installer, who has a minimum three years' experience in finish hardware installation and is qualified and responsible to ensure approved finish hardware is installed, adjusted, and operates properly.

E. Benchmark: Finish hardware installed on full size door and frame assembly that is constructed on-site. Benchmarks are constructed to verify qualities of materials and execution; to review coordination between frames, doors, and architectural hardware; to show interface between partitions and frames; and to demonstrate compliance with specified installation tolerances. Benchmarks are not samples. Unless otherwise indicated, approved benchmarks establish the standard by which the Work will be judged. The approved benchmark may be incorporated into the work of this section.

1.3 SUBMITTALS

A. Waiver of Submittals: The Waiver of Certain Submittal Requirements in Section 013300 does not apply to this Section.

B. Re-Evaluation Fee: In accordance with the General Conditions 07213 Article 4.7.

C. Prior to preparing submittals the hardware supplier is required to perform an on-site visit to identify and confirm ratings, sizes, weight and size of hinges where being replaced and other information to confirm compatibility with existing components.

D. Submittal Package Cover Sheets: The Hardware Distributor shall provide a cover sheet, which identifies each package by:
1. project number.
2. Project name.
3. Facility name and location.
4. Submittal Package name.
5. Specification section name and number.
6. Construction Contractor's company name, address, e-mail address, and telephone number.
7. Finish Hardware Distributor's company name, address, e-mail address, and telephone number.
8. Certified Architectural Hardware Consultant's name, company name, address, e-mail address, and telephone number.
9. Submittal Date.

E. Submittal Packages
1. Quality Control Package: Do not submit balance of packages until this package is approved.
   a. Architectural Hardware Consultant Data:
      1) Provide name, business address, and telephone number of DHI certified Architectural Hardware Consultant.
      2) Submit photocopy of Door and Hardware Institute's certificate demonstrating individual is an Architectural Hardware Consultant.
   b. Company Field Advisor Data:
      1) Provide name, business address, and telephone number of Company Field Advisor(s) for continuous hinges, door bolts, locksets, overhead stops, door closers, and gaskets.
      2) List services and products for which company field advisor(s) is/are certified by manufacturer. Provide written certifications.
   c. Hardware Distributor's Qualification Data:
      1) Provide the Finish Hardware Distributor's company name, address, e-mail address, and telephone number.
      2) Provide the hardware distributor's company history, including number of years in the hardware distribution business, the number of AHC's employed, and the number of employees. Describe the distributor's major market.
      3) Include the names and contact information of physical plant managers for 3 facilities, similar to this project, for which the distributor has furnished architectural hardware within the past 2 years.
   d. Supervisor's/Installer's Qualification Data:
      1) Name of Supervisor and each installer performing Work, and employer's name, business address and telephone number.

2) Names and addresses, and contact information of physical plant managers for 3 facilities, similar to this project, on which each installer has worked on during past 2 years.

2. Finish Hardware Package:

a. Finish Hardware Schedule: Use vertical format and indicate finish hardware items, both mechanical and electrical in one document, required to complete Work of this section. Submit Hardware Schedule that includes complete hardware sets for each door and frame shown on Door Schedule.

1) Preface schedule with following:
   a) Certified Architectural Hardware Consultant's statement of preparation of/or certification of, Finish Hardware Schedule.
   b) Index.
   c) List of manufacturers.
   d) List of finishes.
   e) Explanation of abbreviations.
   f) Keying instructions and key schedule.
2) Create hardware groups, each group consisting of similar doors and hardware. Do not combine labeled and non-labeled openings. Do not combine doors and frames with dissimilar door sizes and/or materials.
3) For each opening include the following:
   a) Door and frame materials and dimensions.
   b) Fire rating.
   c) Door number, location and handing.
   d) Degree of opening required for closer and/or overhead stop.
   e) Installation and detailing notes.
4) Under each group heading, list hardware items in detail, required for ordering. For each hardware item include:
   a) Type (Hinges).
   b) Quantity (Hinges 3ea).
   c) Manufacturers' name (Hinges 3ea Hagar).
   d) Catalog number (Hinges 3ea Hagar AB800).
   e) Size (Hinges 3ea Hagar AB800 4 ½ x 4 ½).
   f) Options or accessories (Hinges HTAB800 4 ½ x 4 ½).
   g) Finish (Hinges HTAB800 4 ½ x 4 ½ x 630).
   h) Fasteners (Hinges HTAB800 4 ½ x 4 ½ x 630 x torx with center security pin).
   i) Indicate location of protection plates: Push side or pull side.
   j) Installation Notes, as written in this section, for each hardware group.

5) Use a separate hardware group in Hardware Schedule that lists attic stock hardware items, key cabinets, key control system, special tools required to install hardware, lubricants, and Operations and Maintenance Manuals.

b. Product Data: Furnish six copies of manufacturers' catalog sheets, specifications, sizing charts, and installation instructions, for each item specified. Highlight information pertaining specifically to product (s) submitted.

c. Submit samples as requested.

3. Closeout Submittals Package: Submit as a complete package.

a. Operation and Maintenance Manuals: Furnish 2 hardcover three ring binders with the project name and number displayed on the front cover and spine. Include:

1) List of Manufacturers.
2) Approved Finish Hardware Schedule.
3) Approved Manufacturers' Product Data Sheets.
4) Manufacturer's operation, installation, maintenance, and repair instructions for each type of hardware furnished.
5) Templates for kind of hardware furnished.
6) Parts List for each type of finish hardware furnished.
7) Manufacturers' dated written warranty for each type of finish hardware furnished.
8) Certifications: Written certification from Company Field Advisors that their products are installed according to manufacturers' printed installation instructions, are operating properly, and manufacturers' written warranty will be in effect upon physical completion of the Work.
9) Special Tools: List of special tools required to install hardware, and their purpose.

b. Special Tools:

1) At conclusion of finish hardware installation, turn over to the facility 2 of each special tool required to install hardware together with a list of these tools and their purpose.

1.4 TEMPLATES

A. After receipt of approved submittals, furnish templates to affected trades, to enable fabricators to make provision for finish hardware without delaying the Work of the Project.

1.5 DELIVERY AND STORAGE

A. Coordinate delivery to avoid delay.

B. Clearly label each item for identification and installation location as it corresponds to the approved Finish Hardware Schedule and subsequent information bulletins.

C. Deliver hardware to the jobsite in the manufacturers' original packages complete with fasteners, parts, installation instructions, and templates required for proper installation.

D. Inventory hardware at jobsite to identify shortages or backorders. Resolve delivery shortages and damaged items prior to installing hardware.

E. Store finish hardware where directed by the facility. Provide locked, dry storage for finish hardware.

1.6 QUALITY ASSURANCE

A. Hardware Distributor's Qualification:
1. Hardware Distributor who has been in the business of furnishing, and/ or installing finish hardware for a minimum of three years.
2. Hardware Distributor shall have the DHI certified Architectural Hardware Consultant prepare or certify the Finish Hardware Submittal meets specification requirements, and the schedule is written accurately and in accordance with DHI recommendations, and requirements of this specification.

B. Company Field Advisors: Employ advisor(s) for continuous hinges, door bolts, mortise locksets, surface overhead stops, door closers, and gaskets.

C. Installation Supervisor: Employ a qualified Installation Supervisor who will be responsible to ensure approved finished hardware is installed, adjusted and operates properly.

D. Installers: Employ experienced finish hardware installers who have been regularly employed by a Company installing finish hardware for a minimum of 5 years.

E. On Site Pre-installation Conference: Before finish hardware installation begins, the Contractor will call a conference at the site to review Finish Hardware Specifications, approved Finish Hardware Submittals, and to discuss requirements for the Work including:
1. Hardware delivery and storage.
2. Hardware labeling by door number.
3. Hardware locations.
4. Potential location conflicts.
5. Hardware installation sequence and responsibility.
6. Required accessories and fasteners.
7. Continuous hinge installation.

8. Surface overhead stops and closer template and adjustments.
9. Special tools and maintenance items.
10. Hardware Closeout requirements.
11. Hardware Warranties.

G. Pre-installation Conference Attendance: The Construction Contractor, Company Field Advisors, authorized Finish Hardware Installers, and the Finish Hardware Distributor's Architectural Hardware Consultant shall attend the conference. Finish Hardware Reviewer conducts the meeting. Designers and facility personnel may attend. The Company Field Advisors will present installation instruction and advice.

H. Construction of Benchmark: Before installing portions of the Work requiring benchmarks, install benchmarks for each form of construction required to comply with the following requirements, using materials indicated for the completed Work.
1. Build hardware benchmark in door and frame assembly, specified in section 081102, in locations as directed, and include continuous hinge, lockset, closer, surface overhead stop and gaskets.
2. Notify the Design Team in advance of dates and times when benchmark will be constructed.
3. Install benchmark with supervisor oversight and workers who will be employed during the construction of the Work.
4. Construct benchmarks using the exact materials, products, methods, and workmanship that were approved for the Work.
5. Obtain the Design Team's approval of benchmarks before starting work, fabrication, or construction.
6. Maintain benchmarks during construction in an undisturbed condition as a standard for judging the completed Work.
7. Failure to maintain this standard of quality will be cause for rejection of the Work.
8. Benchmark may be used in the Work unless otherwise indicated.

J. Uniformity of Hardware and Single Source Responsibility: For each kind of hardware provide product(s) of a single manufacturer.

K. Size Variations: Manufacturers' products may vary slightly from sizes specified except where minimum size or thickness is specified.

1.7 WARRANTY

A. Manufacturer's Warranty: Fifteen-year minimum warranty for door closers.

B. Manufacturer's Warranty: Three year minimum for locksets.

1.8 MAINTENANCE

A. Special Tools: At the conclusion of finish hardware installation, turn over to Facilities Representative 2 sets of each special tools required for proper installation and adjustment of hardware, together with a list of these tools and their purpose.

B. Lubricants: Provide manufacturer's recommended lubricants for locksets and closers sufficient for 1 year of maintenance. Turn over to the facility

PART 2 PRODUCTS

2.1 ACCESSORIES

A. Provide brackets, plates, arms, spacers, and special templates to mount door closers in combination with overhead stops and coordinators, on narrow top rails and for special ceiling and jamb conditions.

B. Provide curved lip strikes, with wrought boxes, specific to individual lock functions. Universal strikes that fit a variety of lock functions are not acceptable.

2.2 FASTENINGS

A. Provide fasteners that harmonize with finish hardware material and finish.

B. Provide torx center pin security fasteners for exposed hardware, including full mortise hinges.

C. Provide machine screws for hardware secured to metal; and machine screws and metal expansion shields for attachment to masonry substrates. Self-tapping or self-drilling screws are not acceptable.

D. Provide undercut shallow head torx center pin security fasteners where necessary for proper seating.

E. Attach door closers and overhead stops with sex bolts.

2.3 MATERIALS AND FINISHES

A. General: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of finish hardware are indicated in this section and in the Hardware Groups.

B. Continuous Hinges
1. Full height barrel-type manufactured from 14-gauge 304 stainless steel.
2. .25" diameter stainless steel pins.

3. Provide hinges without covers.

C. Locks, Latches and Bolts
1. Comply with UL requirements for throw of bolts and latch bolts on rated fire openings.
2. Provide 3/4" minimum throw on other latch bolts.
3. Provide 1" minimum throw deadbolts.

D. Closers and Door Control Devices
1. Closer bodies: Provide closer bodies with the same hole template pattern regardless of type or application.
2. Closer arms: Non-handed forged steel.
3. Closer size: Provide sized closers.
4. Provide all-weather fluid to eliminate seasonal adjustment of closer speed.
5. Powder coat closer body, arm, and adapter plate or pre-treat closer body, arm, and adapter plate with rust-inhibiting coating before painted finish is applied.

2.4 FINISH HARDWARE

A. HARDWARE MANUFACTURERS:

1. MK- MCKINNEY
2. SA – SARGENT
3. LC – LCN
4. SE – SECURITRON
5. AR - ADAMS RITE
6. RO - ROCKWOOD
7. CA - COMMAND ACCESS

B. HARDWARE SETS

1. All hardware listed will be supplied by this section unless specifically listed including but not limited to permanent cylinder cores.

SET 01 PAIR OF DOORS (Latch Retraction)

2	Ea.	Power Transfer	EL-CEPT	SE	630
1	Ea.	Exit Device	53-55-56-8504	SA	630
1	Ea.	Exit Device	53-55-56-8510	SA	630
1	Ea.	Cylinder	Compatible with existing system and lockset	BE	626
2	Ea.	Door Pull	BF158-2	RO	630

1	Ea.	Power Supply	3520 24 VDC	SA	GRY
2	Ea.	Position Sw.	MSS100-4	FL	BRN.
2	Ea.	Wire Harness	QC-C300P	MK	
2	Ea.	Wire Harness	QC-2500P	MK	

Balance of hardware existing

Doors are normally closed and locked. Entry by Valid Credential momentarily retracting one exit device allowing door to be pulled open. Access Control system can unlock all devices during events. Doors are monitored by door position switch and latch bolt monitoring. Free egress at all times by manually pushing exit device in path of travel. Request to exit switch built into push bar.

SET 02 SINGLE DOOR (Latch Retraction)

1	Ea.	Power Transfer	EL-CEPT	SE	630
1	Ea.	Exit Device	53-55-56- 8804	SA	630
1	Ea.	Cylinder Compatible with existing system and lockset		BE	626
1	Ea.	Door Pull	Reuse Existing	RO	630
1	Ea.	Power Supply	3520 24 VDC	SA	GRY
1	Ea.	Position Sw.	MSS100-4	FL	BRN.
1	Ea.	Wire Harness	QC-C300P	MK	
1	Ea.	Wire Harness	QC-2500P	MK	

Balance of hardware existing

Door is normally closed and locked. Entry by Valid Credential momentarily retracting one exit device allowing door to be pulled open. Access Control system can unlock all devices during events. Doors are monitored by door position switch and latch bolt monitoring. Free egress at all times by manually pushing exit device in path of travel. Request to exit switch built into push bar.

SET 03 SINGLE DOOR (Latch Retraction)

1	Ea.	Power Transfer	EL-CEPT	SE	630
1	Ea.	Exit Device	53-55-56-8904	SA	630
1	Ea.	Cylinder Compatible with existing system and lockset		BE	626
1	Ea.	Door Pull	Reuse Existing	RO	630
1	Ea.	Power Supply	3520 24 VDC	SA	GRY
1	Ea.	Position Sw.	MSS100-4	FL	BRN.
1	Ea.	Wire Harness	QC-C300P	MK	
1	Ea.	Wire Harness	QC-2500P	MK	

Balance of hardware existing

Door is normally closed and locked. Entry by Valid Credential momentarily retracting one exit device allowing door to be pulled open. Access Control system can unlock all devices during events. Doors are monitored by door position switch and latch bolt monitoring. Free egress at all times by manually pushing exit device in path of travel. Request to exit switch built into push bar.

SET 04 SHELTER IN PLACE (PAIRS AND SINGLES)

1	Ea.	Poe Transfer	CEPT-C5E	SE	630
1	Ea.	POE Lockset	70-IN220-82278-BIPS-B-LN-NJ Supplied by Security Supplier	SA	630
1	Ea.	Permanent Cylinder Core compatible with existing keying system and core housing supplied by security supplier.		BE	626
1	Ea.	Door Closer	PR8501 NO689		
1	Ea.	Wire Harness	PoE-C306P	MK	
1	Ea.	Wire Harness	PoE-C1300P	MK	

Balance of Hardware existing

Door is normally closed and locked. Door momentarily unlocked for entry by valid credential at reader. Door position monitored by door position switch built into lockset. Request to Exit incorporated into lockset. Thumbturn on room side extends deadbolt. Free Egress at all times by turning inside lever.

SET 05 EXISTING DOORS

1	Ea.	Position Sw.	MSS100-4	FL	BRN.

Balance of hardware existing

Doors are monitored by door position switch.

SET 06 EXTERIOR PAIR OF DOORS (Latch Retraction)

2	Ea.	Power Transfer	EL-CEPT	SE	630
1	Ea.	Exit Device	53-55-56-8804	SA	630
1	Ea.	Exit Device	53-55-56-8810	SA	630
1	Ea.	Cylinder Compatible with existing system and lockset		BE	626
2	Ea.	Door Pull	BF158-2	RO	630
2	Ea.	Position Sw.	MSS100-4	FL	BRN.
1	Ea.	Power Supply	3540 24 VDC	SA	GRY
2	Ea.	Wire Harness	QC-C300P	MK	
2	Ea.	Wire Harness	QC-2500P	MK	

Balance of hardware existing

Doors are normally closed and locked. Entry by Valid Credential momentarily retracting one exit device allowing door to be pulled open. Access Control system can unlock all devices during events. Doors are monitored by door position switch and latch bolt monitoring. Free egress at all times by manually pushing exit device in path of travel. Request to exit switch built into push bar.

SET 07 EXTERIOR BANK OF 3 DOORS (Latch Retraction)

3	Ea.	Power Transfer	EL-CEPT	SE	630
1	Ea.	Exit Device	55-56-8504	SA	630
2	Ea.	Exit Device	55-56-8510	SA	630
1	Ea.	Cylinder	Compatible with existing system and lockset	BE	626
3	Ea.	Position Sw.	MSS100-4	FL	BRN
3	Ea.	Door Pull	Reuse Existing	RO	630
1	Ea.	Power Supply	3540 24 VDC	SA	GRY
3	Ea.	Wire Harness	QC-C300P	MK	
3	Ea.	Wire Harness	QC-2500P	MK	

Balance of hardware existing

Doors are normally closed and locked. Entry by Valid Credential momentarily retracting one exit device allowing door to be pulled open. Access Control system can unlock all devices during events. Doors are monitored by door position switch and latch bolt monitoring. Free egress at all times by manually pushing exit device in path of travel. Request to exit switch built into push bar.

SET 08 EXTERIOR SINGLE

1	Ea.	Cont Hinges	SL-11HD EPT	SL	AL
1	Ea.	Power Transfer	EL-CEPT	SE	630
1	Ea.	Exit Device	53-55-56-8904	SA	630
1	Ea.	Door Closer	PR7501	NO	689
1	Ea.	Cylinder	Compatible with existing system and lockset	BE	626
1	Ea.	Door Pull	BF158-2	RO	630
1	Ea.	Power Supply	3520 24 VDC	SA	GRY
1	Ea.	Position Sw.	MSS100-4	FL	BRN.
1	Ea.	Wire Harness	QC-C300P	MK	
1	Ea.	Wire Harness	QC-2500P	MK	

Balance of hardware existing

Door is normally closed and locked. Entry by Valid Credential momentarily retracting one exit device allowing door to be pulled open. Access Control system can unlock all devices during events. Doors are monitored by door position switch and latch bolt monitoring. Free egress at all times by manually pushing exit device in path of travel. Request to exit switch built into push bar.
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SET 09 EXTERIOR PAIR OF DOORS (Latch Retraction)

2	Ea.	Power Transfer	Reuse Existing		
2	Ea.	Retraction Kits	MLRK1-XXX-Elynx	CA	630
			Confirm exit device manufacturer prior to ordering		
2	Ea.	Position Sw.	MSS100-4	FL	BRN
2	Ea.	Door Pull	Reuse Existing	RO	630
1	Ea.	Power Supply	3540 24 VDC	SA	GRY
2	Ea.	Wire Harness	QC-C300P	MK	

2	Ea.	Wire Harness	QC-2500P	MK	

Balance of hardware existing

Doors are normally closed and locked. Entry by Valid Credential momentarily retracting one exit device allowing door to be pulled open. Access Control system can unlock all devices during events. Doors are monitored by door position switch and latch bolt monitoring. Free egress at all times by manually pushing exit device in path of travel. Request to exit switch built into push bar.

SET 10 EXTERIOR SINGLE DOOR (Latch Retraction)

1	Ea.	Power Transfer	Reuse Existing		
1	Ea.	Retraction Kits	MLRK1-XXX-Elynx	CA	630
		Confirm exit device manufacturer prior to ordering			
1	Ea.	Position Sw.	MSS100-4	FL	BRN
1	Ea.	Door Pull	Reuse Existing	RO	630
1	Ea.	Power Supply	3540 24 VDC	SA	GRY
1	Ea.	Wire Harness	QC-C300P	MK	
1	Ea.	Wire Harness	QC-2500P MK		

Balance of hardware existing

Doors are normally closed and locked. Entry by Valid Credential momentarily retracting one exit device allowing door to be pulled open. Access Control system can unlock all devices during events. Doors are monitored by door position switch and latch bolt monitoring. Free egress at all times by manually pushing exit device in path of travel. Request to exit switch built into push bar.

SET 11 EXTERIOR SINGLE DOOR (Latch Retraction)

1	Ea.	Power Transfer	EL-CEPT	SE	630
1	Ea.	Exit Device	53-55-56-8504	SA	630
1	Ea.	Cylinder	Compatible with existing system and lockset	BE	626
1	Ea.	Door Pull	Reuse Existing	RO	630
1	Ea.	Power Supply	3520 24 VDC	SA	GRY
1	Ea.	Position Sw.	MSS100-4	FL	BRN.
1	Ea.	Wire Harness	QC-C300P	MK	
1	Ea.	Wire Harness	QC-2500P	MK	

Balance of hardware existing

Door is normally closed and locked. Entry by Valid Credential momentarily retracting one exit device allowing door to be pulled open. Access Control system can unlock all devices during

events. Doors are monitored by door position switch and latch bolt monitoring. Free egress at all times by manually pushing exit device in path of travel. Request to exit switch built into push bar.

SET 12 NEW PAIR OF DOORS

2	Ea.	Cont Hinges	SL-11HD EPT	SL	AL
2	Ea.	Power Transfer	EL-CEPT	SE	630
1	Ea.	Exit Device	53-55-56-8404 x 106	SA	630
1	Ea.	Exit Device	53-55-56-8410	SA	630
1	Ea.	Cylinder Compatible with existing system and lockset		BE	626
2	Ea.	Position Sw.	MSS100-4	FL	BRN
2	Ea.	Door Pull	BF158-2	RO	630
2	Ea.	Closer	7501	no	689
1	Ea.	Power Supply	3540 24 VDC	SA	GRY
2	Ea.	Wire Harness	QC-C300P	MK	
2	Ea.	Wire Harness	QC-2500P	MK	

Balance of hardware existing

Doors are normally closed and locked. Entry by Valid Credential momentarily retracting one exit device allowing door to be pulled open. Access Control system can unlock all devices during events. Doors are monitored by door position switch and latch bolt monitoring. Free egress at all times by manually pushing exit device in path of travel. Request to exit switch built into push bar.

SET 13 NEW PAIR OF DOORS EXISTING FRAMES

2	Ea.	Cont Hinges	SL-11HD EPT	SL	AL
1	Ea.	Poe Transfer	CEPT-C5E	SE	630
1	Ea.	POE Lockset	70-IN220-82278-BIPS-B-LN-NJ Supplied by Security Supplier	SA	630
1	Ea.	Permanent Cylinder Core compatible with existing keying system and core housing supplied by security supplier.		BE	626
2	Ea.	Door Closer	PR7501	NO	689
1	Set	Auto Flushbolts	2845	RO	626
1	Ea.	Coordinator	2672 x required brackets	RO	689
2	Ea.	Kickplates	K1050 10” x 1.5” ldwLDW	RO	630
2	Ea.	Wall Stops	406	RO	630
1	Ea.	Wire Harness	PoE-C306P	MK	
1	Ea.	Wire Harness	PoE-C1300P	MK	

Confirm and template existing hinge size weight and location of existing hinge prep to confirm compatibility with new door and hinges.
Door is normally closed and locked. Door momentarily unlocked for entry by valid credential at reader. Door position monitored by door position switch built into lockset. Request to Exit incorporated into lockset. Thumbturn on room side extends deadbolt. Free Egress at all times by turning inside lever.

SET 14 PAIR OF DOORS (Latch Retraction)

2	Ea.	Power Transfer	EL-CEPT	SE	630
1	Ea.	Exit Device	12-55-56-8504	SA	630
1	Ea.	Exit Device	12-55-56-8510	SA	630
1	Ea.	Cylinder Compatible with existing system and lockset		BE	626
2	Ea.	Door Pull	BF158-2	RO	630
1	Ea.	Power Supply	3520 24 VDC	SA	GRy
2	Ea.	Wire Harness	QC-C300P	MK	
2	Ea.	Wire Harness	QC-2500P	MK	

Balance of hardware existing

Doors are normally closed and locked. Entry by Valid Credential momentarily retracting one exit device allowing door to be pulled open. Access Control system can unlock all devices during events. Doors are monitored by door position switch and latch bolt monitoring. Free egress at all times by manually pushing exit device in path of travel. Request to exit switch built into push bar.

SET 15 INTERIOR SHELTER IN PLACE (PAIRS AND SINGLES)

1	Ea.	Poe Transfer	CEPT-C5E	SE	630
		Fire Rated Door use matching Power Transfer Hinges			
1	Ea.	POE Lockset	70-IN220-82278-BIPS-B-LN-NJ Supplied by Security Supplier	SA	630
1	Ea.	Permanent Cylinder Core compatible with existing keying system and core housing supplied by security supplier.		BE	626
1	Ea.	Door Closer	PR8501	NO	689
1	Ea.	Wire Harness	PoE-C306P	MK	
1	Ea.	Wire Harness	PoE-C1300P	MK	

Balance of Hardware existing

Door is normally closed and locked. Door momentarily unlocked for entry by valid credential at reader. Door position monitored by door position switch built into lockset. Request to Exit incorporated into lockset. Thumbturn on room side extends deadbolt. Free Egress at all times by turning inside lever.

SET 16 PAIR OF DOORS (Electrified Trim)

6	Ea.	Hinges	BB199 4 ½ x 4 ½	ST	630
		Confirm size and weight of existing hinges			
2	Ea.	Power Transfer	EL-CEPT	SE	630
1	Ea.	Exit Device	12-55-8876 x ETL	SA	630
1	Ea.	Exit Device	12-55-8810	SA	630
1	Ea.	Cylinder Compatible with existing system and trim		BE	626
2	Ea.	Position Sw	MSS100-4	FL	BRN
1	Ea.	Power Supply	3540 24 VDC	SA	GRY
2	Ea.	Wire Harness	QC-C300P	MK	

2	Ea.	Wire Harness	QC-2500P	MK	
2	Ea.	Door Closer	PR8501	NO	689
2	Ea.	Kickplates	K1050- x 1” LDW	RW	630
1	Ea.	Removable Mullion 980S		SA	PRI

Balance of hardware existing

Doors are normally closed and locked. Entry by Valid Credential momentarily unlocking the exit device trim device allowing door to be pulled open. Access Control system can unlock all devices during events. Doors are monitored by door position switch. Free egress at all times by manually pushing exit device in path of travel. Request to exit switch built into push bar.

SET 17 INTERIOR SHELTER IN PLACE (New Doors)

6	Ea.	Hinges	BB199 4 ½ x 4 ½	ST	630
		Confirm size and weight of existing hinges			
1	Ea.	Poe Transfer	CEPT-C5E	SE	630
1	Ea.	POE Lockset	70-IN220-82278-BIPS-B-LN-NJ	SA	630
			Supplied by Security Supplier		
1	Ea.	Permanent Cylinder Core compatible with existing keying system and core housing supplied by security supplier.		BE	626
1	Ea.	Door Closer	PR8501	NO	689
1	Set	Auto Flush Bolts	2842	RW	626
2	Ea.	Kickplates	K1050- x 1” LDW	RW	630
1	Ea.	Wire Harness	PoE-C306P	MK	
1	Ea.	Wire Harness	PoE-C1300P	MK	

Balance of Hardware existing

Door is normally closed and locked. Door momentarily unlocked for entry by valid credential at reader. Door position monitored by door position switch built into lockset. Request to Exit incorporated into lockset. Thumbturn on room side extends deadbolt. Free Egress at all times by turning inside lever.

SET 18 INTERIOR SHELTER IN PLACE (New Doors)

3	Ea.	Hinges	BB199 4 ½ x 4 ½	ST	630
		Confirm size and weight of existing hinges			
1	Ea.	Poe Transfer	CEPT-C5E	SE	630
1	Ea.	POE Lockset	70-IN220-82278-BIPS-B-LN-NJ	SA	630
			Supplied by Security Supplier		
1	Ea.	Permanent Cylinder Core compatible with existing keying system and core housing supplied by security supplier.		BE	626
1	Ea.	Door Closer	PR8501	NO	689
1	Ea.	Stop	Reuse existing		
1	Ea.	Kickplates	K1050- x 1 ½” LDW	RW	630
1	Ea.	Wire Harness	PoE-C306P	MK	

1	Ea.	Wire Harness	PoE-C1300P	MK

Balance of Hardware existing

Door is normally closed and locked. Door momentarily unlocked for entry by valid credential at reader. Door position monitored by door position switch built into lockset. Request to Exit incorporated into lockset. Thumbturn on room side extends deadbolt. Free Egress at all times by turning inside lever.

SET 19 SINGLE DOOR (Electrified Trim)

1	Ea.	Power Transfer	EL-CEPT	SE 630
1	Ea.	Exit Device	12-55-8976 x ETL	SA 630
1	Ea.	Cylinder	Compatible with existing system and trim	BE 626
1	Ea.	Position Sw	MSS100-4	FL BRN
1	Ea.	Power Supply	3540 24 VDC	SA GRY
1	Ea.	Wire Harness	QC-C300P	MK
1	Ea.	Wire Harness	QC-2500P	MK
1	Ea.	Door Closer	PR8501	NO 689

Balance of hardware existing

Doors are normally closed and locked. Entry by Valid Credential momentarily unlocking the exit device trim device allowing door to be pulled open. Access Control system can unlock all devices during events. Doors are monitored by door position switch. Free egress at all times by manually pushing exit device in path of travel. Request to exit switch built into push bar.
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SET 20 EXTERIOR ROOF DOORS

1	Ea.	Transfer	EL-CEPT	SE 630
1	Ea.	EL Lockset	70-RX-8271 FEL x 24 VDC	SA 630
1	Ea.	Cylinder	Compatible with existing system and lockset	BE 626
1	Ea.	Door Closer	PR8501	NO 689
1	Ea.	Position Sw	MSS100-4	FL BRN
1	Ea.	Power Supply	3540 24 VDC	SA GRY
1	Ea.	Wire Harness	QC-C306P	MK
1	Ea.	Wire Harness	QC-C1300P	MK

Balance of Hardware existing

Door is normally closed and locked from the interior, preventing access to the roof. Door momentarily unlocked for entry to the roof by valid credential at reader.
Door position monitored by door position switch. Request to Exit incorporated into lockset roof to corridor. Free Egress from the roof at all times by turning outside lever.

2.5 KEYING

A. Continue existing Best key system established Systems for Facility.
   1. Stamp key symbol on one side of key, and “Do Not Duplicate” on other side of key.
   3. Furnish one copy of factory bitting list to facility.
   4. Factory key cylinders.
   5. Furnish 3 cut keys for each master key.
   6. Furnish 7 cut keys for each keyed lockset.
   7. These cut key quantities are for bidding purposes only. Actual number of cut keys required will be determined at keying meeting.
   8. When lockset and cylinder are by different manufacturers, identify and furnish correct cylinder cam to operate lockset.
   9. Provide compression rings and spacers to achieve proper spacing relationship between cylinder and face of door.

B. Keying Conference
   1. Immediately following contract award, Contractor will schedule a keying conference to develop a written key schedule that reflects Facility’s specific keying requirements.
      Facility Representative(s), Hardware Distributor, Consulting Hardware Designer, and Hardware Designer will attend.
   2. Incorporate this schedule in Finish Hardware Submittals for approval.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine doors and frames and related items for conditions such as, but not limited to, incorrect handing, hardware preparation, misaligned lock and strike preparations, that would prevent proper application of finish hardware. Do not proceed until defects are corrected.

B. Report conditions or hardware applications that are incorrect to the design team

3.2 INSTALLATION

A. Do not proceed with installation of finish hardware prior to attending referenced pre-installation conference.

B. Installation Sequence: Use proper installation sequence, i.e., install coordinators, and overhead stops and holders before surface mounted door closers.

C. Install hardware in accordance with manufacturer’s printed installation instructions, and adjust for smooth operation, free of sticking, binding or rattling.
   1. Template surface overhead stops and holders for proper operation
   2. Template and adjust closers for proper operation.

D. Use proper tools and methods to prevent scratches, burrs or other defacement.

E. Threshold Installation:
1. Drill holes 3 inches from each end of threshold and intermediate holes 12 inches maximum o.c. for required fasteners. Prepare holes for countersunk fasteners.
2. Level and align thresholds with frames and doors. Where required, use non-corrosive shims.
3. Exterior Doors: Set thresholds in a solid bed of Type 3 sealant.
4. Secure thresholds to substrate with countersunk fasteners.

F. Door Bottom Installation:
1. Mount sweep type door bottom protection/drip caps on exterior side of doors.
2. Before mounting apply Type 2 sealant on the back side of bearing surface. Secure to door with required fasteners.

G. Gasket Installation:
1. Install continuous stripping at each opening without unnecessary interruptions.
2. Where fasteners are required, secure fasteners for stripping and seals so they will not work loose during door operation. Exposed heads of fasteners shall be free of sharp edges.
3. Coordinate meeting stile gasket with hardware before installation.
4. Install units plumb and level at the optimum location to maintain a permanent effective seal.

H. After installation, cover and protect hardware to prevent damage during remaining construction. Remove protection upon completion of construction.

3.3 LOCATIONS

A. Locate hardware as follows:
1. Door Closers: Template for maximum door swing allowed by wall placement and jamb conditions. Where overhead stop prevents door from swinging to wall, template the closer to exceed degree of opening allowed by overhead stop.
2. Protection Plates: 1/8 inch from door bottom.
3. Wall Stops: Centerline of bumper to match centerline of locking trim.

3.4 FIELD QUALITY CONTROL

A. Post Installation Review: After hardware is adjusted for proper operation, The design team will hold a Post-Installation Review with the Contractor, Hardware Designer, Company Field Advisors, Hardware Distributor and Hardware Installers.

1. Physically inspect to verify proper application, installation, adjustment and operation of finish hardware, and in particular that:
   a) Latches engage freely without binding. Filing of strike plates to relieve latch bind is not acceptable.
   b) Closers are adjusted for proper spring power; sweep speed, latching speed; and hydraulic back check.
   c) Locations and proper attachment of installed protective hardware are as specified.
   d) There is no field modification of fasteners.
   e) Damaged fasteners are replaced.
2. Defective hardware is repaired or replaced.
3. Hardware is to be left clean and free from disfigurement.

B. Turn referenced Operations and Maintenance Manuals over to Facility.

END OF SECTION

SECTION 088100 - GLASS AND GLAZING

PART 1 GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

A. Security Glass and Glazing: Section 088853.

B. Plastic Sheet Glazing: Section 088400.

1.02 REFERENCES

A. Comply with recommendations in the "Glazing Manual" of the Glass Association of North America and the "Sealant Manual" of the Flat Glass Marketing Association except as shown or specified otherwise, and except as specifically recommended otherwise by the manufacturers of the glass and glazing materials.

1.03 SUBMITTALS

A. Product Data: Manufacturer's specifications and installation instructions for each type of glass and glazing material specified, and spacers and compressible filler rod.

B. Samples:
   1. Glass: 12 x 12-inch pieces for each type of glass specified.
      a. Insulating glass samples need not be hermetically sealed but include edge construction materials.
   2. Setting blocks, full size.
   3. Color Samples for Glazing Materials: Manufacturer's standard colors.
      a. Marking Decals: Manufacturer's standard colors.
      b. Tinted Glass: Manufacturer's standard colors.
      c. Spandrel Glass Ceramic Coat: Manufacturer's standard colors.
   4. Pattern Samples:
      a. Type C-1 Glass: Manufacturer's standard patterns.
      b. Type F Glass: Manufacturer's standard patterns.

C. Quality Control Submittals:
   1. Certificates:
      a. Affidavit required under Quality Assurance Article.

1.04 QUALITY ASSURANCE

A. Compatibility of Materials: All components of the glazing system shall be manufactured or recommended by one manufacturer to assure the compatibility of materials.

B. Safety Glazing Material: Type indicated, meeting requirements of ANSI Z97.1 with label on each piece.

C. Certification:
1. Affidavit by the material supplier, certifying type and quality of glass furnished.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect glass from edge damage during handling, storage, and installation.

1.06 PROJECT CONDITIONS

A. Environmental Requirements: Comply with glazing materials manufacturer's written recommendations regarding environmental conditions under which glazing materials can be installed.

B. Glazing channel dimensions shown are intended to provide for necessary minimum bite on the glass, minimum edge clearance and adequate glazing material thicknesses, with reasonable tolerances. Provide correct glass size for each opening, within the tolerances and necessary dimensions required.

PART 2 PRODUCTS

2.01 GLASS

A. Type I Glass (Interior View Lites): Laminated Safety Glass; two sheets of double-strength clear sheet glass; ASTM C 1036, Type I, Class 1, quality q3; permanently laminated together with a minimum 0.030-inch-thick sheet of clear plasticized polyvinyl butyral, which has been produced specifically for laminating glass.

B. Type 2 Glass (Exterior Insulated Units):

a. Type D Glass: Tempered Float Glass; ASTM C 1048, Kind FT, Condition A, Type I, Class 1, tempered by the manufacturer's standard process (after cutting to final size).
1. Thickness: 1/4 inch.
b. Laminated Safety Glass; two sheets of double-strength clear sheet glass; ASTM C 1036, Type I, Class 1, quality q3; permanently laminated together with a minimum 0.030-inch-thick sheet of clear plasticized polyvinyl butyral, which has been produced specifically for laminating glass.

1. Unit Thickness:
a. Interior – 3/8”
b. Exterior Side Lite – 1"
c. Exterior Door – 1/2"

2.02 GLAZING MATERIALS

A. Type 1 Glazing Material: Silicone Rubber Glazing Sealant; silicone rubber one-part elastomeric sealant; FS TT-S-001543, Class A; acid-type for non-porous

channel surfaces, and non-acid type where any of the channel surfaces are porous.

B. Type 3 Glazing Material: Acrylic Glazing Sealant; solvent-based, acrylic terpolymer, thermoplastic sealant; FS TT-S-00230, Type II, Class B, 95 percent of solids acrylic; compounded specifically for glazing.

C. Type 4 Glazing Material: Acrylic-Latex Glazing Sealant; modified latex rubber and acrylic emulsion-polymer; compounded specifically as a glazing sealant with permanent flexibility (non-hardening), non-staining and non-bleeding.

D. Type 5 Glazing Material: Butyl Rubber Glazing Sealant; polymerized butyl rubber compound with inert fillers and pigments; FS TT-S-001657, Type I; solvent-based with 75 percent solids, non-sag, tack-free within 24 hours, paintable, non-staining.

E. Colors: For exposed materials provide color as indicated or, if not indicated, as selected by the Director from the manufacturer's standard colors. For concealed materials, provide any of the manufacturer's standard colors.

F. Setting Blocks: Neoprene, 70-90 durometer hardness, with proven compatibility with sealants used.

G. Spacers: Neoprene, 40-50 durometer hardness, with proven compatibility with glazing materials used.

H. Compressible Filler Rod: Closed-cell or waterproof-jacketed rod stock of synthetic rubber or plastic foam, proven to be compatible with glazing materials used, flexible and resilient, with 5-10 psi compression strength for 25 percent deflection.

I. Cleaners, Primers and Sealers: Type recommended by glazing material manufacturer.

2.03 MISCELLANEOUS

A. Safety Marking Decals: Opaque decals, 4-inch diameter, color as selected by the Director from manufacturer's standard colors.

PART 3 EXECUTION

3.01 PREPARATION

A. Clean the glazing channel, or other framing members to receive glass, immediately before glazing. Remove coatings which are not firmly bonded to the substrate. Remove lacquer from metal surfaces wherever elastomeric sealants are used.

B. Inspect each piece of glass immediately before installation and eliminate pieces which have observable damage or face imperfections.

C. Apply primer or sealer to joint surfaces wherever recommended by sealant manufacturer.

3.02 INSTALLATION

A. Each installation shall withstand normal temperature changes, wind loading, and impact loading (for operating sash and doors) without failure of any kind including loss or breakage of glass, failure of sealants or gaskets to remain watertight and airtight, deterioration of glazing materials and other defects in the Work.

B. Install glass in accordance with the standards detailed in the "Glazing Manual" of the Glass Association of North America and the "Sealant Manual" of the Flat Glass Marketing Association except as shown and specified otherwise, and except as specifically recommended otherwise by the manufacturers of the glass and glazing materials.

C. Unify appearance of each series of lights by setting each piece to match others as nearly as possible. Inspect each piece and set with pattern, draw and bow oriented in the same direction as other pieces.

D. Install glazing materials in accordance with the manufacturer's printed instructions.

3.03 GLAZING

A. Install setting blocks of proper size at quarter points of sill rabbet. If required to keep in place set blocks in thin course of the heel-bead compound.

B. Provide spacers inside and out, and of proper size and spacing, for all glass sizes larger than 50 united inches, except where gaskets are used for glazing. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width, except with sealant tape use thickness slightly less than final compressed thickness of tape.

C. Voids and Filler Rods: Prevent exudation of sealant or compound by forming voids or installing filler rods in the channel at the heel of jambs and head (do not leave voids in the sill channels) except as otherwise indicated, depending on light sizes, thickness and type of glass, and complying with manufacturer's recommendations.

D. Force glazing materials into channel to eliminate voids and to ensure complete "wetting" or bond of glazing material to glass and channel surfaces.

E. Tool exposed surfaces of glazing sealants and compounds to provide a substantial "wash" away from the glass. Install pressurized tapes and gaskets to protrude slightly out of the channel, so as to eliminate dirt and moisture pockets.

F. Where wedge-shaped gaskets are driven into one side of the channel to pressurize the sealant or gasket on the opposite side, provide adequate anchorage to ensure that gasket will not "walk" out when subjected to dynamic movement. Anchor gasket to stop with matching ribs, or by proven adhesives, including embedment of gasket tail in cured heel bead.

3.04 CURE, PROTECTION AND CLEANING

A. Cure glazing materials in accordance with manufacturer's printed instructions and recommendations, to obtain high early bond strength, internal cohesive strength, and surface durability.

B. Mark glazed openings immediately upon installation of glass by attaching crossed streamers to framing. Do not apply markers of any type to surfaces of glass.

C. Replace glass included in the work, which is broken, or otherwise damaged, from the time Work is started at the site until the date of physical completion.

D. Maintain glass in a reasonably clean condition until date of physical completion.
1. Clean and trim excess glazing material from the glass and stops or frames promptly after installation.

E. When directed, or just before the project is turned over to the State, remove dirt and other foreign material and wash and polish glass included in the work on both sides.

3.05 MARKING DECALS

A. Install two marking decals on each transparent glass door, and on each transparent glass sidelight which is wider than 20 inch between stiles. Locate decals midway between stiles 34 inch and 64 inch above the floor line.

END OF SECTION

SECTION 092116 - GYPSUM BOARD SYSTEMS

PART 1 GENERAL

1.01 DEFINITIONS

A. Sheet Steel Gages: US Standard.

B. Gypsum Board Terminology: ASTM C 11 - Standard Terminology Relating to Gypsum and Related Building Materials and Systems.

1.02 SUBMITTALS

A. Product Data: Catalog sheets, specifications, and installation instructions for each item specified.

1.03 QUALITY ASSURANCE

A. Fire Resistance Rated Applications: Provide UL listed or ASTM E 119 tested materials, accessories, and application procedures to comply with the rating, UL Design Number, or Gypsum Association File Number indicated.

B. Sound Transmission Class (STC) Rated Applications: Provide materials and installation procedures identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer.

B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Stack gypsum panels flat to prevent sagging.

1.06 PROJECT CONDITIONS

A. Environmental Requirements: Comply with gypsum board manufacturer’s printed temperature and ventilation requirements during application and finishing. Ventilate installation areas to relieve excess moisture.

PART 2 PRODUCTS

2.01 FRAMING

A. Studs, Tracks, and Furring: ASTM C 645; 25 gage (minimum base metal thickness 0.0179 inch) galvanized steel, with additional framing members, reinforcing, accessories, and anchors necessary for the complete framing system.
   1. Deep-Leg Deflection Track: ASTM C 645 top runner with 2 inch deep flanges.
   2. Resilient Furring Channels: Steel furring members designed to reduce sound transmission.

2.02 GYPSUM BOARD

A. Standard Gypsum Board: ASTM C 1396; long edges as follows:
   1. Long Edges: Tapered.
B. Fire Resistant Gypsum Board: ASTM C 1396; Type X, UL listed and bearing listing marking; long edges as follows:
   1. Long Edges: Tapered.

2.03 FASTENERS

A. Steel Drill Screws: ASTM C 1002; gypsum board manufacturer's recommended types and sizes for substrates involved.

B. Laminating Adhesive: Gypsum board manufacturer's recommended type for substrates involved.

C. Expansion Anchors: Anchor bodies AISI 1018 or 12L14, of dimensions indicated; with nuts, ASTM A 563; and flat washers. Expansion sleeves AISI 1010, of dimensions indicated; with bolts, SAE Grade 5; and flat washers.

D. Toggle Bolts: Tumble wing type.
   1. Wing Body: AISI 1008-1010 or equivalent cold rolled steel.
   2. Trunnion Nut: 1/4 inch thru 3/8 inch AISI 1010 steel; 1/2 inch Zamac alloy.
   3. Screw: Carbon steel.

E. Self Threading Masonry Screws: Zinc plated; Tapcon Fasteners by ITW Buildex 1349 West Bryn Mawr Ave. Itasca, IL 60143, (800) 284-5339.

2.04 TRIM

A. Interior Trim: ASTM C 1047.
   1. Material: Galvanized steel or extruded vinyl.
   2. Shapes:
      a. Cornerbead: Use at outside corners.
      b. Bullnose Bead: Use where indicated.
      c. LC-Bead: J-Shaped, exposed long flange receives joint compound. Use at exposed panel edges.
      d. L-Bead: L-shaped, exposed long leg receives joint compound with tear away bead. Use where gypsum board abuts or intersects dissimilar material.
      e. U-Bead: J-shaped, exposed short flange does not receive joint compound. Use where indicated.

f. Expansion (Control) Joint: Use where indicated.

2.05 JOINT TREATMENT MATERIALS

A. Joint Tapes: ASTM C 475; plain or perforated.

B. Joint Compound: ASTM C 475; gypsum board manufacturer's recommended dry powder or ready-mixed, either of the following:
1. One Compound Treatment: One compound for both bedding and finishing joints.
2. Two Compound Treatment: Compatible joint compounds; one compound for bedding and the other compound for finishing joints.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates to which gypsum board system attaches or abuts, preset steel door frames, cast in anchors, and structural framing, with installer present for compliance with requirements for installation tolerances and other conditions affecting performance of gypsum board system construction. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 CONSTRUCTION TOLERANCES

A. Do not exceed 1/8 inch in 8 feet variation from plumb or level in any exposed line or surface, except at joints between boards do not exceed 1/16-inch variation between planes or abutting edges or ends. Shim as required to comply with specified tolerances.

3.03 STEEL FRAMING INSTALLATION

A. Installation Standards: ASTM C 754, and ASTM C 840 requirements that apply to framing installation.

B. Install supplementary framing, blocking, and bracing at terminations in gypsum board system to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction. Comply with details indicated and with gypsum board manufacturer's written recommendations.

C. Isolate partitions from structural elements with slip or cushion-type joints between steel framing and structure as recommended by steel framing manufacturer to prevent transfer of structural loads or movements to partitions.

D. Partition Framing Installation:
1. Align tracks accurately at floor and ceiling. Secure tracks as recommended by the framing manufacturer for the floor and ceiling construction involved, except do not exceed 24 inches oc spacing for powder-driven fasteners, or 16 inches oc for other types of attachment. Provide fasteners approximately 2 inches from corners and ends of tracks.

2. Position studs vertically and engage both floor and ceiling tracks. Install studs so flanges point in the same direction and leading edge or end of each panel can be attached to open (unsupported) edge of stud flanges first. Space studs 16 inches on center, unless otherwise indicated on the Drawings. Fasten studs to track flanges with screws or by crimping.
3. Use full length studs between tracks wherever possible. If necessary, splice studs with a minimum 8 inch nested lap and fasten with two screws per stud flange.
4. Install additional studs to support inside corners at partition intersections and corners, and to support outside corners, terminations of partitions, and both sides of control joints (if any).
5. Extend partition framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing over frames for doors and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board.
6. Brace chase wall framing horizontally to opposite studs with 12 inch wide gypsum board gussets or metal framing braces, spaced vertically not more than 4 feet on center.
    a. Attach gypsum board gussets with a minimum 3 screws per stud flange.
    b. Attach metal framing braces with a minimum 2 screws per stud flange.
7. Install rough framing at openings consisting of full-length studs adjacent to jambs and horizontal header and sill tracks. Cut horizontal tracks to length and split flanges and bend webs at ends for flange overlap and screw to jamb studs. Install intermediate studs between jamb studs at head and sill sections, at same spacing as full-length studs.
8. At door frames, install rough framing as specified above. Install jamb studs to comply with framing manufacturer's recommendations for the types of frames and weights of doors required. Fasten jamb studs to metal frames with anchor clips using 2 self tapping screws or bolts per clip. Where wood frames are shown, fasten jamb studs to rough framing with screws.
9. Where solid core wood doors, double doors, or doors weighing more than 50 lb are indicated or scheduled, install two studs at each jamb and one additional stud not more than 6 inches from jamb studs.
10. Where vertical control joints are shown at jamb lines, install additional vertical studs located on opening side of jambs and not less than 1/2 inch from jamb studs. Do not fasten the additional studs to tracks or jamb studs.
11. Where wall mounted door bumpers are scheduled, provide horizontal reinforcement consisting of 2 pieces of framing installed back-to- back, flush with the face of adjacent stud flanges.

3.04 GYPSUM BOARD INSTALLATION

A. Install gypsum board in the most economical direction, of maximum lengths to minimize end butt joints. Where unavoidable, locate end butt joints as far from center of walls or ceilings as possible.

C. Install gypsum board with face side out. Butt boards together at edges and ends over firm bearing with not more than 1/16 inch of open space between boards. Do not force into place.

D. Fasteners: Fasten gypsum board to supports and furring with steel drill screws of required size and spacing as recommended by the gypsum board manufacturer.

E. Provide additional framing and blocking required to support gypsum board at openings and cutouts.

F. Form control joints in gypsum board where indicated. Allow 1/2-inch continuous opening between boards to allow for insertion of control joint trim.

G. Wood Supports: Provide “floating” interior angle construction between gypsum board at interior corners.

H. Reinforce joints formed by tapered edges, butt edges, and interior corners or angles with joint tape.

3.07 TRIM INSTALLATION

A. Coordinate installation of trim progressively with gypsum board installation where trim is of type required to be installed prior to, or progressively with installation of gypsum board.

B. Securely fasten trim pieces in accordance with manufacturer’s printed instructions.

C. Install cornerbeads at external corners. Install LC-Bead (J-Bead) beads at unprotected (exposed) edges and where gypsum board abuts dissimilar materials. Use single unjointed lengths unless otherwise approved by the Director.

D. Install control joint trim in accordance with ASTM C 840, where indicated.

E. Comply with joint compound manufacturer’s recommended drying time for the relative humidity and temperature at time of application. Allow minimum of 24 hours drying time between applications of joint compound.

3.08 LEVELS OF GYPSUM BOARD FINISH

A. General: Finish panels to levels indicated below, in accordance with ASTM C 840, for locations indicated.
   1. Level 1 Finish (Temporary Partitions): Joints and angles, provide tape embedded in joint compound. Surface shall be free of excess joint compound. Tool marks and ridges will be acceptable.
   2. Level 4 Finish: Joints and angles, provide tape embedded in joint compound and provide three separate coats of joint compound over all joints, angles, and fastener heads. Accessories to be covered with three separate coats of joint compound. Joint compounds to be smooth and

free of tool marks and ridges. Cover the prepared surface with a drywall primer prior to the application of the final decoration.

END OF SECTION

SECTION 099101 - CONSTRUCTION PAINTING

PART 1 GENERAL

1.01 DEFINITIONS

A. The word “paint” in this Section refers to substrate cleaners, fillers, sealers, primers, undercoats, enamels, stains, varnishes and other first, intermediate, last or finish coatings.

B. The word “primer” in this Section refers to substrate cleaners, fillers, sealers, undercoats, and other first or intermediate coats beneath the last or finish coating.

C. The words “finish paint” in this Section refers to the last or final coat and previous coats of the same material or product directly beneath the last or final coat.

D. Finish Paint Systems: Finish paint and primers applied over the same substrate shall be considered a paint system of products manufactured or recommended by the finish coat manufacturer.
   1. Finish paint products shall meet or exceed specified minimum physical properties.

1.03 SUBMITTALS

A. Painting Schedule: Cross-referenced Painting Schedule listing all exterior and interior substrates to be painted and specified finish paint type designation; product name and manufacturer, recommended primers and product numbers, and finish paint color designation for each substrate to be painted.
   1. Designate exterior substrates by building name and number, substrate to be painted and surface location.
   2. Designate interior substrates by building name and number, floor, room name and number, and surface to be painted.

B. Product Data Sheets: Manufacturer’s published product data sheets describing the following for each finish paint product to be applied:
   1. Percent solids by weight and volume, solvent, vehicle, weight per gallon, ASTM D 523 gloss/reflectance angle, recommended wet and dry film thickness, volatile organic compound (VOC) content in lbs/gallon, product use limitations and environmental restrictions, substrate surface preparation methods, directions and precautions for mixing and thinning, recommended application methods, square foot area coverage per gallon, storage instructions, and shelf-life expiration date.
   2. Manufacturer’s recommended primer for each finish paint product and substrate to be painted.
   3. Manufacturer’s complete range of available colors for each finish paint product to be applied.

C. Quality Control Submittals:
1. Test Reports:, Furnish certified test results from an independent testing laboratory showing that products submitted comply with the specifications, if requested by the Owner's Representative.
2. Certificates: Furnish certificates of compliance required under QUALITY ASSURANCE Article.

D. Existing Exterior Paint Film Stripping and Removal Submittals:
1. Submit proposed materials and methods for removing existing paint films down to a clean and original undamaged substrate.
a. Depending upon the substrate to be stripped and thickness of paint films to be removed, acceptable methods of removal include hand or mechanical tools, pressure washing with water, heat or steam devices, chemical strippers and other appropriate methods.
b. More aggressive paint stripping and removal methods will not be accepted when less aggressive methods are equally effective with less damages.
c. Chemical Strippers: As recommended by a letter of approval from finish paint manufacturer.

1.04 QUALITY ASSURANCE

A. Volatile Organic Compounds (VOCs) Regulatory Requirements: Chapter III of Title 6 of the official compilation of Codes, Rules and Regulations of the State of New York (Title 6 NYCRR), Part 205 Architectural Surface Coatings.
1. Certificate of Compliance: List of each paint product to be delivered and installed. List shall include written certification stating that each paint product listed complies with the VOC regulatory requirements in effect at the time of job site delivery and installation.

B. Container Labels: Label each product container with paint manufacturer's name, product name and number, color name and number, thinning and application instructions, date of manufacture and shelf-life expiration, required surface preparation, recommended coverage per gallon, wet and dry film thickness, drying time, and clean up procedures.

C. Field Examples:
1. Prior to on-site painting, at locations designated by the Owner's Representative, apply field examples of each paint type to be applied.
2. Field examples to be applied on actual substrates to be painted and shall duplicate earlier approved paint samples.
a. Interior field examples to be applied in rooms and spaces to be painted with the same products.
b. Field Example Minimum Wet and Dry Film Thickness: As indicated on approved product data sheet.
c. Application: Apply each coat in a smooth uniform wet mil thickness without brush marks, laps, holidays, runs, stains, cloudiness, discolorations, nail holes and other surface imperfections.

1) Leave a specified exposed width of each previous coat beneath each subsequent coat of finish paint and primer.

D. Do not begin applying paints represented by field examples until examples have been reviewed and approved by the Owner's Representative.
   a. Protect and maintain approved field examples until all painting work represented by the example has been completed and approved.

D. Compatibility of Paint Materials: Primers and intermediate paints shall be products manufactured or recommended by the finish paint manufacturer.

E. Performance Criteria:
   1. The following criteria are REQUIRED for products included in this section:
      a. Paints and coatings manufactured within 500 miles (by air) of the project site shall be documented in accordance with Submittal Requirements of Item 1.03.F.
      b. Architectural paints and coatings applied to interior walls and ceilings must not exceed the volatile organic compound (VOC) content limits established in Green Seal Standard GS-11, Paints.
      c. Anti-corrosive and anti-rust paints applied to interior ferrous metal substrates must not exceed the VOC content limit established in Green Seal Standard GC-03, AntiCorrosive Paints.
      d. Clear wood finishes, floor coatings, stains, primers, and shellacs applied to interior elements must not exceed the VOC content limits established in South Coast Air Quality Management District (SCAQMD) Rule 1113, Architectural Coatings.
   2. Volatile Organic Compounds: The VOC concentrations (in grams per liter) of the product shall not exceed those listed below as determined by U. S. Environmental Protection Agency (EPA) Reference Test Method 24 and the standards referenced in 1.04.E.1.
      a. Interior Paints and Coatings:
         1. Non-flat: 150
         2. Flat: 50
      b. Anti-Corrosive Paints (if used in interior applications):
         1. Gloss: 250
         2. Semi-gloss: 250
         3. Flat: 250
      c. Exclude water and tinting color added at the point of sale in the calculation of VOC concentrations.
   3. Chemical Component Limitations: Aromatic Compounds: the product must contain no more than 1.0% by weight of the sum total of aromatic compounds. Testing for the concentration of these compounds will be performed if they are determined to be present in the product during a materials audit.
   4. Chemical Component Limitations, Other Chemicals: The manufacturer shall demonstrate that the following chemical compounds are not used as ingredients in the manufacture of the product:
      a. Halomethanes: Methylene chloride.

b. Chlorinated ethanes: 1,1,1-trichloroethane.
c. Aromatic solvents: benzene, toluene (methylbenzene), ethylbenzene.
d. Chlorinated ethylenes: Vinyl chloride.
e. Polynuclear aromatics: Naphthalene.
f. Chlorobenzenes: 1,2-dichlorobenzene.
g. Phthalate esters: Di (2-ethylhexyl) phthalate, butyl benzyl phthalate, di-n-butyl phthalate, di-n-octyl phthalate, diethyl phthalate, dimethyl phthalate.
h. Miscellaneous semi-volatile organics: Isophorone.
i. Metals and their compounds: antimony, cadmium, hexavalent chromium, lead, mercury
j. Preservatives (antifouling agents): formaldehyde
k. Ketones: methyl ethyl ketone, methyl isobutyl ketone
l. Miscellaneous volatile organics: acrolein, acrylonitrile

1.05 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials to the Site in original, unopened containers and cartons bearing manufacturer's printed labels. Do not deliver products which have exceeded their shelf life, are in open or damaged containers or cartons, or are not properly labeled as specified.

B. Storage and Handling: Store products in a dry, well-ventilated area in accordance with manufacturer's published product data sheets. Storage location shall have an ambient air temperature between 45 degrees F and 90 degrees F.

1.06 PROJECT CONDITIONS

A. Environmental Requirements:
1. Ambient Air Temperature, Relative Humidity, Ventilation, and Surface Temperature: Comply with paint manufacturer's published product data sheet or other printed product instructions.
2. If paint manufacturer does not provide environmental requirements, use the following:
a. Ambient Air Temperature: Between 45 degrees F and 75 degrees F.
b. Relative Humidity: Below 75 percent.
c. Ventilation: Maintain the painting environment free from fumes and odors throughout the Work of this Section.
d. Surface Temperature: At least 5 degrees F above the surface dewpoint temperature.
3. Maintain environmental requirements throughout the drying period.

B. The following items are not to be painted unless otherwise specified, noted or directed:
1. Exposed stainless steel, chrome, copper, bronze, brass, and aluminum.
2 Steel to be encased in cast-in-place concrete.
3. Top flanges of structural beams and girders in composite concrete-steel construction.

4. Factory prefinished items.
5. Exposed structural wood floor joists, subflooring, rafters, roof sheathing and other framing lumber.
6. Galvanized items not exposed in finished spaces.

PART 2 PRODUCTS

2.01 PAINT MANUFACTURERS

A. Where noted, the following finish paint manufacturers produce the paint types specified.
1. Benjamin Moore and Co., 51 Chestnut Ridge Rd., Montvale, NJ 07645, (201) 573-9600.
2. Samuel Cabot Inc., 100 Hale St., Newburyport, MA 01950, (508) 465-1900.
3. Sherwin-Williams Co., Cleveland, OH 44101, (800) 321-8194.
4. Valspar Corp., 1401 Severn St., Baltimore, MD 21230, (800) 638-7756.

2.02 PAINT PRODUCTS

A. Bedding Compound: Water based pre-mixed gypsum wallboard joint compound.

B. Cleaning Solvents: Low toxicity with flash point in excess of 100 degrees F.

C. Color Pigments: Pure, nonfading, finely ground pigments with at least 99 percent passing a 325 mesh sieve.
1. Use lime-proof color pigments on masonry, concrete and plaster.
2. Use exterior pigments in exterior paints.

D. Galvanizing Compound, Cold: Single component compound with 93 percent pure zinc in the dried film and meeting the requirements of DOD-P-21035A (NAVY).

E. Glazing Compound: ASTM C 669.

F. Masking Tape: Removable paper or fiber tape, self-adhesive and nonstaining.

G. Metal Filler: Polyester resin base autobody filler.

H. Mineral Spirits: Low odor type recommended by finish paint manufacturer.

I. Nonskid Deck Enamel Additive: Sid Tex by Gamma Labs, Inc., 840 Arroyo Ave., San Fernando, CA, 91340-1832, (818) 369-7500.

J. Paint Stripper: As recommended by finish paint manufacturer.

K Spackling Compound: Water based pre-mixed plaster and gypsum wallboard finishing compound.

L. Stain Blocker, Primer-Sealer: As recommended by finish paint manufacturer.

M. Turpentine: ASTM D 13.

N. Wood Putty: Water based pre-mixed wood filler.
1. Color match putty to wood substrate beneath clear and semi-transparent finishes.

O. Wood Substrate Cleaner, Brightener, Conditioner, and Open-grain Sealer: As recommended by finish paint manufacturer.

2.03 FINISH PAINT TYPES

A. Physical Properties:
1. Specified percent solids by weight and volume, pigment by weight, wet and dry film thickness per coat, and weight per gallon are minimum physical properties of acceptable materials.
a. Opaque Pigmented Paints: Physical properties specified are for white titanium dioxide base before color pigments are added.
b. Specified minimum wet and dry film thickness per coat are for determining acceptable finish paint products. Minimum wet and dry film thickness per coat to be applied shall comply with approved finish paint manufacturer's product data sheets.
2. Gloss or Reflectance: The following ASTM D 523 specified light levels and angles of reflectance:
a. Flat: Below 15 at 85 degrees.
b. Eggshell: Between 5 and 20 at 60 degrees.
c. Satin: Between 15 and 35 at 60 degrees.
d. Semigloss: Between 30 and 65 at 60 degrees.
e. Gloss: Over 65 at 60 degrees.

B. Exterior Finish Paint Types:
1. Paint Type 1: Exterior Acrylic Latex, Flat.
a. Solids by Weight: 52.0 percent.
b. Solids by Volume: 32.0 percent.
c. Solvent: Water.
d. Vehicle: 100 percent acrylic resin.
e. Weight Per Gallon: 10.5 lbs.
f. Wet Film Thickness: 4.0 mils.
g. Dry Film Thickness: 1.3 mils.
h. Manufacturers: Benjamin Moore and Sherwin-Williams.

2. Paint Type 2: Exterior Acrylic Latex, Semigloss Enamel.
a. Solids by Weight: 47.0 percent.
b. Solids by Volume: 33.2 percent.
c. Solvent: Water.
d. Vehicle: 100 percent acrylic resin.
e. Weight Per Gallon: 10.0 lbs.
f. Wet Film Thickness: 4.0 mils.
g. Dry Film Thickness: 1.3 mils.
h. Manufacturers: Benjamin Moore and Sherwin-Williams.

3. Paint Type 3: Exterior Acrylic Latex, Gloss Enamel.
   a. Solids by Weight: 40.0 percent.
   b. Solids by Volume: 32.0 percent.
   c. Solvent: Water.
   d. Vehicle: 100 percent acrylic resin.
   e. Weight Per Gallon: 10.0 lbs.
   f. Wet Film Thickness: 3.4 mils.
   g. Dry Film Thickness: 1.2 mils.
   h. Manufacturers: Benjamin Moore, PPG, Sherwin-Williams.

C. Interior Finish Paint Types:
1. Paint Type INT-1: Interior Acrylic Latex, Flat.
   a. Solids by Weight: 50.0 percent.
   b. Solids by Volume: 32.0 percent.
   c. Solvent: Water.
   d. Vehicle: Vinyl acrylic resin.
   e. Weight Per Gallon: 10.9 lbs.
   f. Wet Film Thickness: 3.8 mils.
   g. Dry Film Thickness: 1.3 mils.
   h. Manufacturers: Benjamin Moore, ICI Dulux, Sherwin-Williams.
2. Paint Type INT-2: Interior Acrylic Latex, Eggshell.
   a. Solids by Weight: 51.0 percent.
   b. Solids by Volume: 35.0 percent.
   c. Solvent: Water.
   d. Vehicle: Vinyl acrylic resin.
   e. Weight Per Gallon: 11.0 lbs.
   f. Wet Film Thickness: 3.8 mils.
   g. Dry Film Thickness: 1.3 mils.
   h. Manufacturers: Benjamin Moore, ICI Dulux, Sherwin-Williams.

3. Paint Type INT-3: Interior Acrylic Latex, Semigloss Enamel.
   a. Solids by Weight: 49.0 percent.
   b. Solids by Volume: 35.0 percent.
   c. Solvent: Water.
   d. Vehicle: Vinyl acrylic resin.
   e. Weight Per Gallon: 10.0 lbs.
   f. Wet Film Thickness: 3.8 mils.
   g. Dry Film Thickness: 1.2 mils.
   h. Manufacturers: Benjamin Moore, ICI Dulux, Sherwin-Williams.

4. Paint Type INT-4: Interior Acrylic Latex, Gloss Enamel.
   a. Solids by Weight: 40.0 percent.
   b. Solids by Volume: 32.0 percent.
   c. Solvent: Water.
   d. Vehicle: Vinyl acrylic resin.
   e. Weight Per Gallon: 10.0 lbs.
   f. Wet Film Thickness: 3.4 mils.
   g. Dry Film Thickness: 1.2 mils.
   h. Manufacturers: Benjamin Moore, PPG, Sherwin-Williams.

D. Colors: Provide paint colors either shown on contract drawings or to be selected by the Director from finish paint manufacturers available color selections.
   1. Approved finish paint manufacturers to match designated colors of other manufacturers where colors have been shown on the contract documents.
   2. Safety Colors: Industry Standard ANSI Safety Colors.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine surfaces to be prepared, primed, or painted for compliance with contract documents, required environmental conditions, manufacturer's product data sheets, product label instructions and other written requirements.
   1. Do not begin any phase of the work without first checking and verifying that surfaces and environmental conditions are acceptable for such work and that any earlier phase deficiencies and discrepancies have been properly corrected.
      a. The commencement of new work shall be interpreted to mean acceptance of surfaces to be affected.

3.02 PREPARATION

A. Protection: Cover and protect both surfaces to be painted and adjacent surfaces not to be painted from existing paint removals, airborne sanding particles, cleaning fluids and paint spills using suitable drop cloths, barriers and other protective devices.
   1. Adjacent exterior surface protections include roofs, walls, landscaping, driveways and walkways. Interior protections include floors, walls, furniture, furnishings and electronic equipment.
   2. Remove and replace removable hardware, lighting fixtures, telephone equipment, other devices and cover plates over concealed openings in substrates to be painted.
      a. Cover and neatly mask permanently installed hardware, lighting fixtures, cover plates and other devices which cannot be removed and are not scheduled for painting.
   3. Schedule and coordinate surface preparations so as not to interfere with work of other trades or allow airborne sanding dust particle to fall on freshly painted surfaces.
   4. Provide adequate natural or mechanical ventilation to allow surfaces to be prepared and painted in accordance with product manufacturer's instructions and applicable regulations.
   5. Provide and maintain "Wet Paint" signs, temporary barriers and other protective devices necessary to protect prepared and freshly painted surfaces from damages until Work has been accepted.

B. Clean and prepare surfaces to be painted in accordance with specifications, paint manufacturer's approved product data sheets and printed label instructions. In the event of conflicting instructions or directions, the more stringent requirements shall apply.

1. Cleaners: Use only approved products manufactured or recommended by finish paint manufacturer. Unless otherwise recommended by cleaner manufacturer, thoroughly rinse with clean water to remove surface contaminants and cleaner residue

C. Surfaces:
1. Existing Exterior Painted Surfaces: Thoroughly clean to remove dirt, soot, grease, mildew, chalkiness and stains using finish paint manufacturer's recommended spray-on liquid cleaner.
   a. Apply cleaner using hand-held wand applicator in accordance with product manufacturer's instructions. Thoroughly rinse and remove all residue with clean water.
   b. Remove loose, peeling, cracked and blistered paint by chipping, scraping, and sanding smooth with medium and fine sandpaper.
   c. Fill surface holes and depressions with finish paint manufacturer's recommended filler and sand smooth to adjacent undisturbed edges.
   d. Touch-up bare spots on previously painted surfaces with finish paint manufacturer's recommended primer.
   e. Sand existing semigloss and gloss paint surfaces to a uniform smooth dull finish before painting.
   f. Fill and sand smooth existing paint surface damages, depressions, ridges and other imperfections that will remain visible after new paints have been applied.

2. Steel Doors and Frames: Fill indentations and cracks with metal filler; sand smooth to match adjacent undamaged surfaces.
3. Plaster, Cement Plaster, and Gypsum Wallboard:
   a. Fill cracks, holes, and other indentations smooth to adjacent surfaces using specified bedding, spackling, and finishing compounds.
   b. Plaster: Scrape and sand smooth ridges, spills, nibs, and other surface projections.
   c. Cement Plaster: Coat surfaces to be patched with a bonding agent. Patch cement plaster with an approved mortar patching mix and finish to match adjacent surface and texture.
   d. Gypsum Wallboard: Fill and sand smooth minor bedding and finishing compound defects.
   e. Vacuum and wipe surfaces free of all sanding residue and dust.

D. Painting Material Preparations:
1. Prepare painting materials in accordance with manufacturer's approved product data sheets and printed label instructions.
   a. Stir materials before and during application for a consistent mixture of density. Remove container surface paint films before stirring and mixing.
   b. Slightly tint first opaque finish coat where primer and finish coats are the same color.
   c. Do not thin paints unless allowed and directed to do so in writing within limits stated on approved product data sheets.

3.03 APPLICATION

A. Environmental Conditions:
   1. Water-based Paints: Apply when surface temperatures will be 50 degrees Fahrenheit to 90 degrees Fahrenheit throughout the drying period.
   2. Other Paints: Apply when surface temperatures will be 45 degrees Fahrenheit to 95 degrees Fahrenheit throughout the drying period.
   3. Apply exterior paints during daylight hours free from rain, snow, fog and mist when ambient air conditions are more than 5 degrees above the surface dewpoint temperature and relative humidity less than 85 percent.
      a. When exterior painting is allowed or required during nondaylight hours, provide portable outdoor weather recording station with constant printout showing hourly to diurnal air temperature, humidity, and dewpoint temperature.
   4. Exterior Cold Weather Protection: Provide heated enclosures necessary to maintain specified temperature and relative humidity conditions during paint application and drying periods.

B. Install approved paints where specified, or shown on the drawings, and to match approved field examples.
   1. Paint Applicators: Brushes, rollers or spray equipment recommended by the paint manufacturer and appropriate for the location and surface area to be painted.
      a. Approved minimum wet and dry film thicknesses shall be the same for different application methods and substrates.

C. Paint Type Coats To Be Applied: Unless specified otherwise by finish paint manufacturer's product data sheet, the number of coats to be applied as follows:
   1. Interior Gypsum Board Assemblies:
      a. New Unpainted Surfaces: Apply 1 coat of primer and 2 coats of finish paint.
      b. Existing Painted Surfaces:
         1) Apply 2 coats of finish paint when existing paint has a lower gloss.
         2) Apply one coat of primer and 2 finish coats when existing paint has a higher gloss.

   2. Factory Primed Surfaces: Apply 2 coats of finish paint.

D. Surfaces: Unless otherwise specified or shown on the drawings, paint surfaces as follows:
   1. Exterior Surfaces:
      a. Factory Finished Metal Substrates: Field painting not required.
      b. Factory Primed and Unprimed Ferrous Substrates:
         1) Doors, Frames and Trim: Paint Type -3.

   2. Interior Surfaces:
      a. Ceilings: Paint Type -1
      b. Walls: Paint Type -2

c. Doors, Windows, Frames and Trim: Paint Type -3

3. Unless otherwise noted, paint both exterior and interior unremovable and exposed wall and ceiling air supply and return grilles; plumbing pipes; electrical panel and fuse boxes, raceways and conduits; heating convector cabinets, radiators, radiator cabinets, unit heaters, and similar existing and installed devices and equipment by other trades.
   a. Paint to match adjacent wall or ceiling surfaces.
   b. Paint exposed surfaces when any part of the surface is on or within 8 inches of ceiling or wall surface to be painted.
   c. Paint visible interior surfaces behind grilles, guards and screens.
4. Doors and Frames: Unless otherwise noted, paint doors and frames the same color in the next highest gloss as adjacent wall surfaces.
   a. Where walls are not the same color on both sides of a door frame, change color at the inside corner of the frame stop.
   b. Prime and finish paint door faces and edges before installation.
      1) Paint door edges the same paint type color as the exterior side of the door.
   c. Do not paint door components which are clearly not intended to be painted such as non-ferrous hardware, frame mutes, and weather stripping.
   d. Do not allow doors and frames to touch until paint is thoroughly dry on both surfaces.
5. Ferrous Metal Door and Window Hardware: Unless otherwise noted, prime and paint to match adjacent doors, windows and frames.

3.04 FIELD QUALITY CONTROL

A. Paint Samples: Assist the Owner's Representative in obtaining random one quart paint samples for testing at any time during the Work.
   1. Notify the Owner's Representative upon delivery of paints to the Site.
   2. Furnish new one quart metal paint containers with tight fitting lids and suitable labels for marking.
      a. Furnish labor to thoroughly mix paint before sampling and provide assistance with sampling when required.

3.05 ADJUSTING AND CLEANING

A. Reinstall removed items after painting has been completed.
   1. Restore damaged items to a condition equal to or better than when removed. Replace damaged items that cannot be restored.

B. Touch up and restore damaged finish paints. Touch up and restoration paint coats are in addition to the number of specified finish paint coats.

C. Remove spilled, splashed, or spattered paint without marring, staining or damaging the surface. Restore damaged surfaces to the satisfaction of the Owner's representative.

D. Remove temporary barriers, masking tape, and other protective coverings upon completion of painting, cleaning and restoration work.

END OF SECTION

SECTION 27 10 00

NETWORK CABLE INSTALLATION

Part 1: Introduction

1.1.1.1) Introduction

Purchase College (SUNY) located in Purchase, NY, maintains the following specification (hereafter referred to as “Specification”, “the Specification”, or “this Specification”) as a set of requirements for any installation of cables that shall support any Data, Telephone, Audio/Video, and Security (alarm, surveillance, and door access systems) services on the Purchase College campus.

1.2) The Terms “Owner” and “the Owner”

The Terms “Owner” and “the Owner” shall represent Purchase College, State University of New York (SUNY) of 735 Anderson Hill Rd., Purchase, NY 10577.

1.3) Applicability of this Specification and the Term “Contractor”

This Specification may be presented in a number of ways, including but not limited to the following:

1.3.1) This Specification may be attached to a request for quotation or request for proposal, in which case this document shall specify requirements for proposed work upon which a vendor shall base its quotation. In this case the terms “Contractor” and “the Contractor” shall represent the vendor who is providing cost quotation/proposal upon which an agreement to perform the work may be reached. By use of the terms “Contractor” and “the Contractor”, Owner conveys no promise or intention that such an agreement will be reached.

1.3.2) This Specification may accompany an order for installation services and materials, in which case it shall serve as requirements by which vendor is to provide requested services and materials should the vendor accept the order. In this case the terms “Contractor” and “the Contractor” shall represent the selected vendor in its obligation to perform the actual work.

1.4) Format

This Specification consists of the following five parts:

Part 1: Introduction
Part 2: General,
Part 3: Materials,
Part 4: Execution
Part 5: Documentation

With some projects an additional part may be added:
Part 6: Scope of Work

Part 2: General

2) General

2.1) Schedule

Contractor shall complete all work according to any Schedule Requirements specified in the Scope of Work (if provided) and the original RFQ/RFP/Project.

Contractor shall accompany any request for quote with a proposed schedule in writing, including all of the Project Milestones specified below and the Schedule Requirements specified in the Scope of Work (if provided) and the original RFQ/RFP/Project..

If work is awarded to contractor, then proposed schedule of Contractor shall become the Schedule absent other written agreement by Owner. Contractor shall adhere strictly to the Schedule and convey any proposed adjustments to the Schedule and all Project Milestones as a Transmittal to Owner Project Manager.

Written approval from Owner Project Manager must be obtained by Contractor prior to change of Schedule according to any proposed adjustments. If written approval from Owner Project Manager is not obtained by Contractor, then the Schedule remains unchanged and Contractor is obligated to perform according to Schedule.

Project Milestones are as follows:

2.1.1) Date Order Must be Received By
2.1.2) Materials Delivery Date (if different from the start date)
2.1.3) Start of Work Date
2.1.4) Start Date of Work on Communication Rooms
2.1.5) Start Date of Pathway Installation (incl. core drilling, riser installation, raceway installation)
2.1.6) Completion of Risers Date
2.1.7) Completion of Path Installation Date
2.1.8) Start of Fiber-Optic Cable Installation Date
2.1.9) Fiber-Optic Testing and Labeling Date
2.1.10) Completion of Fiber-Optic Cable Installation Date
2.1.11) Start of Other Cable Installation Date
2.1.12) Completion of Cable Pulling/Rough-in Date
2.1.13) Completion of Category 6 / 6A Cable Installation Date
2.1.14) Completion of Telecommunications Feeder Installation Date
2.1.15) Completion of Other Cable Installation Date
2.1.16) Documentation Delivery Date
2.1.17) Project Total Completion Date

2.2) Contractor References

Contractor shall supply along with their bid a list of references of comparable installations, including contact name and telephone number. Owner may elect to perform a site visit to one or more references. Contractor shall note at least one reference that is able to accommodate a site visit by Owner.

2.3) Designated Contacts

2.3.1) Owner Designated Contacts

Owner shall specify the name, mailing address, email address, fax, and telephone numbers for the following persons, hereafter referred to as “Owner Designated Contacts”.

Changes to any Owner Designated Contacts before or during the relevant period of this work shall be communicated to all Designated Contacts by the Owner Project Manager.

Contractor shall communicate exclusively with the Owner Designated Contacts defined below in regard to any matter pertaining to the work described herein.

2.3.1.1) Owner Project Manager

Sean Connolly
Capital Facilities Planning

Purchase College
735 Anderson Hill Rd., Purchase NY 10577
(914)251-6916
sean.connolly@purchase.edu

2.3.1.2) Owner Technical Contacts

Joseph Kennedy
Campus Technology Services
Purchase College
735 Anderson Hill Rd., Purchase NY 10577
(914)251-6916
joseph.kennedy@purchase.edu

William Redding
University Police Department
Purchase College
735 Anderson Hill Rd., Purchase NY 10577
(914)251-6905
William.Redding@purchase.edu

2.3.1.3) Owner Billing Contact

Elizabeth Pleva
Purchasing and Accounts Payable Office
Purchase College
735 Anderson Hill Rd., Purchase NY 10577
Phone: (914)251-6070
Fax: (914)251-6075

2.3.1.4) Owner Parking and Transportation Contact

Christine Onderdonk
Parking and Transportation Office
CCN Building, Rm. 1014
Purchase College
735 Anderson Hill Rd., Purchase NY 10577
(914)251-6177
christine.onderdonk@purchase.edu

2.3.1.5) Owner Certified Payroll Records Contact

Anne Marie Russillo
Capital Facilities Planning Office
Purchase College
735 Anderson Hill Rd., Purchase NY 10577
(914)251-4480

2.3.1.6) Owner Capital Projects Contact

Anne Marie Russillo
Capital Facilities Planning
Purchase College
735 Anderson Hill Rd., Purchase NY 10577
(914)251-4480

2.3.2) Contractor Designated Contacts

Contractor shall specify the name, mailing address, email address, fax, and telephone numbers for the following persons, hereafter referred to as “Contractor Designated Contacts”.

Changes to any Contractor Designated Contacts before or during the relevant period of this work shall be communicated to all Designated Contact by the Contractor Project Manager.

2.3.2.1) Contractor Project Manager
2.3.2.2) Contractor Field Contact
2.3.2.3) Contractor Sales Contact
2.3.2.4) Contractor Billing Contact
2.3.2.5) Contractor President / CEO

2.3.3) Coordination by Contractor with Owner Designated Contacts

Contractor shall simultaneously forward copies to the Owner Project Manager of any correspondence between Contractor (or any of its employees or designees) and Owner (or any of its employees or designees).

Contractor shall forward copies of meeting minutes to the Owner Project Manager within one business day following any meeting with Owner (or any of its employees or designees).

Contractor shall submit all required documentation; all test results, all quotations, all matters of dispute, and all questions pertaining to this document in writing via the mailing address of the Owner Project Manager. Contractor shall send electronic copy of same to both the Owner Project Manager and the Owner Technical Contact via email.

Contractor shall submit all technical questions to the Owner Technical Contact via email, with copy to Owner Project Manager.

Contractor shall submit all matters of billing to the mailing address of the Owner Billing Contact, with copy to Owner Project Manager.

Contractor shall submit all certified payroll records to the Owner Certified Payroll Records Contact, and notify Owner Project Manager when these are sent.

Contractor shall submit all questions regarding parking and transportation on Owner premises, all requests for permission to park vehicles on owner premises, and all disputes related to parking/ticketing/towing on Owner premises to the Owner Parking and Transportation Contact

2.4) Quality Assurance and Contractor Qualifications:

Contractor must have and maintain the following qualifications:

2.4.1) Contractor’s personnel are trained and experienced in the installation and testing of cabling systems according to all parts of all referenced standards bodies, certification organizations, and laws/codes listed in the “Technical References” section of this document.

2.4.2) Contractor’s personnel are trained and experienced in cable support techniques.

2.4.3) Contractor’s personnel are trained and experienced in fire stopping methods.

2.4.4) Contractor’s on-site personnel must be fully conversant with and capable of the installation of large scale Category 6 / 6A cabling systems for high-speed data and voice, and telecommunications cabling systems to support both analog and digital voice communications.

2.4.5) Contractor’s on-site personnel must be trained and certified in the installation of Category 6 / 6A and equivalent-cabling systems at the level required to provide the cabling system manufacturer extended performance warranty with a minimum of a 20-year term.

2.4.6) Contractor's on-site supervisory personnel have completed training/testing and are certified in BICSI "Installer 2, Copper (INSTC)".

2.4.7) Contractor's on-site personnel must have completed at least three comparable installations of telecommunications cabling systems supporting analog and digital voice communications within the last year.

2.4.8) Contractor's on-site personnel must be fully conversant with and capable of the installation of large scale Single-mode Fiber-Optic (SMF) cabling systems supporting high-speed data and voice, if scope requires SMF installation.

2.4.9) Contractor's on-site personnel must have completed at least three comparable installations of SMF cabling systems supporting 10GBASE-LR Ethernet within the last year.

2.4.10) Contractor's on-site supervisory personnel have completed training/testing, and are certified in BICSI "Installer 2, Optical Fiber (INSTF)".

2.4.11) Contractor's on-site personnel must be trained and certified in installing Corning Single-mode Fiber and equivalent cabling system at the level required to provide the cabling system manufacturer extended performance warranty with a minimum of a 25 year term.

2.4.12) Contractor's on-site personnel must be fully conversant with and capable of the installation of large scale Security cabling systems supporting analog and digital signals.

2.4.13) Contractor's on-site personnel must have completed at least three comparable installations of cabling systems supporting installation of Security cable within the last year.

2.4.14) Contractor's on-site personnel must be trained and certified in installing Security cabling systems supporting analog and digital signals.

2.5) Technical References

The provision and installation of the cable plant is to adhere to the strictest codes, standards, and practices. All products, processes, and standards of work must conform to the current versions of all applicable standards, certification guidelines, and codes as defined by the following organizations and as otherwise cited herein:

American National Standards Institute (ANSI)
American Society for Testing and Materials (ASTM)
Edison Testing Laboratories (ETL)
Building Industry Consulting Service International (BICSI)
Association of Cabling Professionals (ACP)
Electronic Industries Association (EIA)
Federal Communications Commission (FCC)
International Electrotechnical Commission (IEC)
Institute of Electrical and Electronics Engineers (IEEE)
International Standards Organization (ISO)
National Electrical Code (NEC / NFPA 70)
National Electrical Contractors Association (NECA)
National Electrical Manufacturers Association (NEMA)

National Electrical Safety Code (NESC)
National Fire Protection Association (NFPA)
New York State Uniform Fire Prevention and Building Code
Telecommunication Industries Association (TIA)
Underwriters Laboratories (UL)

In the event of a conflict between standards or codes, Contractor shall adhere to the most stringent standard or code.

In the event of a conflict between this Specification and any standard, code, or practice whereby this Specification is the most stringent, Contractor shall adhere to this Specification.

In the event of a conflict between this Specification and any standard, code, or practice whereby this Specification is not the most stringent, Contractor will immediately inform Owner Technical Contact and identify the conflict.

2.6) Submittals and Approvals

Unless otherwise specified, all submittals must be sent by Contractor via email as electronic file in Adobe® PDF format to Owner Project Manager and Owner Technical Contact via email. Submittal emails sent to Owner Technical Contact and Owner Project manager must be less than 10 Megabytes in size. No more than six (6) Adobe® PDF files shall be attached to a single submittal email. No more than one (1) product or one (1) method shall be detailed in each Adobe® PDF file.

Any variance from this Specification or from this Scope of Work (if provided) and the original RFQ/RFP/Project must be explicitly approved in writing by both the Owner Technical Contact and the Owner Project Manager. An approval from one of either the Owner Technical Contact or Owner Project Manager shall not suffice as approval.

Owner reserves the right to deny any request for approval. If an approval request is denied or an approval is not received, then Contractor shall comply with this Specification and Scope of Work.

2.6.1) Materials and Practices

All non-miscellaneous materials Contractor intends to provide and/or install must be submitted by contractor and approved in writing by the Owner Technical Contact prior to Contractor providing and/or installing.

The use of any materials and practices that are specified in this specification do not waive Contractor’s requirement for submittal and approval prior to provision and/or installation. If Contractor wishes to use a specific manufacturer and part number specified in this specification, then Contractor must still submit manufacturer’s product cut sheet to the Owner Technical Contact and Owner Project Manager for approval of material. Submitted cut sheets shall have specific product part number and specific product options encircled by Contractor to clearly identify the product and all options Contractor intends to provide/install.

If specific manufacturer and part number are unspecified in this specification, or if Contractor wishes to propose an equivalent component or practice to one that is specified, then a Contractor must submit formal request for approval to the Owner Technical Contact and Owner Project Manager for approval, and must include electronic copies of all of the following as applies to material or practice:

2.6.1.1) Performance data
2.6.1.2) Cut sheets
2.6.1.3) Shop drawings
2.6.1.4) All supporting documentation.

Submitted cut sheet shall have specific product part number and specific product options encircled

Proposed alternate component or practice must not invalidate any manufacturer warranty on any installed components, any installed cable plants, or any installed systems.

2.6.2) Change Orders

Requests for Change Orders Proposals may be sent in writing by Owner Project Manager to Contractor at any time following Award and prior to Completion. Request shall describe a proposed Change Order scope in detail and may reference discussions in field.

Contractor shall respond within ten (10) days by sending a Change Order Proposal to Owner Project Manager that shall include a Proposed Change Order Cost Quotation and a Proposed Change Order Schedule Impact Statement.

2.6.2.1) Proposed Change Order Cost Quotation

Contractor shall submit Proposed Change Order Cost Quotation to Owner Project manager which includes detailed line item unit pricing, quantity, and extended pricing for each type of material and labor that would be required to execute the Proposed Change Order.

2.6.2.1.1) Unit Pricing

Unit prices for materials and labor shall be based on calculable values from the first applicable source according to the following ordered list:

2.6.2.1.1.1) Materials and Labor: Contractor's base-bid proposal
2.6.2.1.1.2) Labor: Prevailing wage labor rates

If a required material is not quoted as part of base-bid, then unit price shall be Contractor's gross cost to purchase one unit of that material from supplier at projected quantity, plus 20%

2.6.2.1.2) Quantities

Quantities of materials shall be based on need pertaining to Proposed Change Order and shall not project greater than 10% surplus quantity where such a surplus is typically required for estimation of work. All surplus materials shall be furnished to Owner at end of proposed work, unless otherwise instructed in writing by Owner Project Manager.

Quantities of labor units for a required work or trade shall be based on calculable quantities from Contractor's base-bid proposal.

If a required work or trade is not quoted as part of base-bid, then unit based on the first applicable source of the latest editions of the following ordered list of industry-standard guides for estimating:

2.6.2.1.2.1) National Electrical Contractors Association (NECA), Manual of Labor Units
2.6.2.1.2.2) Mechanical Contractors Association of America (MCAA), Labor Estimating Manual
2.6.2.1.2.3) U.S. Army Corps of Engineers, Modification Impact Evaluation Guide
2.6.2.1.2.4) Walker's Building Estimator's Reference Book

2.6.2.2) Proposed Change Order Schedule Impact Statement

Proposed Change Order Schedule Impact Statement shall summarize the greatest potential impact to Schedule as a result of execution of the proposed Change Order by Contractor, and shall propose a new Schedule including an adjustment of all Project Milestones as defined herein, that would be adopted should Owner Project Manager approve of Change Order in writing.

2.6.2.3) Change Order Approval

Approval of Change Order Proposal may take place at sole option of Owner, and shall be sent in writing by Owner Project Manager at any time following Award and prior to Completion.

A Purchase Order shall accompany any approval of Proposed Change Order. Contractor shall not act on approval of Change Order Proposal unless Purchase Order is received.

2.6.3) Field-Directed Changes

Field-Directed Changes shall be defined as minor changes to the Scope of Work (if provided) and the original RFQ/RFP/Project that would result in zero additional cost to Owner or would result in a credit to Owner, and also would have zero impact on Schedule or would result in earlier completion of Schedule, as agreed by both Owner Project Manager and Contractor.

Requests for Field-Directed Change may be sent in writing by Owner Project Manager to Contractor at any time following Award and prior to Completion. Request shall describe Field-Directed Change scope in detail and may reference discussions in field.

Contractor shall respond to Owner Project Manager within two (2) days with a Field-Directed Change Response, which shall either:

2.6.3.1) Confirm that Requested Field-Directed Change is properly classified, and that Field-directed change is agreed by all parties to result in:

2.6.3.1.1) zero cost and schedule impact to Owner, or else

2.6.3.1.2) provide details of credit amount and/or earlier completion of schedule, including a Schedule Impact Statement that demonstrates earlier completion.

2.6.3.2) Dispute that the Requested Field-Directed Change is properly classified as such, and that there are cost and/or schedule implications of executing such a change.

2.6.4) Schedule Impact Statement.

Field-Directed Changes shall not be made by Contractor unless Owner Project Manager directs Contractor in writing to perform a Field-Directed Change. Direction shall be accompanied by detailed description of the Field-Directed change. If Contractor agrees that said Field-Directed Change shall be at zero additional cost or result in a credit to Owner, then Contractor shall respond within

2.6.5) Construction Change Directives

Construction Change Directives shall not be permitted, nor any change that is associated with additional cost in advance of a Purchase Order being issued.

2.7) Notification of Errors, Inquires and Interpretation

It shall be the responsibility of the Contractor to notify owner of any errors in this Specification and to make recommendations to Owner Project Manager and Owner Technical Contact in writing for any additional requirements deemed necessary. If Owner finds the errors significant or a change in the requirements necessary, then Owner will notify Contractor in writing of the change in this Specification. No deviations from this Specification shall be made without approval from Owner Technical Contact and Owner Project Manager.

2.8) Hazards

Contractor must immediately notify Owner Project Manager by telephone, by email, and in writing of any Hazards to any person(s), any Hazards to animal(s), any Hazards to the environment, and any Hazards to asset(s), when a Hazard is not managed or manageable by contractor as part of standard means, standard methods, and standard safety procedures. Contractor shall immediately notify Owner Project Manager in writing of any such hazard that exist in this Specification, in the proposed Scope of Work (if provided) and the original RFQ/RFP/Project, in any proposed Change Order, or in any Field-Directed Change. Contractor shall avoid the Hazard until written or email reply is received from Owner Project Manager instructing Contractor regarding the identified Hazard.

2.9) Parking and Operation of Vehicles on Campus

Contractor will operate vehicles responsibly under campus rules and regulations and will not park vehicles in unauthorized areas. Illegally parked vehicles will be towed at vehicle owner’s expense.

It will be the responsibility of the Contractor to contact the Parking and Transportation Office at (914)251-6177 to arrange for temporary visitor parking permits.

Contractor shall not park or operate motor vehicles on grass or other non-paved surfaces unless explicit written permission is granted by the Parking and Transportation Office.

2.10) Proper Contractor Identification

Employees of Contractor while on site shall wear a uniform shirt. Employees of Contractor shall carry identification badge or identification cards and shall be instructed to submit same to scrutiny upon request by campus personnel.

2.11) Subcontracts

All requirements that apply to Contractor or Employees of Contractor shall also apply to any Subcontractor that Contractor uses to execute the requirements of this Specification. It is Contractor's sole responsibility to ensure that all work is executed according to this Specification, whether performed directly by Contractor, or by Contractor's Subcontractor. Upon request, Contractor must provide a list of all proposed subcontractors along with detailed information regarding their financial and technical abilities.

2.12) Certified payroll records must be submitted by the Contractor to Owner Certified Payroll Records Contact.

Part 3: Materials

3) Materials

The following requirements apply to all materials provided, installed, and/or used by Contractor.

3.1) General

Contractor shall supply all materials, unless otherwise noted.

All materials, equipment, tools and methods shall be of standard manufacture, shall have undergone thorough tests, shall have been proven in actual use, and shall not be custom-designed for this project.

Communications Rooms and Spaces (herein referred to as "Communications Room", "CR", "Closet", or plural derivatives of same) shall refer to any central location where Data, Telecommunications, Security, and/or Audio/Video cables are collectively run to, including interior spaces containing Open Equipment Racks, Equipment Cabinets, Splice Enclosures, and furniture- or wall-mounted Patch Panels.

3.2) Category 6 and Category 6A

All Category 6 / 6A cable, jacks, plugs, patch panels, and patch cables must be rated to meet or exceed performance specifications for Category 6 / 6A components as defined in ANSI/TIA-568-C and ISO/IEC 11801 performance requirements for Category 6 / 6A, and shall be ETL verified to Category 6 / 6A, and must be certified by manufacturer at a frequency range of 1Mhz through 600Mhz.

Installed Category 6 / 6A system and components shall support 100BASE-TX Ethernet as per IEEE 802.3u, 1000BASE-T Ethernet as per IEEE 802.3ab, 1000BASE-TX Ethernet as per TIA-854, 2.5GBASE-T and 5GBASE-T Ethernet as per IEEE 802.3bz, 10GBASE-T Ethernet as per IEEE 802.3an, Voice-Over-IP telephony (VOIP) as per TIA-TR41, digital telephony as per TIA-810-B, analog telephony as per TIA 470-C, Power over Ethernet as per IEEE 802.3af, IEEE802.3at, and IEEE802.3bt standards.

Installed materials must form an integrated system and must integrate with existing network. Components and interconnections must match for optimum future performance. All components must be produced by the same manufacturer or be warranted by an exclusive partnership.

3.2.1) Warranty on Installed Category 6 / 6A Cabling System

Manufacturer warranty on installed Category 6 / 6A Cabling System shall be extended to Owner for a period of not less than 20 years and shall provide immediate remediation or replacement of installed cabling system by manufacturer, if cabling system does not meet the requirements of this Specification, including but not limited to testing parameters, at any point during the warrantee period.

Contractor shall submit manufacturer warranty information on proposed Category 6 / 6A cabling system, along with copies of manufacturer certification credentials for Contractor, with Contractor's bid.

3.2.2) Category 6 / 6A Cable

Category 6 / 6A Cable shall be 24 AWG, 4-pair, with a blue jacket. Plenum-rated cable shall be used where cabling runs through an air-handling space as per NEC/NFPA70. Individual conductors shall be 100% FEP insulated. Cable jacketing shall be lead-free.

Cable shall be independently verified for flammability compliance to NEC article 800 and NFPA 70; CMR ANSI/UL 1666.

Cable shall be dispensed from a plastic reel in a cardboard box packaged by manufacturer.

3.2.2.1) Category 6 Cable

Outer cable jacket diameter shall not exceed 0.25 inches.

Unless otherwise noted, Category 6 cable shall be Unshielded Twisted Pair (UTP).

3.2.2.2) Category 6A Cable

Outer cable jacket diameter shall not exceed 0.285 inches.

Unless otherwise noted, Category 6A cable shall be Foil-shielded Unscreened Twisted Pair (F/UTP).

3.2.2.3) Outside Service Plant Cable (“Category 6A OSP Cable”)

Category 6A OSP Cable shall be 4-pair Foil-shielded Unscreened Twisted Pair (F/UTP).cable. Category 6A OSP Cable shall consist of a core of four balanced twisted pairs surrounded by water-blocking gel, surrounded by a dielectric inner jacketed core, covered by dry water block material , surrounded by aluminum tape shield, surrounded by a sunlight and abrasion resistant black polyethylene outer jacket. OSP Category 6A Cable shall be suitable for direct-buried, underground conduit, and lashed aerial applications.

OSP Category 6A Cable must meet or exceed ANSI/TIA-568-C and ISO/IEC 11801 Class E_A performance requirements for Category 6A, and shall be ETL verified to Category 6A.

3.2.3) Category 6 / 6A Terminations

3.2.3.1) Modular Jacks for Category 6 / 6A Permanent Links

Modular jacks used in Data/Telecommunications Outlets and Patch Panels shall be un-keyed, RJ-45 (8-position – 4-pair) and shall meet EIA/TIA-568 requirements for Category 6 / 6A component performance.

Modular jacks shall fit in a .790" X .582" opening. Modular jacks shall be terminated using PDS 110-style insulation displacement pc board connectors, color-coded for both T568A and T568B wiring. The 110-style connectors shall be capable of terminating 22-24 AWG solid wire. The 110 Contacts shall be paired (with additional space between pairs) to improve crosstalk performance. Each jack shall be provided with a bend-limiting strain relief. The strain relief shall provide a “silo” to limit the bend radius at the point of termination.

Each jack shall have an integrate dust cover or separate approved dust covers must be provided.

Modular jacks shall be colored orange

3.2.3.2) Modular Plugs for Category 6 / 6A Single-Connector Modified Permanent Links

Where Single-Connector Modified Permanent Links are called for, station/device end shall be terminated in 8-Position 8-Conductor “RJ45” shielded modular plug with dual-pronged blades designed to be crimped onto and create secure contact with the specified/approved solid-conductor cable. Modular plugs for Category 6 / 6A Outside Service Plant (OSP) Cable shall be designed to operate as part of an installed Category 6A cabling system.

3.2.3.3) Modular Plugs for Category 6A Outside Service Plant (OSP) Cable

Outside Service Plant Data Cable shall terminate on both ends in 8-Position 8-Conductor “RJ45” shielded modular plugs with dual-pronged blades designed to be crimped onto and create secure contact with the specified/approved solid-conductor cable. Modular plugs for Category 6 / 6A Outside Service Plant (OSP) Cable shall be designed operate as part of an installed Category 6A cabling system.

3.2.4) Category 6 / 6A Station/Device Outlets

3.2.4.1) Standard Faceplates

Standard faceplates shall be non-metallic, constructed of a single molded piece, and shall be of angled type such that the front of installed modular jacks face downward 45-degrees when faceplate is installed with faceplate longest dimension up/down.

Standard faceplates shall be single-gang, and shall accept four modular jacks (“four-port”). Blanks shall be installed in any unused port/space on the faceplate.

Faceplates and blanks shall be colored ivory, unless otherwise specified.

Faceplates shall have insert-type labels capable of accepting and retaining printed non-adhesive paperboard labels of minimum 10-point thickness. Paperboard labels must be of suitable width and height to meet labeling requirements, as defined herein, with label text positioned centered on and parallel to each port to which label text pertains.

A transparent snap-in flexible plastic label cover shall retain the label, and shall have a small hole at side to permit label cover removal.

3.2.4.2) Biscuit Surface-Mount Box (“Biscuit”)

Biscuit shall be constructed of high-impact flame-retardant plenum-rated thermoplastic and shall be colored white. Biscuits are acceptable only where specified in Scope section for use in outlets above ACT ceilings that are air-handling spaces.

Biscuit shall provide two Category 6A modular jack ports.

Biscuit shall have insert-type label capable of accepting and retaining printed non-adhesive paperboard labels of minimum 10-point thickness. Paperboard labels must be of suitable width and height to meet labeling requirements, as defined herein, with label text positioned centered on and parallel to each port to which label text pertains.

3.2.5) Category 6 / 6A Patch Panels

Category 6 / 6A Patch panels shall be angled, shall be 1.75” high, shall occupy one 19” rack unit (1RU), and shall provide twenty-four (24) individually-replaceable Category 6 / 6A Modular Jacks for termination of cabling. Patch panels shall be colored black.

The front of each patch panel shall be capable of accepting and retaining printed non-adhesive paperboard labels of minimum 10-point thickness. Paperboard labels must be of suitable width and height to meet labeling requirements, as defined herein, with label text positioned centered on and parallel to each port to which label text pertains.

A transparent snap-in flexible plastic label cover shall retain the label, and shall have a small hole at side to permit label cover removal.

3.2.6) Horizontal 19-inch Lacing Bar for Patch Panel Rear Cable Strain Relief

Each installed rack-mounted Category 6 / 6A Patch Panel shall have, projecting to rear of rack from rear of patch panel, a 6-inch deep x 19-inch wide x 0.7-inch high L-shaped horizontal lacing bar installed on rack.

Horizontal 19-inch Lacing Bar for Patch Panel Rear Cable Strain Relief shall have lacing slots of 0.150-inch x 0,9-inch, suitable for attaching hook-and-loop fasteners to secure and reduce strain on solid-conductor cables entering patch panel.

Horizontal 19-inch Lacing Bar for Patch Panel Rear Cable Strain Relief shall be constructed of 18-gauge cold rolled steel, and shall have powder-coat black finish.

Horizontal 19-inch Lacing Bar for Patch Panel Rear Cable Strain Relief shall attached to 19-inch equipment rails in two places (one left rail, one right rail) via equipment mounting screws at rear of front-face of rack.

3.2.7) Category 6A Lightning Protectors (for use with OSP Category 6A Cable)

Category 6A Lightning Protectors shall be designed and laboratory-tested for use with 10/100/1000/10000 Base-T Ethernet networks in indoor and outdoor environments between -40 degrees Fahrenheit and +158 degrees Fahrenheit. Category 6A Lightning Protectors shall meet or exceed the UL497B surge protection requirements for 10/100/1000/10000 Base-T Ethernet lines.

Category 6A Lightning Protectors shall present two Category 6A 8P8C shielded modular jacks, with shield isolated from the safety ground. Category 6A Lightning Protectors modular jacks shall accept 8P8C shielded modular plugs for inline installation in a single permanent link. Category 6A Lightning Protectors shall be compatible with 802.3bt Power-over-Ethernet (PoE) devices, and shall support PoE modes A and B as per 802.3bt.

Category 6A Lightning Protectors clamping voltage shall be no more than 15 Volts for wire-to-wire, 90 Volts for wire-to-ground, and 90 Volts for shield-to-ground.

Outdoor Category 6A Lightning Protectors shall have a weatherproof ABS enclosure with gasketed cover and concealed mounting holes. Ground clamp provided outside the Category 6 Lightning Protector enclosure shall accept a 10-gauge ground cable.

Indoor non-rack mounted Single Channel Category 6A Lightning Protectors shall be DTK-MRJPOES manufactured by DITEK or approved equal.

Indoor non-rack mounted Eight-Channel Category 6A Lightning Protectors shall be DTK-WM8NETS manufactured by DITEK or approved equal.

Outdoor non-rack mounted Single Channel Category 6A Lightning Protectors shall be DTK-MRJPOEX manufactured by DITEK or approved equal.

3.2.7.1) Rack-mount Category 6A Lightning Protectors (for use in interior spaces, only)

Rack-mount Category 6A Lightning Protectors are only to be used where specified in interior spaces or whether-protected exterior cabinets.

Rack-mount Category 6A Lightning Protectors shall provide lightning and surge protection for up to 24 POE 802.3bt lines, with low line to line and line to ground capacitance to minimize distortion of high-speed signals.

Rack-mount Category 6A Lightning Protectors shall provide protection for both common and differential mode surges.

Rack-mount Category 6A Lightning Protectors shall be compatible with 802.3bt Power-over-Ethernet (PoE) devices. It shall support both PoE mode A and B for power.

Rack-mount Category 6A Lightning Protectors shall provide lightning protection for twelve (24) Category 6A cables via 48 shielded (24 in / 24 out) RJ-45 jacks.

Rack-mount Category 6A Lightning Protectors Category 6A Lightning Protectors shall be DTK-RM24NETS manufactured by DITEK, or approved equal.

3.2.8) Category 6 / 6A Patch Cables

Patch Cables shall be gray in color, unless otherwise noted.

Patch cables shall be constructed using 50-micron gold-plated RJ45 (8-position 8-conductor) modular plugs.

Patch Cable shall be constructed using 24 gauge stranded cable.

Patch Cable assemblies shall utilize colored cable and "snag-less" slim cable boots that are clear and integrated with the RJ45 connector.

Each Patch Cable assembly shall be individually certified to Category 6 / 6A performance specification according to TIA-568-C and ISO/IEC 11801, and shall be backed by a 20-year component warranty provided by the manufacturer to Owner.

3.3) Category 3 Telecommunications Feeder/Backbone

All Telecommunications Feeder Cables, Telecommunications Patch Panels, and Connection Blocks shall be rated Category 3, shall comply with or exceed specifications as defined in TIA-568-B, and must be certified by manufacturer at a frequency range of 1Mhz through 16Mhz.

Installed Category 3 Telecommunications Feeder components shall support analog telephony as per TIA 470-C and digital telephony as per TIA-810-B.

Installed materials shall form an integrated system and shall integrate with existing telecommunications network. Components and interconnections must match for optimum future performance. All components shall be produced by the same manufacturer or be warranted by an exclusive partnership.

3.3.1) Telecommunications Feeder Cable

Telecommunications Feeder Cable shall be type ARMM and shall consist of 100-pair of #24 AWG solid conductor cables wrapped individually in expanded polyethylene insulation. Telecommunications Feeder Cable shall be wrapped in ALVYN sheath-corrugated polymer-coated aluminum shield adhering to a flame-retardant grey PVC jacket. Cable shall be UL/NEC rated. Cable jacketing shall be lead-free.

Color-coding of insulation on individual pairs of conductors shall conform to TIA-568-B and PIC standard color codes for telecommunications backbone cable.

Telecommunications Feeder Cable shall be ETL verified to Category 3 transmissions requirements as defined in the TIA-568-A standard.

Typical electrical characteristics shall be as follows at 20-degree Celsius:

3.3.1.1) Max DC Resistance of 27.3 Ohms/kft
3.3.1.2) Insulation Resistance of 5000 Megohms-kft
3.3.1.3) Mutual Capacitance of 83 nF/mile at 1 kHz(nom)
3.3.1.4) Nominal Attenuation of 6.9 dB/kft at 772 kHz
3.3.1.5) Characteristics Impedance of 100 Ohms at 1 MHz(nom)

3.3.2) Telecommunications Feeder Patch Panels

Telecommunications Feeder Patch Panels shall be 1.75 inches high, shall occupy one 19” rack units (4RU), and provide 24 RJ45 (8-position – 8-pair) modular jack ports on front of panel, with PDS 110-style insulation displacement connectors on rear of panel that accommodate between 26 and 23 gauge wire. Modular jack ports on front of panel may be configured in groups of between four and six ports.

Telecommunications Feeder Patch Panels shall be fully loaded with RJ-45 jacked, colored black.

Telecommunications Feeder Patch Panel Ports shall be clearly factory-labeled on front of patch panel with consecutive numbers between 1 (at leftmost port) and 24 (at rightmost port).

Telecommunications Feeder Patch Panels shall have integrated lacing lattice at rear of panel to manage wire pairs and permit re-punching IDC for each pair in-place.

Telecommunications Feeder Patch Panels shall be colored black.

Telecommunications Feeder Patch Panels shall be CommScope “Telephone Patch Panel, Category 3, RJ45, 19 in, 25-port, black” part number 1711213-2, or approved equal.

3.3.3) Telecommunications Connection Block

Telecommunications Connection Blocks for distribution shall be type 66M split 50-pair insulation displacement punch-down blocks. Connection blocks shall provide 6 pins per row and shall be designed for termination of 22-26 AWG solid or 20-26 AWG stranded conductors. Blocks shall be molded of flame-retardant thermoplastic with quick-connect clips.

3.3.4) Telecommunications Gas Protector Panel

Gas Protector Panels shall be CIRCA Telecom (serial #205226, CIRCA 1900A1-100) gas protector panel, or approved equal.

3.3.5) Telecommunications Patch Cables

Telecommunications Patch Cables shall be Category 6 Patch Cables, as defined herein.

Category 6 Patch Cables shall be colored Violet.

3.4) Fiber-Optics

All Fiber-Optic network cable, jacks, patch panels, and patch cables shall be designed for Single-mode optical transmission.

Installed Fiber-Optic network shall support standards 1000BASE-LX, 10GBASE-LR, 40GBASE-LR4, and 100GBASE-LR4.

Installed materials must form an integrated system and must integrate with existing Fiber-Optic network. Components and interconnections must match for optimum future performance. All components must be produced by the same manufacturer or be warranted by an exclusive partnership.

All components of the Fiber-Optic cable plant shall be produced by Corning Cable Systems, or approved equal.

3.4.1) Warranty on Installed Cabling system

Manufacturer warranty on installed Fiber-Optic Cabling System shall be extended to Owner **for a period of not less than 25 years** and shall provide immediate remediation or replacement of installed cabling system by manufacturer, if cabling system does not meet the requirements of this Specification, including but not limited to testing parameters, at any point during the warrantee period.

Contractor shall submit manufacturer warranty information on proposed Fiber-Optic Cabling System, along with copies of manufacturer certification credentials for Contractor and Contractor’s employees, with Contractor’s bid.

3.4.2) Fiber-Optic Cable

All Fiber-Optic cable shall contain Single-mode fibers surrounded by a lead-free flame-retardant outer jacket. Fiber-Optic cable shall provide an 8-9 micron core transmission medium with 125 micron cladding, and introduce no more than .4 dB/km of attenuation (nominal).Color of Fiber-Optic strand cladding and buffer tubes shall conform to TIA-598-C.

Outer jacket of all Fiber-Optic cable, including armored and non-armored Fiber-Optic cable, shall be colored yellow.

All Fiber-Optic cable shall be gel-free.

All Fiber-Optic cable shall be pre-terminated at factory in Multi-Fiber Push-On (MPO) Connectors. Pulling eyes shall be attached by faculty at both ends of cable.

3.4.2.1) Intra-building Single-mode Fiber-Optic Cable

All intra-building Single-mode Fiber-Optic cable shall contain 24-strands strands of 900 µm tight-buffered fibers. Fibers shall be surrounded by dielectric strength members and a lead-free flame-retardant outer jacket. Outer jacket of all intra-building Single-mode Fiber-Optic cable shall be colored Yellow.

Indoor Single-mode Fiber-Optic cable shall be:

3.4.2.1.1) Plenum-rated Armored Single-mode Fiber-Optic cable -- Corning MIC Interlocking Armored Plenum Cable, Corning part number 024E88-33131-A3
3.4.2.1.2) Riser-rated Armored Single-mode Fiber-Optic cable -- Corning MIC Interlocking Armored Riser Cable, Corning part number 024E81-33131-A1
3.4.2.1.3) Plenum-rated (non-armored) Single-mode Fiber-Optic cable – Corning MIC Plenum Cable, Corning part number 024E88-33131-29
3.4.2.1.4) Riser-rated (non-armored) Single-mode Fiber-Optic cable – Corning MIC Riser Cable, Corning part number 024E81-33131-24

3.4.2.2) Inter-building Single-mode Fiber-Optic Cable

Unless otherwise noted, all inter-building Single-mode Fiber-Optic cable shall contain 24-strands strands of fiber in two 3.0 mm buffer tubes. Buffer tubes shall be surrounded by water-swellable tape, dielectric strength members, and a lead-free UV-resistant flame-retardant outer jacket.

Inter-building Single-mode Fiber-Optic cable shall be as:

3.4.2.2.1) Plenum-rated Armored inter-building Single-mode Fiber-Optic cable – Corning FREEDM Plenum Loose Tube Cable with Interlocking Armor, part number 024E8P-31131-A3
3.4.2.2.2) Riser-rated Armored inter-building Single-mode Fiber-Optic cable – Corning FREEDM Loose Tube Cable with Interlocking Armor, part number 024EWF-14101-AA1
3.4.2.2.3) Riser-rated (non-armored) inter-building Single-mode Fiber-Optic cable – Corning FREEDM Loose Tube Indoor/Outdoor Cable, part number 024EWF-T4103A20
3.4.2.2.4) Plenum-rated (non-armored) inter-building Single-mode Fiber-Optic cable – Corning FREEDM Loose Tube Indoor/Outdoor Cable, part number

3.4.3) Fiber-Optic Grounding

Armored cable shall be grounded.

Armored cable grounding assembly shall be Corning part number FDC-CABLE-GRND (Armored Cable Grounding Kit)

3.4.4) Fiber-Optic Connectors

Fiber-Optic connectors shall have Ultra Physical Contact (UPC) polish/finish. Fiber-Optic connector ferrules shall be constructed of ceramic.

Fiber-Optic connectors shall present no more than 0.2 dB of typical insertion loss and 0.5 dB of maximum insertion loss, as measured by manufacturer at wavelengths of 1310 nm and 1550 nm, FOTP-171.

Fiber-Optic connectors on patch panels shall be compliant with TIA/EIA 604-2 (“SC”) connectors.

3.4.5) Fiber-Optic Patch Panel

Fiber-Optic patch panels shall meet requirements of TIA-568-C and TIA606, suitable for loose tube, tight-buffered, and optical fiber ribbon cables. Fiber-Optic patch panels shall be rack-mountable in standard EIA 19” (48 cm) equipment racks (1.75-in EIA hole spacing). Fiber-Optic patch panels shall be capable of being rack-mounted with either a 4.5” (11.4 cm) frontal projection to allow entry of Fiber-Optic patch cable sot front compartment, or flush to rack rails (0” projection). Fiber-Optic patch panels shall offer multiple locations for jumper egress, and a slide-out drawer for easy connector access.

Fiber-Optic patch panel shall provide integrated bend radius limiting, cable anchor, and strand fan-out in rear connector housing. Protection for patch cable connectors, D-rings for patch cable routing, and side egress for patch cables shall be provided on front of housing.

Fiber-Optic patch panels installed in building Communications Rooms shall consume two rack spaces (3.5-in high), shall have up to 64 fiber total capacity (SC or ST connectors).

Fiber-Optic Patch Panels shall be manufactured by Corning Cable Systems and shall be of model “CCH”.

3.4.6) Fiber-Optic Cable Management

Fiber-Optic cable management shall be one rack unit (1.75-in) high.

Fiber-Optic cable management shall be Corning Cable Systems part number CJP-01U.

3.4.7) Fiber-Optic Patch Cables (Jumpers)

Fiber-Optic patch cable assemblies shall be Single-mode, 2-fiber jumper cable, and shall provide one duplex SC connector to one duplex un-keyed LC connector.

Fiber-Optic patch cable assembly cable shall be engineered to present lowest attenuation at bends up to and including a minimal bend radius of 30mm (1.2 inches).

Fiber-Optic patch cable assembly cable outer jacket shall be yellow in color, and shall allow separation of individual fibers and duplex connectors in field to allow conversion to two separate 1-fiber jumpers. Each separable 1-fiber cable shall be minimum of 2mm in diameter.

SC and LC connectors shall allow coupling and decoupling in duplex or single connector configuration.

LC connector duplex clip shall allow pairs to be swapped in the field such that cable may be field-configurable as either a straight-through or crossover cable.

Connector ferrules shall be constructed of ceramic. Connectors shall be factory-installed, shall have Ultra Physical Contact (UPC) polish/finish, and shall present no more than 0.15 dB of typical insertion loss and 0.4 dB of maximum insertion loss, as measured by manufacturer at wavelengths of 1310 nm and 1550 nm.

Fiber-Optic patch cable assemblies shall be factory-built and factory-tested to produce no more than 1 dB attenuation at wavelengths of 1310 nm and 1550 nm.

Fiber-Optic patch cable assemblies shall be Corning Cable Systems part number 0472-02-R5120-002-M.

3.4.8) Fiber-Optic Splice Enclosures

Fiber-Optic Splice Enclosures shall be Corning Cable Systems part number SCF-6C28-01-144 or approved equal.

Fiber splice trays shall by type 2S trays, and shall permit for 24 RTF fusion splices.

Fiber-Optic splice trays shall be Corning Cable Systems part number M67-092.

3.5) Audio/Video

3.5.1) Audio/Video systems (“Audio/Video”) may include but not be limited to audio systems, video systems, and control systems installed in classrooms, conference rooms, and performance areas.

3.5.2) All Category 6 / 6A cable and components used to interconnect Audio/Video components shall meet all requirements for Category 6 / 6A cable and components, defined herein.

3.5.3) All Fiber-Optic cable and components used to interconnect Audio/Video components shall meet all requirements for Fiber-Optic cable and components, defined herein.

3.6) Security

3.6.1) Security systems (“Security”) may include but not be limited to security alarm systems (motion, door contact, panic button) systems, video surveillance systems, electronic door access control systems, and/or audio security systems (e.g. intercom, glass-break sensor, and/or shot detection) systems.

3.6.2) All Category 6 / 6A cable and components used to interconnect Security components shall meet all requirements for Category 6 / 6A cable and components, defined herein.

3.6.3) All Fiber-Optic cable and components used to interconnect Security/Surveillance components shall meet all requirements for Fiber-Optic cable and components, defined herein.

3.6.4) Other Security Cable

Except where noted, all cabling and components for security for Security shall be Category 6 data

3.6.4.1) Signal Cable for Security

3.6.4.2) Power Cable for Security

Power cable used for surveillance network shall be two conductor 18 AWG twisted pair, with stranded bare copper conductors, encased in a black jacket.

3.7) Pathways and Spaces

3.7.1) Termination Devices

3.7.1.1) Metallic Recessed-Mount Device Boxes

Metallic Recessed-Mount Device Boxes shall be constructed of 0.0625-inch-thick galvanized steel, and shall be “four-square” extra-deep type, with minimum dimensions of 3.5-inch deep x 4-inch wide x 4-inch high.

Metallic Recessed-Mount Device Boxes shall have eight (8) 3/4-inch side Knockouts.

Metallic Recessed-Mount Device boxes above symsum-board ceiling shall be supported by am 8-inch max depth adjustable height box hanger. Box hanger shall be Garvin BHT481A, or approved equal.

3.7.1.2) Metallic Surface-Mount Device Boxes

Metallic Surface-Mount Device Boxes shall be constructed of 0.0625-inch-thick galvanized steel, and shall be “four-square” extra-deep type, with minimum dimensions of 3.5-inch deep x 4-inch wide x 4-inch high.

Metallic Surface-Mount Device Boxes shall have eight (8) 3/4-inch side Knockouts.

3.7.1.3) Non-Metallic Surface-Mount Device Boxes

Non-Metallic Surface-mount device boxes shall be constructed entirely of PVC, and shall be ivory in color.

NM surface-mount device boxes shall be 2 7/8” inches deep, and shall be single-gang, 3 inches wide by, 4 7/8” high.

NM surface mount boxes shall be of same manufacturer and compatible with approved raceway, and shall have knockouts/twist-outs for selected raceway model.

NM surface-mount device boxes shall be designed to be secured to wall mechanically using screws or bolts.

3.7.2) Low Voltage Faceplate Mounting Brackets

Low-Voltage Faceplate Mounting Brackets shall be constructed of minimum 0.0303 inch thick galvanized steel, and shall be mounted to wall using a minimum of two fold-back tabs as well as drywall screws.

Unless otherwise noted, Low-Voltage Faceplate Mounting Brackets shall be single-gang.

Unless otherwise noted, Low-Voltage Faceplate Mounting Brackets shall be used for retrofit applications, only.

Low-Voltage Faceplate Mounting Brackets must allow faceplate to be mounted flush to wall, with no greater than a 1/16” gap between faceplate and wall.

3.7.3) Floor Boxes (In-Floor Device Box)

In-floor device boxes shall be constructed of galvanized steel, and shall be installed with parts to permit concrete pour around box. Box

In-floor device box shall have mechanically-fastened self-sealing flip-open covers installed flush with floor that prevent water and dust ingress when covers are closed. Cover shall be able to be secured by turning integrated screw when not in use.

Unless otherwise noted, in-floor device boxes shall offer two divided compartments per NEC requirements permitting both low-voltage communications cabling and 120-Volt electrical power to be terminated in the same device box.

Floor box shall permit installation of at least two (2) standard single-gang faceplates for communications, and at least two (2) single-gang faceplates for electrical power. Single-gang faceplates when installed must face up at no less than 45 degree angle. At least three inches of space must be provide between center of single-gang faceplate cover to permit patch cables and power cords to be connected.

Standard Category 6 / 6A faceplates must be able to be used in singe-gang slots, with insert labels visible while cover is on.

3.7.4) Poke-Throughs

Poke-throughs shall fit into nominal 4” cored hole, and shall be fire-rated for four hours when installed in compatible unprotected reinforced concrete floors or fire-rated for three hours when installed in compatible floors employing steel floor units with concrete top floors. An adjustable fire barrier shall be integral to the poke-through that may accommodate floors between 2 ¼ inches to 7 inches in thickness. Poke-throughs shall be suitable for new or retrofit installations, shall be suitable for use in air handling spaces, and shall be appropriate for installation on carpeted or tiled floors.

3.7.4.1) Recessed Poke-throughs shall provide minimum four (4) Category 6 / 6A modular jacks, and minimum two (2) NEMA 5-20R electrical power receptacles fed by two separate 20 Amp 125V power circuits.

3.7.4.2) Furniture Feed Poke-throughs shall provide a minimum 1-1/2” opening for low voltage Category 6 / 6A cable conduits, and minimum 3/4” opening for electrical power cable conduits. Both low voltage and power openings shall allow watertight connection using standard Liquid-tight Flexible Metal Conduit (LFMC) adapters, and shall be furnished with threaded/gasketed blank plugs of same finish as cover that prevent scrub water infiltration and provide a flush finish of plate should furniture feed conduit be disconnected in the future.

Poke-through cover shall be gasketed to prevent scrub water infiltration around perimeter of poke through, and shall permit replacement of gasketed cover with a furniture feed cover

Poke-throughs shall provide flip-up gasketed covers over each data/communications and power receptacle, to exclude scrub-water and dirt/debris when closed. Poke-through receptacles shall be positioned face-up atop a flange that shall raise the receptacles a minimum of 0.5 inches in height, further discouraging scrub-water infiltration even when covers are opened.

Poke-throughs shall exceed UL514A and UL514C testing standards, and UL scrub water exclusion requirements.

3.7.5) Ladder Cable Tray

All cable trays installed in Communications Rooms will be ladder-style cable tray. Unless otherwise noted, Ladder Cable Tray shall be 18 inches wide, and powder-coat painted black.

Ladder Cable Tray shall have stringers and cross members that are 1.5 inches wide by 0.375 inches high made from tubular steel with 0.065 wall thickness. Cross members shall be welded to stringer 4-1/2 inches from end of a single tray section, and thereafter at 9 inch intervals in that section. When properly installed, stringers will be positioned under cross members, creating a flat load area on top of Ladder Cable Tray.

Maximum load shall be at least 132 pounds per foot when manufacturer-approved supports for Ladder Cable Tray are installed at 5-foot intervals.

Ladder Cable Tray shall be installed according to manufacturer specification, using proper radius fittings and fasteners prescribed by manufacturer. Ladder Cable Tray shall be grounded per NEC and manufacturer standards and bonded to the equipment rack in Communications Rooms.

Ladder Cable Tray shall be sized to contain cables as specified in Scope of Work (if provided) and the original RFQ/RFP/Project, and shall account for 10% spare capacity while not exceeding 40% fill/capacity ratio as per TIA.

Ladder Cable Tray shall be “Cable Runway” manufactured by Chatsworth Products, or approved equal.

3.7.6) Basket Cable Tray

Unless otherwise noted, all intra-building cable trays will be 8”-wide welded wire mesh Basket Cable Tray with a 2” usable load depth. Finish of Basket Cable Tray shall be pre-galvanized zinc finish, applied to steel wire prior to fabrication, and meeting the minimum properties of ASTM A 641.

Basket Cable Tray shall be made of high strength steel wires and formed into a standard 2 inch by 4 inch wire mesh pattern with intersecting wires welded together. All mesh sections must have at least one bottom longitudinal wire along entire length of straight section, which shall measure nominally ten (10) feet in length.

Basket Cable Tray shall have T-weld on top rail in order to avoid sharp surfaces or protrusions on tray surface. Wire Diameter on all mesh sections of Basket Cable Tray must be a minimum of 0.196 inch.

Basket Cable Tray manufacturer must have a demonstrated history of production and distribution of product offering for a minimum period of 3 years in the US.

Basket Cable Tray shall be installed as per manufacturer's specification. All fittings shall be field-formed, from straight sections, in accordance with manufacturer's instructions.

Basket Cable Tray shall be classified by UL as an Equipment Ground Conductor (ECG) when spliced as recommended. All splicing assemblies shall likewise be UL approved as ECG.

Basket Cable Tray shall be sized to contain cables as specified in Scope of Work (if provided) and the original RFQ/RFP/Project, and shall account for 10% spare capacity while not exceeding 40% fill/capacity ratio as per TIA.

Basket Cable Tray shall be "Flextray" manufactured by Cooper B-Line, or approved equal.

3.7.7) J-Hooks

J-Hooks shall provide wide base design and smooth beveled edges to provide a three-inch (3") bending radius for current and future high-performance data cables, and shall comply with TIA standards for Cat 6A, and Cat 7 cable installations.

J-Hooks, when mounted, shall swivel to support various directional runs of cables.

J-Hooks shall have wire retainer providing 360 degree containment for installed cables.

Magnetic or hammer-on mounting clips are not acceptable for use in mounting J-Hooks.

J-Hooks shall be UL listed for use in environmental air handling spaces per 2008 NEC code requirements 300-22(c).

J-Hooks shall be: "Cat HP J-Hook" by Erico/CADDY; or "HPH J-Hooks" by Platinum Tools; or approved equal.

3.7.8) Loop/Strap Cable Hangers

Loop/Strap Cable Hangers (“Hangers”) shall be constructed of flexible non-metallic material where they contact installed cable, and shall provide sturdy support of Category 6 and Category 6A cable without sagging, bending, or damaging the cable. Loop/Strap Hangers shall be mountable in a variety of ways and be rotatable to any angle.

Loop/Strap Hangers shall be UL listed for use in environmental air handling spaces per 2008 NEC code requirements 300-22(c).

Where Loop/Strap Hangers are directed by Scope of Work (if provided) and the original RFQ/RFP/Project for use in open areas, they shall be UV (Ultraviolet light) resistant-rated.

Loop/Strap Hangers shall be available in a variety of sizes to accommodate a 2-inch and 5-inch diameter bundle of cable.

Magnetic or hammer-on mounting clips are not acceptable for use in mounting Loop/Strap Hangers.

Loop/Strap Cable Hangers (“Hangers”) shall be: “The LOOP” by Arlington, Part Number TL20, TL25, TL50; or “Cat 425 Adjustable Cable Support” by CADDY; or approved equal.

3.7.9) Conduit

All conduits to be installed by Contractor, unless otherwise specified, shall be Electrical Metallic Tubing.

3.7.9.1) Electrical Metallic Tubing

Electrical Metallic Tubing (EMT) must be ANSI C80.3 galvanized conduit.

EMT fittings and conduit bodies installed in interior spaces must be NEMA FB 1 steel setscrew type.

EMT fittings, conduit bodies, and junction boxes installed in exterior spaces must be weatherproof compression type.

Conduit system bushing and connectors must have nylon insulated throats.

3.7.10) Surface-Mount Non-Metallic Raceway (“Raceway”)

Raceway and fittings shall be constructed entirely of PVC, and shall be colored Ivory. minimum 8’ lengths. Raceway shall be designed to be secured to walls mechanically using screws or bolts. Raceway product series must include the following finishing fittings:

3.7.10.1) cover clip / union
3.7.10.2) internal 90-degree bend
3.7.10.3) external 90-degree bend
3.7.10.4) flat 90-degree bend
3.7.10.5) end-cap

Fittings shall have a minimum of 1.3 inches interior bend radius, and shall be suitable to maintain rating of selected Category 6 / 6A cable.

Raceway shall be Wiremold NM2000 series or approved equal.

3.8) Innerduct

All innerduct shall be constructed of corrugated High Density Polyethylene (HDPE) and shall be colored orange.

3.9) Pull Tape

Pull tape shall be composed of longitudinal aramid strands tied together with a 90-degre cross-weave of polyester strands. Pull cord shall have a minimum tensile strength of 1250 pounds, and shall maintain less than 4% tensile elongation at yield.

Pull tape shall have lubrication coating applied at factory, and shall have a coefficient of less than 0.12 (twelve hundredths).

Pull tape shall have footage marked clearly on tape by manufacturer.

Pull tape shall meet or exceed pull line requirement as defined in Bellcore GR-356-CORE “Generic Requirements for Optical Cable Innerduct and Accessories”.

3.10) Pull Cord

Pull cord shall be composed of continuous polyethylene fibers and shall have a tensile strength of at least 200 pounds.

3.11) Cable Fasteners

Velcro brand hook-and-loop fasteners, or equivalent shall be used to secure cables. Contractor shall not use nylon or plastic zip strip, tie wrap, cable tie, (etc.) or similar fasteners on cables during construction and installation of the Data/Telecommunications Cabling System.

3.12) Free-Standing Equipment Cabinets (“Cabinets”)

Free-Standing Equipment Cabinets (“Cabinets”) shall be four-post free-standing EIA 19” cabinets, specifically designed for high-density cabling system applications. Cabinets shall include steel side panels each end of a series of bayed cabinets. Each cabinet shall include steel locking doors on front and rear. Installed cabinets shall provide NEMA 12 rating of protection against dust, falling dirt, and dripping non-corrosive liquids.

Cabinets shall be rated IP 51, and classified UL 50 Type 1, UL 50 Type 2, and UL 50 Type 12. Cabinets shall be certified by Underwriters Laboratories to be in compliance with UL 50 (Standard for Safety for Enclosures for Electrical Equipment), and to maintain integrity of a UL Type 12 enclosure.

Cabinets shall include integrated plinths (base) to raise bottom of cabinet a minimum of 4” from floor when installed. Plinths shall have side, front, and rear covers.

Cabinets shall be constructed of steel and shall provide a minimum of 2500 pound static load capacity when properly installed. Cabinet mounting rails/panels shall be constructed of 12-gauge zinc-plated steel. Cabinet frame, roof, base, and sidewalls shall be constructed of 16-gauge steel. Cabinet doors shall be constructed of 14-gauge steel.

Cabinet rails depth shall be fully adjustable. All rack mounting rails shall be factory machine-tapped with 10/32” factory-tapped holes in EIA-310-D Universal pattern.

Cabinet exterior shall be dip coat primed, and powder-painted RAL 7035 light gray at factory.

Cabinet door handles shall be tamper-proof with integrated locks, keyed alike.

Unless otherwise specified, cabinets shall be 82 inches high, 28 inches wide, and 31.5” deep, and provide 42 rack units (RU) of equipment mounting space.

If integrated cabinet system air conditioner is specified, then air conditioner shall be manufactured by the same manufacturer as the cabinet, and shall be compatible with cabinet. Cabinet shall maintain its NEMA 12 rating when the air conditioner is installed. Air conditioner shall accept 230V input and provide a minimum of 3500 BTU of continuous cooling in sustained ambient temperatures of 55 degrees Celsius.

Cabinets shall be Hoffman base model number PDCP2078GAC or approved equal. Solid doors shall be Hoffman part number PDS207G.

Integrated cabinet system air conditioner shall be Hoffman part number CR290426G002 or approved equal.

One baying kit shall be supplied with each cabinet.

Additional Hoffman components are required to meet this Specification.

Contractor shall coordinate with Hoffman product specialist and Owner Technical Contact to ensure proper cabinet configuration and order. Contractor shall submit Bill of Materials to Owner Technical Contact and Owner Project Manager for approval prior to order placement.

3.12.1) Mounting Hardware for Cabinets

Contractor shall furnish a quantity of one hundred (100) compatible equipment mounting bolts for each cabinet supplied.

3.12.2) Power Distribution Units for Cabinets

Contractor shall install two (2) Power Distribution Units (PDUs) per each cabinet supplied by Contractor.

PDUs for cabinets shall each have a single 30 amp 125 volt input via a NEMA L5-30P (male) plug, and shall distribute power to a total of twenty-four (24) NEMA 5-15/20R ("T-slot") female receptacle outputs.

PDUs shall each be between 42" and 49" in height, between 2" and 3" in width, and less than 2.5" inches in depth. Input power cable shall be 7' long.

Two 20 Amp circuit breakers shall be integrated into PDU chassis and shall each be wired to twelve (12) NEMA 5-15/20R outputs.

3.12.3) Vertical Cable Management Panels for Cabinets

One Vertical Cable Management Panels shall be provided and installed by Contractor on each post of each cabinet provided by Contractor (four per cabinet).

Vertical Cable Management Panels installed in cabinet shall be molded out of plastic and shall incorporate bend radius control throughout the fingers, pass-through holes, and transitions between horizontal and vertical pathways. Integral cable retainers shall be molded on the end of each finger. Four snap-on adjustable cable retainers, manufactured specifically to fit the selected model of cable management, shall be attached to duct fingers to provide additional retention of cables within channel.

Vertical Cable Management Panels provided with cabinet shall be double-sided. Front and rear dual-hinged cover shall open minimum of 110-degrees in the left or right position. Front duct shall be 83" high X 6" deep X 4.9" wide. Rear duct shall be 83" high X 6" deep X 4.9" wide.

Vertical Cable Management Panels provided with cabinets shall be colored black.

3.12.4) Horizontal Cable Management Panels for Cabinets

One Horizontal Cable Management Panel shall be supplied and installed per each Free-Standing Equipment Cabinet installed, to permit patch cables to pass from left to right side of Cabinet at center of Cabinet.

Horizontal Cable Management Panels shall be double-sided.

Horizontal Cable Management Panels shall mount to any standard EIA 19” wide rack, and when mounted to rack shall provide two fingered ducts -- one in front of rack, and one in rear of rack. Front dual-hinged removable cover shall open 180-degrees in the up or down position. Rear cover shall snap on. Front duct shall be 7” high X 5.5” deep. Rear duct shall be 7” high X 7.6” deep. Pass-through holes shall permit routing cables from front duct to rear duct.

Horizontal Cable Management Panels shall be molded out of plastic and shall incorporate bend radius control throughout the fingers, pass-through holes, and transitions between horizontal and vertical pathways. Integral cable retainers shall be molded on the end of each finger. Four snap-on adjustable cable retainers shall be attached to duct fingers to provide additional retention of cables within channel. Snap-on adjustable cable retainers must be manufactured specifically to fit the selected model of Horizontal Cable Management Panels.

Horizontal Cable Management Panels shall be colored black.

Horizontal Cable Management Panels shall be PANDUIT part number NM4 or approved equal.

3.13) Wall-Mounted Cabinets (“Wall-Mounted Cabinets”)

Wall-Mounted Cabinets shall be constructed of 16 gauge steel with black powder-coated finish. Wall-Mounted Cabinets shall have four equipment mounting rails – two in front and two in rear. Wall-Mounted Cabinet equipment mounting rails shall be constructed of 11 gauge steel with black powder-coated finish, shall be 19 inches apart with fully adjustable depth position, and shall provide 26 rack units of usable rack space. All rack mounting rails shall be factory machine-tapped with #12/24 factory-tapped holes in EIA-310-D Universal pattern. Wall-Mounted Cabinets shall have solid front door. Wall-Mounted Cabinet shall have a rear hinged section with pre-drilled/cut keyholes slots that permits mounting to wall, and allows full access to rear of cabinet when mounted. Rear section of cabinet shall have minimum three (3) 3-inch diameter and eight (8) ¾-inch diameter conduit entry knockouts on top and bottom panels. Wall-Mounted Cabinet side panels shall be vented via ventilation slots/louvers. Wall-Mounted Cabinet top shall have 250 CFM exhaust fan. Wall-Mounted Cabinet dimensions shall be 48 inches high, by 21 inches wide, by 26 inches deep.

Wall-Mounted Cabinet shall be Hubbell base part number HSQ48S36.

Wall-Mounted Cabinet shall include an installed top-mounted Fan Kit With Tray containing two (2) 57 CFM fans, Hubbell part number HWKF120..

Wall-Mounted Cabinet shall include an installed 1-RU Power Strip (PDU) with casing constructed of steel, with one (1) NEMA 5-15P input on six-foot stranded cord, and ten (10) rear-facing NEMA 5-15R outlets. Power Strip (PDU) shall be Hubbell part number HPWPWR.

Wall-Mounted Cabinet rear rails shall be Hubbell part number WMC48RAILS or approved equal, installed.

3.13.1) Mounting Hardware for Wall-Mounted Cabinets

Contractor shall furnish a quantity of one hundred (100) compatible #12/24 equipment mounting bolts for each cabinet supplied.

3.14) Open Equipment Racks (“Racks”, “Open Racks”)

Open Equipment Racks shall be two-post free-standing EIA 19” wide racks, specifically designed for high-density cabling system applications. Racks shall be constructed of steel and shall provide a minimum of 1500 pound static load capacity. Rack shall be colored black with powder-painted at factory.

Rack posts shall be factory machine-tapped on front and rear with #12/24 factory-tapped holes in EIA-310-D Universal pattern.

Rack posts shall contain built-in cable routing channels with hand-hole access openings on sides. The depth of the built-in cable routing channels shall be 16.5”. Rack shall provide open access to cable routing channels from top, bottom, and inside of rack. The cable routing channel outside walls shall provide built-in cable tie points for affixing ¾”-wide hook-and-loop fasteners directly to sidewalls while dressing cable.

Racks shall have integrated rungs on top of rack behind rack face to permit support and routing of cables to patch panel rear. Integrated rungs shall be of sufficient radius to maintain proper bend radius of cable.

Racks shall have integrated top trough with built-in waterfall in front of posts to provide bend radius control and efficient routing for patch cables.

Unless otherwise specified, racks shall be seven feet high (7’ H), and provide 45 rack units (45 RU) of equipment mounting space.

Seven-foot-high Open Racks shall be Legrand part number MM10716, or approved equal.

Eight-foot-high Open Racks shall be Legrand part number MM10816, or approved equal.

3.14.1) Mounting Hardware for Open Racks

Contractor shall furnish a quantity of one hundred (100) compatible #12/24 bolts for each rack supplied.

3.14.2) Power Distribution Units for Open Racks

Contractor shall install two (2) Power Distribution Units (PDUs) on each Open Rack provided and/or installed by Contractor.

PDUs for Open Racks shall each have a single 30 amp 125 volt input via a NEMA L5-30P (male) plug, and shall distribute power to a total of twenty-four (24) NEMA 5-15/20R ("T-slot") female receptacle outputs.

Two 20 Amp circuit breakers shall be integrated into PDU chassis, and shall each be wired to twelve (12) NEMA 5-15/20R outputs.

PDUs for open racks shall each be between 42" and 49" in height, between 2" and 3" in width, and less than 2.5" inches in depth. Input power cable shall be 7' long.

PDUs for open racks shall be mounted vertically on rear of Open Rack and secured to factory-tapped holes on rear face of Open Rack using PDU-manufacturer-supplied brackets.

PDU must have mounting brackets that permit mounting PDU to pre-tapped holes in the Open Rack as described herein. Adjustable mounting brackets are acceptable if brackets securely fasten PDU to rack. Tapping of rear face of Open Rack shall not be permitted. Use of pre-tapped 19-inch EIA-pattern equipment mounting holes to mount PDU shall not be permitted.

One PDU shall be installed on each (left and right) side of rear face of Open Rack, four inches away from (clear) of EIA Universal equipment mounting holes of Open Rack.

Each PDUs for Open Racks shall be mounted such that output receptacles face laterally inward, toward nearest of the two rear 19-inch equipment-mounting rails of Open Rack. PDU shall not block ability to mount or remove equipment on rear rails when installed and fully-populated with 3-inch deep plugs in each output receptacle of PDU.

3.14.3) Vertical Cable Management Panels for Open Racks

One vertical cable management panels shall be provided and installed by Contractor on each post of each rack provided by Contractor.

Vertical cable management provided with racks shall be colored black, with a solid black front cover with hinge on both sides to permit opening of panel from right or left without removal of panel. Vertical cable management provided with racks shall be manufactured by same manufacturer of rack to fit selected rack. Vertical cable management provided with racks shall include snap-on bend-radius-limiting cable management spools and bend-limiting clips. Vertical cable management provided with racks shall provide an 8.25-inch-wide channel between racks for front and back routing of equipment cables and patch cords.

Seven-foot-high vertical cable management panels for seven-foot-high open racks shall be Ortronics part number MM10VMD712 or approved equal.

Eight -foot-high vertical cable management panels for eight-root-high open racks shall be Ortronics part number MM10VMD812 or approved equal.

3.14.4) Horizontal Cable Management Panels for Open Racks

One (1) 4RU Horizontal Cable Management Panel shall be supplied and installed per each Open Equipment Rack installed, to permit patch cables to pass from left to right side of rack at center of rack height.

Horizontal Cable Management Panels shall mount to any standard EIA 19” wide rack, and when mounted to front of rack shall provide two fingered ducts -- one facing front of rack, and one facing rear of rack. Dual-hinged removable covers shall open 180-degrees in the up or down position. Pass-through holes shall permit routing cables from front duct to rear duct.

Horizontal Cable Management Panels shall be molded out of plastic and shall incorporate bend radius control throughout the fingers, pass-through holes, and transitions between horizontal and vertical pathways. Integral cable retainers shall be molded on the end of each finger. Four snap-on adjustable cable retainers shall be attached to duct fingers to provide additional retention of cables within channel. Snap-on adjustable cable retainers must be manufactured specifically to fit the selected model of Horizontal Cable Management Panels.

Horizontal Cable Management Panels shall be colored black.

Horizontal Cable Management Panels shall be PANDUIT part number NM4 or approved equal.

3.15) Labels

All label text shall conform to the Cable Installation Labeling Convention, defined herein.

All labels shall meet the legibility requirements of UL 969, and shall be preprinted using a mechanical means of printing (e.g., laser printer) using the label content of an approved Circuit Endpoint Table Spreadsheet submittal.

3.15.1) Data/telecommunications Outlet Labels

Data/telecommunications faceplates shall be labeled using compatible non-adhesive labels. A transparent snap-in flexible plastic label cover shall retain the label, and shall provide a small hole at side to permit label cover removal.

Data/telecommunications outlets and data/telecommunications outlet ports shall be labeled according to the Cable Installation Labeling Convention, defined herein.

3.15.2) Labels for Patch Panels (all types)

Patch Panels shall be labeled using compatible non-adhesive labels. A transparent snap-in flexible plastic label cover shall retain the label, and shall provide a small hole at side to permit label cover removal

Patch panels and patch panel ports shall be labeled according to the Cable Installation Labeling Convention, defined herein, and shall meet the legibility requirements of UL 969. Font shall be Bold 8-point Courier (fixed width), and label content shall be left-justified.

3.15.3) Cable Marking Labels

Cable marking labels shall be composed of vinyl substrate with a white printing area and a clear “tail” that self laminates the printed area when wrapped around the cable.

Cable marking labels shall meet the legibility, defacement, exposure, and adhesion requirements of UL 969, and shall be preprinted using a mechanical means of printing (e.g., laser printer).

If cable jacket is white, provide cable label with printing area that is any other color than white, preferably orange or yellow – so that the labels are easily distinguishable.

Cables shall be labeled on both ends according to the Cable Installation Labeling Convention, defined herein.

3.15.4) Fiber-Optic Cable Warning Labels

Fiber-Optic cable warning labels shall alert to the presence of Fiber-Optic cable within innerduct and conduit.

Fiber-Optic cable warning labels shall be colored yellow, and shall clearly state in black print applied by manufacturer: “WARNING” and “FIBER-OPTIC CABLE”.

Fiber-Optic cable warning labels shall also advise reader in clearly legible print to “CONTACT: CTS NETOPS AT (914)251-6465” for information.

Fiber-Optic cable warning labels shall be manufactured to attach directly to innerduct, conduit, and Fiber-Optic cable via mechanical means, rather than adhesive.

3.16) Communications Room Backboard

Communications Room Backboard (“Backboard”) shall be constructed of 3/4” thick type A/C fire-rated plywood. Backboard shall be stamped clearly on the “good” finished side (the “A” side) by manufacturer, showing that it has been treated with fire-retardant chemical and meets Class A requirements for NFPA Life Safety Code (NFPA 101). Backboard shall be entirely unpainted. At least one fire-retardant treatment stamp must be clearly visible on installed Backboard at all times, regardless of what is mounted on the backboard.

Whole 4’ x 8’ sections of plywood shall be cut to fit the specified area of Backboard. Scrap or remnant wood is not acceptable. Plywood must be free of dirt and dust.

Plywood shall be cut and mounted such that specified size and area of Backboard is covered continuously, with as few joints and as few cuts as possible.

3.16.1) Steel Strut Used as Standoff for Communications Room Backboard

Steel strut Used as Standoff for Communications Room Backboard shall be 1-5/8 inch wide by 2-7/16″ deep, and shall be constructed of 12 Gage, low-carbon cold formed steel.

Steel strut used as standoff for Communications Room Backboard shall have mounting holes drilled every 1-7/8” inch on center at its face.

3.17) Electrical Grounding Busbar for Communications Rooms

Unless existing, Contractor shall install one UL-listed electrical grounding busbar in Communications Rooms, to be used as the Telecommunications Main Grounding Busbar (TMGB) in data/telecommunications located closest to entrance facility, and as Telecommunications Grounding Busbar (TBB) in all other Communications Rooms as per TIA/EIA J-STD-607-A.

Grounding busbars for Communications Rooms shall be 0.25” deep x 4" high x 12" wide copper grounding busbar with a minimum of eighteen (18) 0.437” holes at a minimum of 1” separation.

Grounding busbars for Communications Rooms shall be insulated from each of its supports by a minimum of two inches (2”) of UL standoff insulators.

Grounding busbars for Communications Rooms shall be mounted at bottom of plywood backboard via two stainless steel mounting brackets, and four stainless steel assembly bolts and lock washer.

Grounding busbars for Communications Rooms shall be suitable for indoor or outdoor installations.

Electrical Grounding Busbar shall be Storm Copper SCGB-5KT Ground Bar Kit, or approved equal.

3.18) Firestopping

Use only Firestopping products that have been tested for specific fire resistance rated construction conditions conforming to construction assembly type, penetrating item type, annular space requirements, and fire rating involved for each separate instance.

Firestopping products shall form a seal around cables that shall remain soft and pliable to allow removal, repair, and the addition of cables (“re-enterability”) without power tools, and without any danger of damaging existing cable traversing the penetration

Firestopping products shall be UL-Listed.

3.18.1) Firestopping

Materials used for Firestopping shall remain soft and pliable to allow removal, repair, and the addition of cables (“re-enterability”) without power tools, and without any danger of damaging existing cable traversing the penetration.

Firestopping Materials shall not re-emulsify, dissolve, leach, breakdown or otherwise deteriorate over time from exposure to atmospheric moisture, sweating pipes, ponding water or other forms of moisture characteristic during or after construction.

Firestopping Putty/Caulk/ Foam shall be colored red.

3.18.2) Fire Rated Cable Pathway Devices (Firestop Assemblies)

Fire Rated Cable Pathway Devices shall be comprised of steel raceway with intumescent foam pads allowing 0 to 100 percent cable fill while retaining all Firestopping properties.

Fire rated pathway devices shall:

3.18.2.1) Meet the hourly rating of the floor or wall penetrated.
3.18.2.2) Permit the allowable cable load to range from 0% to 100% visual fill while retaining intumescent/firestopping properties, thereby eliminating the need to calculate allowable fill ratios.
3.18.2.3) Permit multiple devices to be ganged together to increase overall cable capacity.
3.18.2.4) Allow for retrofit to install around existing cables.
3.18.2.5) Include an optional means to lengthen the device to facilitate installation in thicker barriers without degrading fire or smoke sealing properties or inhibiting ability of device to permit cable moves, add-ons, or changes.
3.18.2.6) Not require any additional action on the part of the installer to open or close the pathway device or activate the internal smoke and fire seal, such as, but not limited to:
3.18.2.6.1) Opening, closing, or adjustment of doors.
3.18.2.6.2) Twisting an inner liner.
3.18.2.6.3) Removal or replacement of any material such as, but not limited to, sealant, caulk, putty, pillows, bags, foam plugs, foam blocks, or any other material.

Fire Rated Cable Pathways shall be Specified Technologies Inc. (STI) EZ-PATH™ Fire Rated Pathway or approved equal.

3.18.3) Firestopping for Data/Telecommunications Cabinet Penetrations

Firestopping used on data/telecommunications cabinet penetrations shall provide a fire- and smoke-proof seal to and from space within cabinet.

3.19) Wireless Access Point Mounting Brackets

3.19.1) Suspended-Ceiling-Mount Wireless Access Point Mounting Bracket

Suspended-Ceiling-Mount WAP Bracket shall be Cisco AIR-AP-T-RAIL-R, Part Number 700-19209-04. Suspended-Ceiling-Mount Wireless Access Point Bracket shall be provided by Purchase College.

3.19.2) Indoor Wall-Mount Wireless Access Point Mounting Bracket

Indoor Wall-Mount Wireless Access Point Mounting Bracket shall be constructed of 18 gauge steel, and be constructed sturdily with a hostile environment in mind. Door concealing faceplate must lock, and all Wall-Mount WAP Mounting Brackets must be keyed alike. Two keys shall be furnished for each Wall-Mount WAP Mounting Bracket provided. Surface of WAP Mounting Bracket shall be finished with textured white powder coat.

Indoor Wall-Mount Wireless Access Point Enclosures shall be Oberon Wireless model 1012-00 or approved equal.

3.20) Ceiling Access Hatches

Ceiling Access Hatches shall be plenum-rated, shall be constructed of steel, and shall have a hinged door. Ceiling Access Hatches shall provide a 2-foot by 2-foot square opening in ceiling when opened. Hinged door on Ceiling Access Hatches shall be square and shall be secured mechanically via coin-slot drive in each corner of hinged door.

Contractor is required to install ceiling access hatches at a spacing of 15 feet maximum for during/after installation accessibility.

Part 4: Execution

4) Execution

4.1) Quality of Work

All work shall be performed to the highest industry standards. All equipment and materials are be installed in a neat and secure manner in accordance with applicable industry technical standards, local code standards, and product manufacturer's installation instructions and standards.

4.2) Pre-Bid and Pre-Installation Surveys

Prior to placing any cabinet, rack, wireless access point enclosure, conduit, cable tray, raceway, feeder, or cable, the Contractor shall survey the site to see that job conditions do not impose any obstructions that would interfere with the safe and satisfactory placement of the cables or equipment. Necessary changes to the plans may be determined by Contractor's site survey, and such changes require written approval by Owner Project Manager.

Building plans and documentation are not guaranteed to be entirely accurate or to scale, and are provided for informational purposes only. Contractor must verify all measurements in the field.

Unless otherwise noted, Contractor may freely access public areas of campus during normal hours of operation in order to verify measurements and existing conditions.

Contractor is urged to perform a site visit and verify measurements and existing conditions prior to placing a bid in respond to any request for quote or request for proposal.

4.3) Access and Physical Security

Contractor may require access to locked doors or alarmed areas. Contractor shall coordinate access with Owner Project Manager.

If a security alarm is tripped, then Contractor must immediately notify the University Police Department at (914)251-6900.

Contractor shall comply with all of Owner's policies regarding access to non-public areas.

Contractor may be provided with a chaperone by Owner while working in residence facilities, museum, art galleries, and other restricted areas of the campus.

4.4) Coordination with Other Trades

In order to conform to the overall project event schedule, Contractor shall survey the work areas regularly, and coordinate work with other applicable trades and with the Owner Project Manager.

4.5) Regular Meeting with Owner Project Manager

Owner Project Manager and Contractor Project Manager shall meet weekly, or more frequently as determined by Owner Project Manager. Owner Technical Contact and/or Contractor Field Contact, or any other party that Owner or Contractor deem necessary may be present.

4.6) Damage or Loss

During installation, and prior to final acceptance, the Contractor shall protect finished and unfinished work against damage and loss. In the event of such damage or loss, the Contractor shall replace or repair such work at no additional cost to Owner. As cable is installed, care must be taken to avoid nicks, kinks or other damage to the cable.

4.7) Existing Cables and Equipment

Contractor shall perform work without disturbing existing cables and equipment. If Contractor must disturb existing cables in order to perform work, then Contractor must obtain prior written permission to do so from Owner.

4.8) Clean-up

Contractor is required to clean up work areas of debris and dust generated by Contractor, as specified herein.

4.8.1) End of day

Contractor shall broom-clean all work areas of job site prior to leaving job site the end of each workday. Contractor shall restore suspended-ceilings in occupied areas to their former condition by the end of each workday. If suspended-ceiling tiles are damaged or broken, then Contractor shall replace tiles.

4.8.2) End of project

Following the completion of construction in an area, Contractor shall vacuum-clean and wipe-down all dust and debris generated by the work.

4.8.3) Communications Rooms

4.8.3.1) New Communications Rooms

New Communications Rooms and Cabinets shall be delivered to college in clean condition with all surfaces dust-free and debris-free.

Door sweeps and seals shall be installed on any door in New Communications Room to prevent dust from entering.

4.8.3.2) Existing Communications Rooms and Cabinets

Existing Communications Rooms and Cabinets shall be cleaned by Contractor with HEPA-Filter dry Vacuum prior to commencing work in Communications Room, and shall be maintained as dust-free and debris-free for duration of project.

Tools, cloths, boots, and ladders shall be cleaned prior to entering any existing Communications Room or Cabinet.

Sticky mat and door sweep shall be required at Communications Room to prevent dust from entering.

4.9) Splices

All cables shall be “home run” between patch panel and termination point.

No intermediate splice points are permitted for cables of any type.

Splicing of any cables of any type is prohibited, except where
Fiber-Optic fusion splices or Category 3 telephone splices are specified.

4.10) Technical Requirements

4.10.1) Data/Telecommunications Cabling System

Installed Category 6 / 6A system and components shall support 100BASE-TX Ethernet as per IEEE 802.3u, 1000BASE-T Ethernet as per IEEE 802.3ab, 1000BASE-TX Ethernet as per TIA-854, 2.5GBASE-T and 5GBASE-T Ethernet as per IEEE 802.3bz, 10GBASE-T Ethernet as per IEEE 802.3an, Voice-Over-IP telephony (VOIP) as per TIA-TR41, digital telephony as per TIA-810-B, analog telephony as per TIA 470-C, and Power over Ethernet as per the IEEE 802.3af, IEEE802.3at, and IEEE802.3bt standards.

Installation of Data/Telecommunications Cabling System must satisfy requirements set forth in all parts and addenda of ANSI/TIA/EIA-568-C, and TIA-569-A, ISO/IEC 11801, and IEC 61156.

Contractor shall furnish and install cables, terminals, connectors, patch panels, and miscellaneous hardware required for delivery of a complete and working cable plant.

4.11) Cabinets and Racks

4.11.1) Securing Cabinets and Racks to Floor and to Each Other

Cabinets and racks installed by Contractor must be securely anchored and bolted to the floor. Wherever one cabinet or rack is installed directly adjacent to another cabinet or rack, the cabinets or racks must be securely connected using manufacture-approved baying kit.

4.11.2) Knockouts

Where knockouts in cabinet sheet metal are specified or are necessary, knockout will be fitted with a bushed steel chase nipple to prevent cable from contacting sharp surfaces of cut sheet metal, and to allow proper packing of fire-stop material at cabinet penetration. All unused knockouts in cabinet are to be covered with knockout seals, regardless of whether or not knockout was open prior to Contractor performing work.

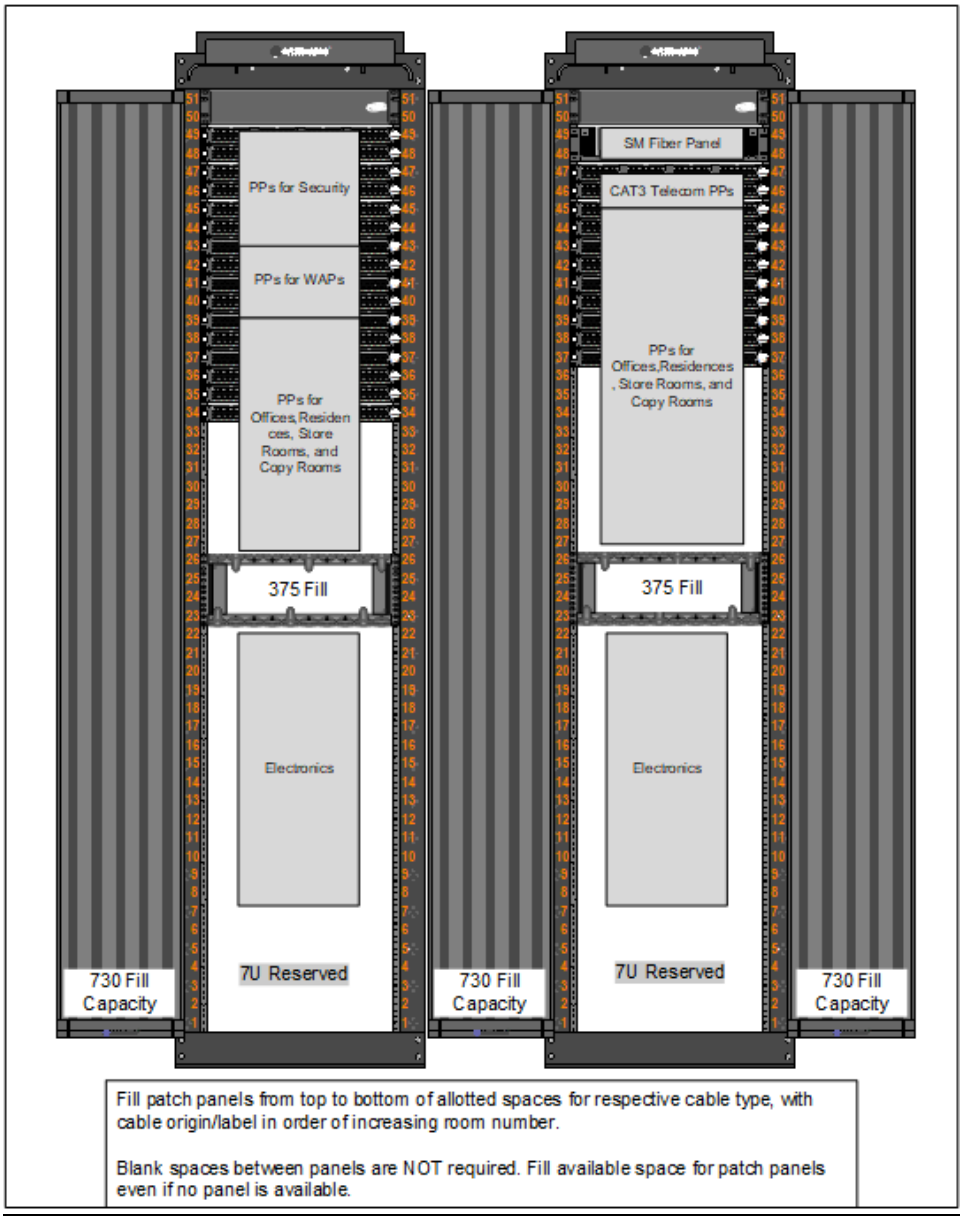
4.11.3) Fire-stop for Cabinet Penetrations

Contractor shall insure that fire-stop material is installed at all knockouts or other entrances to any cabinet in which Contractor performs work, regardless of whether or not Contractor disturbed fire-stop while performing work, and regardless of whether or not fire-stop was present prior to Contractor performing work.

Contractor shall install fire-stop in any new cabinet penetration that contractor creates. Contractor shall insure that every cabinet penetration has firestop installed prior to the completion of the job.

4.11.4) Cabinet or Rack Layout

See following sample rack elevation. Actual rack elevation drawings shall be provided by Owner Project Manager prior to cable dress/termination in each Communications Room, per project schedule, to ensure rack elevations are complete and accurate.


PPs for Security
PPs for WAPs
PPs for Offices,Residences, Store Rooms, and Copy Rooms
375 Fill
Electronics
7U Reserved
730 Fill Capacity
SM Fiber Panel
CAT3 Telecom PPs
PPs for Offices,Residences, Store Rooms, and Copy Rooms
375 Fill
Electronics
7U Reserved
730 Fill Capacity
730 Fill Capacity
Fill patch panels from top to bottom of allotted spaces for respective cable type, with cable origin/label in order of increasing room number.
Blank spaces between panels are NOT required. Fill available space for patch panels even if no panel is available.

4.12) Drip Loops

For all cables Contractor installs, Contractor will create minimum 6” radius drip loops before cabinets, racks, and connection blocks. Drip loops shall not be located anywhere above or within four feet (4’) of cabinets, equipment, patch panels, and connection blocks, and shall direct any water traveling on cables away from such equipment.

4.13) Communications Room Backboard

Communications Room Backboard (“Backboard”) shall be provided in whole 4’x8’ sections cut to maximum size and fit in the designated location.

Backboard shall be mounted such that bottom edge of plywood is 36” AFF and top edge of plywood is 84” AFF.

Six 22-inch lengths of 12-gauge back-to-back 1-5/8” x 4-7/8” steel strut shall be mounted horizontally behind each whole piece of plywood to create a 4-7/8-inch accessible gap (standoff) for routing cable between the Backboard and the wall, with one length of strut mounted roughly at each of the four corners and one length mounted roughly on center of both of the two longest sides of the plywood. Smaller cut sections of plywood shall be mounted using fewer lengths/pieces of steel strut, as appropriate.

Each length of strut shall be mechanically affixed to studs, to blocking, to masonry, or to structural steel behind the finished wall using two ½-inch Grade 8 carbon-steel bolts/washers/anchors.

Prior to installation, bolts and strut must be filed and deburred as to not to nick or cut cables that are routed behind backboard in the future.

Adequate materials, methods, and fasteners shall be utilized to insure proper support of the weight of the backboard assembly plus 600 pounds of static load on each 4’x8’ section of backboard.

Wood screws used in mounting equipment, cable, and supports to backboard shall not exceed the thickness of the backboard. Screws and other sharp objects must not protrude out rear of backboard where they may nick or cut cables that are routed behind backboard in the future.

Existing light fixtures, electrical outlets, switches, and other items fixed to designated wall shall be avoided, or plywood must be cut around such items such that access to items is not hindered in any way.

The “good” finished side (the “A” side) of the fire-rated A/C plywood shall face away from mounting wall, and shall display manufacturer’s stamps confirming that it has been treated with fire-retardant chemical.

Plywood backboard shall be entirely unpainted and installed so that stamps show clearly for all future fire inspections. At least one stamp in its entirety must be clearly visible on plywood at all times, regardless of what is mounted on the backboard.

4.14) Grounding

All components of the Data/Telecommunications Cabling System shall be properly grounded and bonded as per ANSI/TIA/EIA 607, and all applicable electrical codes. Electrical ground busbars shall be available on plywood backboards in all Communications Rooms

A complete connection to ground shall be formed from each structural metallic part of the cable plant to and through all others which parallel the route that a signal is designed to travel. Appropriate gauge copper ground cable as per code and standards shall be used to connect all components. Paint-piercing screws, grounding lugs, and split-bolt connectors shall be utilized as appropriate to insure proper connections.

All connections to the Grounding busbars for Communications Rooms shall all be made via UL-rated two-hole compression lugs – one-hole compression lugs are not acceptable. Each compression lug shall be crimped a minimum of twice to insure good connection to lug. Grounding busbars for Communications Rooms and associated lugs shall be cleaned prior to fastening of conductors, and an anti-oxidant shall be applied to contact area to control corrosion and reduce contact resistance.

Grounding busbars for Communications Rooms shall be installed no more than ten feet from electrical panel located in same Communications Room that serves the data/telecommunications system. A minimum gauge of #6 AWG cable designed for use in grounding/bonding applications shall be used to interconnect grounding/bonding components and shall have a green insulating jacket that meets the fire ratings of its pathway. Any cable used to ground/bond newly-installed components shall be installed without splices.

A Telecommunications Bonding Backbone cable of at minimum #3/0 AWG cable designed for use in grounding/bonding applications shall be supplied and installed by Contractor to interconnect the Main Telecommunications Grounding Busbar and all Telecommunications Ground Busbar(s)as per ANSI/TIA/EIA J-STD-607-A, if one does not exist.

4.15) Keys to Cabinets, Furniture, and WAP Mounting Brackets

Keys to cabinets, Furniture, and WAP Mounting Brackets may be retained by Contractor until Final Completion, at which time all keys must be returned to Owner.

Contractor shall not make copies of any key and shall account for all keys received or purchased prior to Final Completion.

Contractor shall immediately provide keys to Owner upon written request by Owner at any point during construction.

4.16) Service Slack

4.16.1) Data/telecommunications Outlet Service Slack

Each installed data/telecommunications cable shall provide a minimum of eight inches (8”) of service slack in the station outlet gang box at modular jack termination point, or as much as is allowed considering available space in gang box. Service slack shall be arranged in a loop and tucked in gang box, with consideration for the specified maximum bend radius of installed cable.

4.16.2) Additional Service Slack for Wireless Access Point Data Outlets

Each installed data cable designated for Wireless Access Point (WAP) connection shall have thirty feet (30’) of service slack coiled above nearest accessible ceiling to WAP outlet, and fastened to nearest J-Hook or other approved support using hook-and-loop fasteners.

4.16.3) Additional Service slack for Security Cables

Each installed cable designated for Security shall have thirty feet (30’) of service slack coiled above nearest accessible ceiling to Security termination, and fastened to nearest J-Hook or other approved support using hook-and-loop fasteners.

4.16.4) Additional Service Slack for Spare Cables

Each installed data/telecommunications cable designated as a “Spare Cable” shall have fifty feet (50’) of service slack coiled above nearest accessible ceiling, and hung on nearest J-Hook or other approved support using hook-and-loop fasteners.

4.16.5) Communications Room Service Slack

4.16.5.1) Category 6 / 6A Cable

At each Communications Room, Category 6 / 6A cables shall be combed, secured to Communications Room Backboard using hook-and-loop fasteners, and arranged in an S-curve such that ten feet (10’) of service slack is provided in the Communications Room.

With written approval, Contractor may alternatively lay service slack in Communications Room on adjoined cable trays that are dedicated for the purposes of dressing service slack. Service slack on cable tray shall be combed and secured to cable tray using hook-and-loop fasteners.

An additional three feet (3’) of service slack shall be provided in the cabinet or rack via a small “C-curve” secured to side rail of cabinet or rack with hook-and-loop fasteners, directly before cable enters rear of slotted duct cable management.

4.16.5.2) Telecommunications Feeder Cable Service Slack

At each Communications Room and telecommunications distribution frame, Telecommunications Feeder Cable shall be neatly secured to Communications Room Backboard using hook-and-loop fasteners, and arranged in a C-curve such that six feet (6') of service slack is provided.

With written approval, Contractor may alternatively lay Telecommunications Feeder Cable service slack in Communications Room on adjoined cable trays that are dedicated for the purpose of dressing service slack. Service slack on cable tray shall be secured to cable tray using hook-and-loop fasteners.

An additional four feet (4') of service slack on Telecommunications Feeder Cable shall be provided in cabinet or rack, arranged in a "C-curve" secured to side rail of cabinet or rack with hook-and-loop fasteners.

4.16.5.3) Fiber-Optic Cable Service Slack

At each Communications Room, Fiber-Optic cable shall be neatly secured to Backboard using hook-and-loop fasteners, and arranged in a coil such that fifty feet (50') of service slack is provided in each Communications Room.

With written approval, contractor may alternatively lay Fiber-Optic cable service slack in a coil in Communications Room on adjoined cable trays that are dedicated for the purpose of dressing service slack. Service slack on cable tray shall be secured to cable tray using hook-and-loop fasteners.

An additional ten feet (10') of service slack on Fiber-Optic cable shall be provided in the cabinet or rack in an "S-curve" secured to side rail of cabinet or rack with hook-and-loop fasteners.

4.17) Strain Relief and Cable Dressing

The Contractor shall provide and install hook-and-loop fasteners ties, riser cable support grips and strain relief based upon field conditions to maintain orderly cable organization

Contractor shall neatly dress cable in Communications Rooms and securely bundle them at every two-foot interval using prescribed cable fastener. Separate cable fasteners shall be used to attach cable bundle to cable tray, cabinet, cable management, or other cable support in the room.

Contractor shall install Horizontal 19-inch Lacing Bar for Patch Panel Rear Cable Strain Relief for all installed patch panels. Plastic strain relief bars that mount directly to patch panel are not acceptable. Strain relief will be installed in such a way that patch panel may be serviced with strain relief in place.

Strain relief boots and termination caps shall be installed on the station outlet modular jack and patch panel modular jack, if provided as part of the selected jack assembly.

4.18) Data/telecommunications Cabling System

4.18.1) Data/telecommunications Outlets

4.18.1.1) Outlet Placement

Standard wall data/telecommunications outlets shall be installed on the wall entirely above baseboard or cove base, at approximately 15 inches AFF.

Outlet placement shall match the height and orientation of existing electrical and communications outlets that are installed at a minimum of 8 inches in height and maximum of 24 inches in height on center. Existing outlets installed below 8 inches in height and above 24 inches in height on center shall not be used as a guide to place new outlets.

4.18.1.1.1) Wall outlets from to which an EMT conduit or stub are connected shall be installed in Metallic Recessed-Mount Device Boxes.

4.18.1.1.2) Wall outlets retrofitted into sheetrock walls shall utilize Low Voltage Faceplate Mounting Brackets.

4.18.1.2) Termination

All Category 6 / 6A termination assemblies shall employ the TIA-568-B wiring configuration for color-coding of pinout/position.

In order to maintain the electrical and data transmission characteristics of Category 6 / 6A cables, the following practices must be observed during the termination of all Category 6 / 6A cabling:

4.18.1.2.1) Only remove the minimum amount of cable sheath necessary to properly terminate the wires.

4.18.1.2.2) Cable conductors are arranged in pairs. Each pair has a specific twist associated with that pair. Maintain the pair twist at all times. Do not untwist and then attempt to re-twist cable pairs while terminating. Separate the conductors in a pair only as much as absolutely necessary to terminate the cable onto the connector. For all twisted pair cables the maximum untwisted length is not to exceed 0.5 inches.

4.18.1.2.3) Never remove insulation from the conductors. All of the terminations in this project shall be of the insulation displacement (IDC) type.

4.18.1.2.4) Leave the minimum amount of conductor after termination in an IDC connector. If necessary, use a cable scissor to trim extra length. Under no circumstances shall the excess length exceed 0.125 inches above the terminator block face edge.

4.18.2) Telecommunications Feeder Cable

Contractor shall terminate Telecommunications Feeder Cables on PDS 110-style insulation displacement connectors on the rear of 19” rack-mount Telecommunications Feeder Patch Panels at Communications Room end. Contractor shall terminate one pair of conductors on each port of 19” rack-mount telecommunications feeder patch panel.

Contractor shall terminate all pairs of Telecommunications Feeder Cables in corresponding order on 66M Connection Blocks mounted on backboard at the telecommunications distribution frame end. Connection Blocks shall be mounted to backboard or to distribution frame as specified by Owner.

All terminations shall be made in color order according to TIA/PIC standards.

4.18.3) Telecommunications Gas Protector Panel

If specified, Contractor shall install an intermediary gas protector panel for Communications Room on Communications Room Backboard.

4.19) Fiber-Optic Cable

Fiber-Optic cable shall be run within innerduct or dedicated ¾” EMT for the entirety of the cable length between Communications Rooms.

A conduit less than or equal to 1.5” in diameter that a Fiber-Optic cable is run through shall be deemed non-re-enterable. Additional cables shall not be pulled through this conduit following testing/certification of Fiber-Optic cable, in order to insure performance of the Fiber-Optic cable.

When run through conduit greater than 1.5” in diameter or on cable tray, Fiber-Optic cable shall be run within innerduct.

When otherwise run above suspended-ceilings, in mechanical rooms, and in mechanical spaces, Fiber-Optic cable shall be run in dedicated ¾” EMT.

When otherwise run below suspended-ceilings and in occupied areas that require aesthetics to be maintained, Fiber-Optic cable shall be run in raceway that is specifically designed to maintain bend radius of the Fiber-Optic cable.

4.19.1) Non-Armored Fiber-Optic Cable

No exceptions shall be made in any circumstance regarding the above use of innerduct/EMT/raceway with non-armored Fiber-Optic cable.

4.19.2) Armored Fiber-Optic Cable

Exceptions may be made under certain circumstances regarding the above use of innerduct/EMT/raceway with armored Fiber-Optic cable, but only if explicit written permission is granted from both Owner Project Manager and Owner Technical Contact.

4.19.3) Patch Panels and Termination

Termination of Fiber-Optic cable at Fiber-Optic patch panels shall confirm to TIA-568-C. SC duplex connectors shall be used for all Single-mode fiber termination.

The highest level of workmanship and attention to detail shall be exercised during installation and termination of Fiber-Optic cable.

Only cable manufacturer compatible tools and materials such as crimpers, fan-outs, and connectors shall be used in terminating Fiber-Optic cable termination.

4.19.4) Splicing and Fusion Splicing

Where fusions splices of Fiber-Optic cable are specified, contractor shall use fusion splicing tool from same manufacturer as cable being fused, to insure optimal results. Each fusion splice shall be tested at point of fuse, and less than 0.1 dB

Mechanical splices of Fiber-Optic cable are not permitted.

4.20) Pathways and Spaces

4.20.1) Pathways

Cable pathways will be constructed of appropriate cable supports such as J-Hooks, Loop/Strap Cable Hangers, Basket Cable Tray, raceways, or conduits.

J-Hooks, Loop/Strap Cable Hangers, or Basket Cable Tray may be used to support cable above suspended-ceiling, where there is no requirement for a specific type of cable support at that location.

Cable supports installed above suspended-ceilings shall be supported from the building structure and not from the existing ceiling support cables, grid, rods, or acoustical tees. Cable supports installed above suspended-ceiling shall be installed below plenum partition, if enough space exists between ceiling and plenum partition. If insufficient space exists between ceiling and plenum partition to install cable supports, then alternate pathway or method must be proposed by Contractor and approved in writing by Owner.

Threaded support rods shall extend a minimum of one inch (1") below cable tray wherever space allows to accommodate extension hardware that may be need to be added in the future.

Conduit, cable tray, innerduct, and raceway installation shall be continuous and connected appropriately to all boxes, cabinets, and other pathway components. Manufacturer’s fitting must be used for all transitions. Caps and gaskets shall be used to prevent dirt and moisture from entering installed conduit, innerduct, and raceway where appropriate. Nylon bushings shall be used on all stubs and points of connection to prevent sharp edges from damaging cable and pull tape.

Pathway shall be constructed with Owner’s hostile environment in mind. Unless noted, cables must not be exposed when run below finished ceilings -- all cables shall be run within conduit, within raceway, in walls, or above ceilings. Cables run in Mechanical Rooms shall be run in conduit. Raceway may be used as an alternate path when it is desirable to avoid certain ceiling spaces, though any use of conduit or raceway not explicitly prescribed in the scope of work (if provided) and the original RFQ/RFP/Project must be approved in writing by Owner prior to bid submission.

Headroom shall be maintained when installing conduit, cable tray, raceway, J-Hooks, cable hangers, and cable.

4.20.1.1) Metallic Recessed-Mount Device Boxes

Metallic Recessed-Mount Device Boxes shall be generally used for Category 6 / 6A outlets on gypsum-board (sheetrock) walls, and Category 6A Wireless Access Point (WAP) and outlets installed in gypsum-board ceilings – when either are installed during new construction or during gut-renovations.

During new construction and gut-renovations, Metallic Recessed-Mount Device Box shall be installed with 3/4-inch EMT run to box while finished wall is not yet built, and structure/studs are exposed. The 3/4-inch EMT shall stub to nearest accessible cable tray or nearest accessible ACT/open ceiling.

Cables shall not be installed in Metallic Recessed-Mount Device Boxes until gypsum-board has been installed. Once cables are installed and until room has been completely painted, a temporary cover shall be placed on box to prevent paint and primer from contaminating cable jacket. If ceiling is to be sprayed or painted, then cables above ceiling shall be temporarily wrapped with protective plastic covering to prevent paint and primer or other spray-on materials from contaminating cable jacket

4.20.1.1.1) General Category 6 / 6A outlets

Metallic Recessed-Mount Device Boxes for general Category 6 outlets shall be reduced with single-gang raised reducing ring, unless otherwise noted.

4.20.1.1.2) Category 6A for Wireless Access Point (WAP) or Surveillance Camera installation in gypsum-board ceilings

The following assembly shall be mechanically fastened together:

4.20.1.1.2.1) One (1) Metallic Recessed-Mount Device box (facing downward),
4.20.1.1.2.2) One (1) Flat single-gang reducing ring below,
4.20.1.1.2.3) One (1) Standard Category 6A faceplate, specified herein, facing downward,
4.20.1.1.2.4) One (1) Galvanized steel extension collar that is 2-1/8” deep x 4-inch wide x 4-inch high, and
4.20.1.1.2.5) One (1) Single-gang raised reducing ring (facing downward)

Metallic Recessed-Mount Device box in the above assembly shall be supported in ceiling by 8-inch max depth adjustable height box hanger, specified herein.

WAP may be connected with assembly in place, and WAP bracket mounted to single-gang raised reducing ring, following all priming and painting.

Raised reducing ring and extension collar shall be removable to permit removing faceplate, in order to be able to service Category 6A outlets.

4.20.1.2) Metallic Surface-Mount Device Boxes

Metallic Surface-Mount Device Boxes shall be used for Category 6 / 6A outlets in industrial areas, in Mechanical Equipment Rooms, and above ACT ceilings.

Metallic Surface-Mount Device Boxes shall be reduced with single-gang flat reducing ring, unless otherwise noted.

4.20.1.3) Non-Metallic Surface-Mount Device Boxes

Non-Metallic Surface-mount device boxes shall be constructed entirely of PVC, and shall be ivory in color.

NM surface-mount device boxes shall be 2 7/8” inches deep, and shall be single-gang, 3 inches wide by, 4 7/8” high.

NM surface mount boxes shall be of same manufacturer and compatible with approved raceway, and shall have knockouts/twist-outs for selected raceway model.

NM surface-mount device boxes shall be designed to be secured to wall mechanically using screws or bolts.

4.20.1.4) J-Hooks and Loop/Strap Cable Hangers

J-Hooks and/or Loop/Strap Cable Hangers shall be installed no more than six feet apart. When transitioning from J-Hook to another approved cable support, conduit, or through a penetration, then Cable Hanger shall be at most four feet from alternate cable support or conduit.

4.20.1.5) Basket Cable Tray and Ladder Cable Tray

Contractor shall install anchors, threaded rod, clamps and bars as needed to properly install and secure cable tray. Contractor shall use support methods, splice methods, fittings, and materials that are recommended by the cable tray manufacturer to continuously connect sections of cable tray and fittings. Cable tray shall be bonded per NEC and manufacturer standards and to the same ground as equipment rack. Contractor shall provide a minimum 12-inch working clearance above and on either side of encompassing cable tray to permit access for installing and maintaining cables. Contractor shall install cable tray in accordance with recognized industry practices, and in accordance with all of the following:

4.20.1.5.1) NEMA VE-2 2000
4.20.1.5.2) NEC and applicable portions of NFPA 70
4.20.1.5.3) NECA’s “Standards of Installation” pertaining to general electrical installation practices

4.20.2) Avoidance of Electromagnetic Interference Sources

All conduit, cable tray, and cables containing metallic elements -- including, but not limited to dielectric/non-metallic cable housed in metallic armor -- shall be routed in such a way as to maintain the following distances from sources of electromagnetic interference:

6 inches from power lines 2KVA or less.
12 inches from fluorescent lighting such as fluorescent/HID lamps
60 inches from transformers, motors, or power lines of 5KVA and up

4.20.3) Innerduct

All cables running within conduit of 3” (three inch) or greater outer diameter that is at 0% fill (unused) initially, and is expected to be filled to less than 25% upon completion of job must be run within innerduct supplied and installed by Contractor.

When installing innerduct in an unused conduit, Contractor shall simultaneously pull the maximum number of 1” and/or 1.25” diameter innerduct capable of fitting in the conduit, such that the maximum number of innerducts is provided for future use.

Pull tape shall be installed in each innerduct.

4.20.4) Conduit

Conduit shall be run in parallel, wherever practical, and secured to existing steel channel and steel beams using conduit straps or clamps. Existing steel channel or trapeze may be used if additional load can be supported at appropriate safety factor.

Unless specified, conduit fill ratio must never exceed 40% or the fill ratio specified by the firestopping assembly, whichever is lesser. For conduit of over 50 feet of length with no intermediate pull point, the fill ratio must never exceed 30%.

There shall not be more than 100 feet in length of conduit between pull boxes or conduit ends. Each 30-degrees of bend shall be considered as 10 feet of conduit when determining pull box placement.

There shall not be between two pull boxes or conduit ends more than a 180 degree cumulative total of bends.

Pull boxes shall not be used in place of bends. Conduit ends must be aligned in parallel on opposite sides within each pull box, such that they permit a straight pull through a pull box. Angled pulls and U-pulls through pull boxes are not permitted.

Example:

A length of conduit originating from a pull box, containing one 90-degree bend (counted as 30 feet of a 100 foot total budget), must not contain more than 70 feet of straight conduit (30 + 70 = 100 feet) before terminating in a pull box.

4.20.5) Raceway

Surface-mount raceway (raceway) shall be provided and installed in such a manner to optimize aesthetics. Appropriate raceway fittings such as unions, bends, and end-caps must be provided and installed by Contractor. In-field mitering of raceway in lieu of using fittings is not permitted.

Raceway and fittings used for data/telecommunications cable must be appropriate for a Category 6 / 6A installation, maintaining minimum bend radius and other properties of the Category 6 / 6A cable contained within.

Raceway fill shall not exceed 80% of the raceway manufacturer's recommendations, such that 20% spare capacity remains available in the raceway for future use without exceeding manufacturer's recommendations.

Raceway shall be mechanically mounted as per manufacturer's instructions using screws, anchors, and/or bolts. Raceway shall not be mounted with adhesive.

Raceway shall run vertically near the corners of room and horizontally at same height of data/telecommunications outlets. Raceway shall not run near the middle of walls. Installed raceway shall not cover or prevent access to any existing service, outlet, control, or access panel. Raceway covers must be installed and secured properly.

4.20.6) Pulling Tension

No cable shall be installed with a pulling tension exceeding the maximum recommended by the manufacturer. Pulling tension shall be monitored with a tension gauge (tensiometer) to ensure the maximum tension rating of cable is not exceeded.

A suitable breakaway link (swivel) should be used as a failsafe to insure maximum pulling tension of cable is not exceeded. Breakaway link/swivel shall be used as a failsafe in this respect, and not as a primary means of controlling cable tension.

If multiple cables are to be pulled at one time, the Contractor shall make the necessary allowances to back off the pulling tension of the bundle.

As necessary, for cable pulls in conduit, the Contractor shall use only an approved lubricant compatible with the cable outer jacket insulation, innerduct, and pull tape.

4.20.7) Pull tape

Contractor shall install new pull tape in all conduits 2" or greater in trade size installed by contractor, and in all pre-existing conduits 2" or greater in trade size utilized by Contractor.

Pull tape installed in conduits and innerducts shall be lubricated with a lubricant appropriate for the selected pull tape, innerduct, and installed cable, as necessary to prevent burn-through of pull tape.

All installed pull tape shall be tied securely on both ends of the conduit to a fixed object that is attached to or part of the conduit system. Pull tape installed in a conduit or cable tray shall include 4' of slack on both ends. Slack shall be rolled and tied neatly.

4.20.8) Pull Cord

Contractor shall install pull cord in all conduits less than 2” in trade size installed or utilized by Contractor, all raceways installed or utilized by Contractor, all cable tray installed or utilized by contractor, and all walls fished by Contractor.

4.20.9) Ceiling Access Hatches

Plaster and gypsum board shall be removed, and finished ceiling structural support cut and reinforced as required in each location in order to properly install Ceiling Access Hatches.

Finished ceiling shall be temporarily supported using suitable jack post as required during installation of Ceiling Access Hatches.

4.20.10) Bend Radii

4.20.10.1) Conduits

The minimum inside radius for conduits 2-inch in diameter or less shall be six times the internal diameter of the conduit. Conduits having diameter greater than two inches shall have a minimum inside radius of ten times the internal diameter of the conduit.

4.20.10.2) Basket Cable Tray and Ladder Cable Tray

Radius shields shall be installed at all cable tray lateral bends, and must maintain a minimum 6 inch radius in interior of tray.

Waterfall/radius-drop fittings shall be installed at all cable tray vertical transitions, where cables transition more than six inches (6”) vertically without support. Waterfall/radius-drop fittings shall have minimum of 3 inch radius.

4.20.10.3) Cables

All cables shall be installed with a bend radius greater than or equal to the bend radius recommended by the cable manufacturer to maintain cable rating and transmission properties.

As necessary, cable guides shall be used to maintain recommended bend radii during pulling.

Cables shall be secured using prescribed cable fasteners so as to prevent migration and maintain proper bend radius after initial installation.

Contractor shall secure the cable bundle at each J-Hook and Loop/Strap Cable Hanger with a prescribed cable fastener.

4.21) Labeling

All outlets, patch panel ports, cable ends, and firestopping locations shall be clearly labeled according the Cable Installation Labeling Convention.

A blank Circuit Endpoint Table Spreadsheet (Microsoft Excel spreadsheet form) shall be provided by Owner Technical Contact upon request by Contractor. The Circuit Endpoint Table Spreadsheet can be used as an aid for quickly creating labels that are in compliance with the Cable Installation Labeling Convention.

Contractor must complete and submit an electronic copy of the Circuit Endpoint Table Spreadsheet based on as-built termination locations and the Cable Installation Labeling Convention.

Following receipt of Contractor submittal, Owner Technical Contact shall review and respond to submittal with either “APPROVED”, “APPROVED AS NOTED”, or “REJECTED”. Notes shall direct Contractor specifically and/or generally on corrections that must be made to the spreadsheet before it is resubmitted by Contractor.

4.21.1) Cable Installation Labeling Convention

The Cable Installation Labeling Convention shall be used to identify all components of installed systems, including but not limited to equipment, cable, termination points (such as modular jacks, patch panel ports, or other connectors), and firestop installation, in all documentation, test results, and labeling.

Cable Installation Labeling Convention is an ANSI/TIA-606-A -compatible identification standard.

There are a total of six fields in each name: five identifying fixed-length fields used to identify *where* an item is located and *what* the item is, followed by one *variable length* field used to identify a port on the item.

These six fields can be split up into two parts: the first part identifying a general location and the second part describing specific location of and on an object within that location.

4.21.1.1) General Location Fields

The first three fields describe the general location of an item. This will describe the building, room, suite, and possibly a general location within a room (e.g. a Rack or Cabinet within the room, grid coordinates within room, etc.). These three fields are a total of exactly eight characters in length (2+4+2).

1) Building Code field (two letters)

Examples of Building Code field:
“NS” for Natural Sciences
“MF” for the Center for Media, Film, and Theater
“MT” for Maintenance Tunnels

2) Room or Suite Number field (four digits, typically)

Examples of Room or Suite Number field:
“1023” for room number 1023
“L120” for room number L120
“0055” for apartment 55

3) Location in Suite/Room field (letter+digit, or "-" for either/both)

Use "-" (hyphen) in place of letter or digit if there is no pertinent information for either, and "--" (two hyphens) if no pertinent information for both.

Examples of Location in Suite/Room field:
"K6" for network and server room grid coordinates,
"-2" for rack #2 in a room with three racks in it,
"L-" for living room in a residence suite,
"A-" for bedroom A in a residence suite,
"B-" for bedroom B in a residence suite,
or a placeholder of two hyphens ("--") if not pertinent.

An optional line break (newline/carriage return) may appear after the three General Location Fields where label does not allow all six fields to be legibly printed on a single line.

4.21.1.2) Item Identification

The last three fields identify a specific location of a particular type of item within the general location; specify the unique identification number of that particular type of item in the location; and specify a particular port on that particular item. This part contains three fields and totals four or more characters in length:

4) Item Type Code field (two letters)

Examples of Item Type Code field:
"MJ" for Modular Jack faceplate
"PP" for Patch Panel
"MP" for Modular Plug (Single-Connector Modified Permanent Link)

5) Index number of Item within room or rack field (two digits)

Examples of Item within room or rack field:
"03" for the third item of its type in the location

6) [Optional] Port Number field**: (optional: "-"+ variable length and content)

** The Index Number field is always separated from the Port Number field by a hyphen (e.g. "03-9" or "03-4" or "3-C")

Always pad numeric fields that may be two digits with a leading zero (e.g. "-00", "-01", ... "-10", "-11", etc.), when there is only one significant digit (0-9), in order to permit ease of reading in table format and ease of electronic searching.

Always pad alphabetic data that may be two letters with extra leading hyphen (e.g. "—A", "—B", … "-AA", "-AB", etc.), when there is only one significant letter (A-Z), in order to permit ease of reading in table format and ease of electronic searching.

Examples of Item within room or rack field:
"-4" for modular jack "4", where jacks are numbered 1-4
"-09" for panel port "9", where ports are numbered 1-24
"-C" for device port "C", where ports are numbers A-Z
"—C" for device port "C", where ports numbered A-ZZ
"-B5" for Fiber-Optic patch panel six-pack "A" port "5"

"-B05 for Fiber-Optic patch panel twelve-pack "A" port "5"

[See illustration next page]

Building Code

Format
Two UPPERCASE alphabetic characters

Contents
Code as follows:

AD	Administration
CN	Campus Center North
CS	Campus Center South
DA	Dance
FM	Facilities Management
HU	Humanities
LI	Library
MF	Ctr for Media Film and Theater
MU	Music
NM	Neuberger Museum
NS	Natural Sciences
SS	Social Science
ST	Student Services Building
MS	Mechanical Services below ST
MT	Maintenance Tunnel
PA	Performing Arts Center
PE	Physical Education
VA	Visual Arts
R*	Residence area "*" (e.g. "RA") Use Dormitory or Apartment street code assigned by ResLife

Room or Suite Number

Format
(Typically) Four numeric characters, or as according to building plans. Pad with leading zeros if plans indicate less than 4-digit room number.

Contents
Room number in four-digits
(e.g. "SS0021")
OR

Apartment building/unit numbers
(e.g. "RG0053")

Notes
This field MUST be padded with leading zeros to create four-digit number.

Alphabetical character in room identifier shall be removed and moved to next field ("Sub-Room")

Sub-Room / Cabinet

Format
One UPPERCASE alphabetic character or a hyphen, followed by one numeric character or a hyphen

Contents
Sub-room in suite (A, B, C, or "L" for living room) or hyphen
(e.g. "RJ0041**A**-")
OR

Coordinates or serial number of cabinet or rack in room
(e.g. " SS0027F**5**")

OR

Two hyphens, if nothing relevant
(e.g. "LI1014**--**")

Notes
Hyphens ("-") can be used in one or both characters of this field if field information is irrelevant (e.g. a simple, single room) in order to make this field exactly two characters in length.

C S 0 0 0 8 - 2 P P 0 1 - 0 1

Item Type Code

Format
Two UPPERCASE alphabetic characters

Contents
Code as follows examples below:

MJ	Modular Jack faceplate/box
PP	Patch Panel
MP	Modular Plug (SCMPL/OSP)
FL	Firestopping location
SV	Server
WS	Workstation
SW	Switch
RO	Router
MC	Media Converter
PS	Power Supply / UPS
TE	Terminal
MO	Modem
AB	AB, ABC, ABCD Switch
KV	KVM Switch
AP	Wireless Access device
VS	Video Surveillance
AC	Access Control (reader/sensor)
etc…	

Item Index Number

Format
Two numeric characters

Contents
Unique index number of item in the room, cabinet, or rack

Notes
Index numbers shall unless otherwise specified begin at "01" for equipment of a certain type located at the top of a rack or cabinet and increment for lower equipment of same type in same rack or cabinet.

Port Number

Format
Optional field. May contain any number of characters in any format. Possible values depend on item.

Contents
Used to specify port number

Notes
Always separate from previous field with a hyphen. Use values as labeled by manufacturer on an item, if available (e.g. a certain manufacturer's faceplate may have molded plastic labels of "A", "B", "C", while another might use "1", "2", "3"). If manufacturer does not print labels on ports, then number ports starting at one (1) on top left and proceeding all the way to right, and then down.

4.21.2) Data/telecommunications Outlet Labels

Contractor shall label data/telecommunications outlet faceplates with appropriate far-end (patch panel) termination address for each modular jack, as in the following example:

Example:

NS2055A-
PP01-24

(Showing room NS2055, Cabinet “A”, Patch Panel #01, port 24)

Where a label insert slot or space is available on faceplate, insert a compatible non-adhesive label, and provide and install manufacturer-supplied clear plastic cover over label slot.

4.21.3) Patch Panel Labels

Contractor shall label patch panel ports using compatible labels and label covers.

Contractor shall label patch panel ports with appropriate far-end (Outlet) termination address as in the following example:

Example:

NS1010B-
MJ06-4

(Showing room “NS1010B”, Modular Jack faceplate “06”, Jack “4”)

Where a label insert slot or space is available on patch panel, insert a compatible non-adhesive label, and provide and install manufacturer-supplied clear plastic cover over label slot.

4.21.4) Cable Marking Labels

All cables shall have wrap labels affixed to cable at both ends between three inches (3”) and five inches (5”) from each termination point. The three-inch space is very important to permit future re-termination of cable without need to remove and re-label each cable.

Contractor shall label each cable end with the appropriate near and far-end termination address, as in the following example:

Example:

NS1010B-MJ06-4
NS2055A-PP01-24

(Label on outlet-side of cable run between NS1010B-MJ06-4 and NS255A-PP01-24)

NS2055A-PP01-24
NS1010B-MJ06-4

(Label on panel-side of cable run between NS1010B-MJ06-4 and NS255A-PP01-24)

If label media does not permit all text on a single label, then applying two (2) labels to cable shall be acceptable, such that text read left-to-right reads in the same order.

4.21.5) Labeling of Firestopping Locations

Contractor shall neatly and legibly mark firestopping locations with firestopping location name, according to this convention, using permanent marker on or adjacent to the firestopping material, in a conspicuous location.

If Contractor cannot mark firestopping location name on firestopping materials, then Contractor shall mark firestopping location name on the firestopping barrier or assembly, directly adjacent to firestopping material.

Contractor shall consider aesthetics of surrounding area when labeling/marking firestopping locations.

Example:

4.21.6) Fiber-Optic Cable Warning Labels

Fiber-Optic cable warning labels shall be placed on all innerduct containing Fiber-Optic cable, within two feet of location where innerduct enters or exits conduit.

4.22) Safety and Code Requirements

Contractor will adhere to all applicable local, state, and federal laws and codes.

4.23) Firestopping

Contractor shall provide and install Firestopping materials at all penetrations of fire-rated barriers, both existing and created by Contractor, through which any cable, conduit, or sleeve installed by the Contractor passes.

Contractor shall provide and install Firestopping materials in the interior of all conduits, sleeves, and raceways that are installed or utilized by Contractor and that traverse a fire-rated barrier. Threaded metal caps may be utilized, as per applicable codes, to close-off unused conduits and/or sleeves.

Firestopping materials shall be installed according to code, according to certification listing, and according to firestopping manufacturer instructions. Firestopping materials used must meet the hourly rating of the floor or wall penetrated.

4.23.1) Firestopping product type

The type of firestopping utilized in each case shall be determined based on this Specification, on firestopping manufacturer instructions, on code, on certification listing, and on application including but not limited to:

4.23.1.1) Barrier or assembly in which the firestopping is being installed
4.23.1.2) Size of penetration
4.23.1.3) Materials (e.g. cables, conduit, Basket Cable Tray, etc.) that shall traverse or adjoin the penetration

4.23.2) Fire Rated Pathway Devices

4.23.2.1) Fire Rated Pathway Devices shall be the preferred method of firestopping and shall be installed in all locations where frequent cable moves, add-ons and changes will occur.
4.23.2.2) Cable trays shall terminate at each barrier and resume on the opposite side such that cables pass independently through fire-rated pathway devices. Cable tray shall be rigidly supported independent from fire-rated pathway devices on each side of barrier.
4.23.2.3) Install through-penetration firestop systems in accordance with Performance Criteria and in accordance with the conditions of testing and classification as specified in the published design.

4.23.3) Firestop Putty, Firestop Caulk, and Firestop Foam

Where it is not practical to use a Fire Rated Pathway Device, Firestop Putty/Caulk/Foam may be used.

4.23.3.1) Before beginning installation, verify that substrate conditions previously installed under other sections are acceptable for installation of firestopping in accordance with manufacturer's installation instructions and technical information.
4.23.3.2) Surfaces shall be free of dirt, grease, oil, scale, laitance, rust, release agents, water repellants, and any other substances that may inhibit optimum adhesion.
4.23.3.3) Provide masking and temporary covering to protect adjacent surfaces.

4.23.4) Firestopping Pillows

Pillow-type firestopping may be used in conduits if and where code permits. If firestopping pillows are utilized, then all firestopping pillow manufacturer instructions and certification listing must be adhered to, including but not limited to those pertaining to compression ratio, cable bundling, and hose-stream dislodgement prevention. Proper compression ratio must be maintained as per certification listing and manufacturer instructions. Cable bundles must be shaped properly as per certification listing and manufacturer instructions in order to prevent smoke penetration between cables. Wire mesh or other material must be installed on larger openings to prevent dislodgement of pillow as per certification listing and manufacturer instructions.

Contractor shall submit compression ratio calculations to the Owner Project Manager for each penetration in which a firestopping pillow is used by Contractor, including:

4.23.4.1) any penetration in which a new firestopping pillow is installed by Contractor
4.23.4.2) any existing penetration used by contractor in which an existing firestopping pillow has been disturbed by Contractor
4.23.4.3) any penetration where a cable has been added or removed by Contractor

4.23.5) Firestopping of Data/Telecommunications Cabinet Penetrations

Contractor shall create and maintain fire, smoke, and watertight seal of firestopping for data/telecommunications cabinet penetrations.

4.24) Testing and Certification Requirements

4.24.1) Independent Testing and Certification Requirement

Contractor shall arrange to have a qualified 3rd-Party independent inspecting and testing agency perform field testing and submit certification and observation reports for each and every cable installed by Contractor, including 100% of installed Fiber-Optic cable strands, 100% of installed Category 6 / 6A Cable permanent links, 100% of installed telephone feeder/trunk cable pairs, and 100% of installed security/surveillance cables.

Field test certification and observation reports shall indicate and interpret test results relative to compliance with performance requirements of the installed systems, and as defined herein.

This Independent Testing and Certification Requirement may at the option of Owner be waived in the Scope of Work (if provided) and the original RFQ/RFP/Project or in a Transmittal signed by both the Owner Project Manager and Purchase College Technical Contact. If the Independent Testing and Certification Requirement is waived in such a way, then all certification and testing requirements shall be maintained save that for the requirement of having an independent 3rd-Party perform the testing and certification: Contractor shall submit field test certification reports, as defined herein, from a qualified employee for 100% of cables installed by Contractor.

4.24.2) All Testing to be witnessed and/or reviewed by Owner

The Owner Project Manager and the Owner Technical Contact shall be invited to witness and/or review field-testing.

The Owner Project Manager and the Owner Technical Contact shall be notified of the start date of the testing phase five (5) business days before testing commences.

The Owner Project Manager will select a random sample of 5% of the installed cables. Owner may test these randomly selected cables. The results obtained may be compared to the data provided by the installation contractor. If more than 2% of the sample results differ in terms of the pass/fail determination, then Contractor under supervision of Owner Technical Contact’s representative shall repeat 100% testing at no cost to the Owner.

4.24.3) Ground / Bond Testing

Test all installed or modified grounded components of cable systems as per NFPA 70B, Chapter 18 to ensure electrical continuity of bonding and grounding connections, and to demonstrate compliance with specified maximum grounding resistance.

4.24.4) Category 6 / 6A Cable Testing

100% of the Category 6 / 6A cables in the installation shall be tested in accordance with the Telecommunications Industry Association (TIA) standard ANSI/TIA/EIA-568-C, and with this Specification.

The installed twisted-pair links shall be tested from the patch panel or termination block, to the data/telecommunications outlet against the “Permanent Link” performance limits specification as defined in ANSI/TIA/EIA-568-C.

4.24.4.1) Technician Qualifications

All tests shall be executed by trained technicians who have successfully attended an appropriate training program and have obtained a certificate as proof thereof. Appropriate training programs include but are not limited to installation certification programs provided by BICSI or the ACP.

4.24.4.2) Test Equipment Accuracy

The test equipment (tester) shall comply with or exceed the accuracy requirements for enhanced level II (Level II-E) field testers as defined in TIA-568; Annex I: Section I.4. The tester including the appropriate interface adapter must meet the specified accuracy requirements. The accuracy requirements for the permanent link test configuration (baseline accuracy plus adapter contribution) are specified in Table I.4 of Annex I of TIA/EIA-568-B.2. (Table I.5 in this TIA document specifies the accuracy requirements for the Channel configuration.)

The tester shall be within the calibration period recommended by the vendor in order to achieve the vendor-specified measurement accuracy. The contractor shall provide proof that the interface has been calibrated within the period recommended by the vendor.

The tester interface adapters must be of high quality and the cable shall not show any twisting or kinking resulting from coiling and storing of the tester interface adapters. In order to deliver optimum accuracy preference is given to a permanent link interface adapter for the tester that can be calibrated to extend the reference plane of the Return Loss measurement to the permanent link interface. To ensure that normal handling on the job does not cause measurable Return Loss change, the adapter cord cable shall not be of twisted-pair construction.

4.24.4.3) The Pass or Fail condition for the link-under-test is determined by the results of the required individual tests (detailed in “Performance Test Parameters”, below). Any Fail, Fail*, or marginal pass (“Pass*”) result yields a Fail for the link-under-test. In order to achieve an overall Pass condition, the results for each individual test parameter must pass - the accuracy margin of the testing device.

A Pass or Fail result for each parameter is determined by comparing the measured values with the specified test limits for that parameter. The test result of a parameter shall be marked with an asterisk (*) when the result is closer to the test limit than the accuracy of the field tester. The field tester manufacturer must provide documentation as an aid to interpret results marked with asterisks. (Reference TIA-568; Annex I: Section I.2.2)

4.24.4.4) Performance Test Parameters

The test parameters for Category 6 / 6A are defined in ANSI/TIA/EIA standard TIA-568-B.1; The test of each Category 6 / 6A link shall contain all of the following parameters as detailed below. In order to pass the link test all measurements must meet or exceed the limit value determined in the TIA-568.1 standard at each frequency in the range as prescribed by the standards referenced herein.

All test measurement points at all frequency ranges required are to be recorded in the test results information as detailed in Section 4.25.1.3) (“Database Detailed Information”)

4.24.4.4.1) Wire Map [as defined in TIA/EIA-568-B.1]

4.24.4.4.2) Length [as defined in TIA/EIA-568-B.1]

4.24.4.4.3) Insertion Loss (Attenuation) [as defined in TIA/EIA-568-B.1]

4.24.4.4.4) NEXT Loss, pair-to-pair [as defined in TIA/EIA-568-B.1]

4.24.4.4.5) PSNEXT Loss [as defined in TIA/EIA-568-B.1]

4.24.4.4.6) ELFEXT Loss, pair-to-pair [as defined in TIA/EIA-568-B.1]

4.24.4.4.7) PSELFEXT Loss [as defined in TIA/EIA-568-B.1]

4.24.4.4.8) Return Loss [as defined in TIA/EIA-568-B.1]

4.24.4.4.9) ACR (Attenuation to crosstalk ratio) [This parameter is not demanded by the standards but may be required in order to obtain the premise wiring vendor’s warranty. Premise wiring vendor’s parameters shall prevail.]

This calculation yields 12 combinations – six from each end of the link.

Test results shall identify the wire pair combination that exhibits the worst-case margin and the wire pair combination that exhibits the worst value for ACR.

These wire pair combinations must be identified for the tests performed from each end. Each reported case shall include the frequency at which it occurs as well as the test limit value at this frequency.

4.24.4.4.10) PSACR [This parameter is not required by the standards but may be required in order to obtain the premise wiring vendor’s warranty. Premise wiring vendor’s parameters shall prevail.]

This calculation yields 8 combinations – one for each wire pair from both ends of the link.

Test results shall identify the wire pair that exhibits the worst-case margin and the wire pair that exhibits the worst value for PSACR. These wire pairs must be identified for the tests performed from each end. Each reported case shall include the frequency at which it occurs as well as the test limit value at this frequency.

4.24.4.4.11) Propagation Delay [as defined in TIA/EIA-568-B.1; Section 11.2.4.10]

4.24.4.4.12) Delay Skew [as defined in TIA/EIA-568-B.1]

4.24.4.4.13)DC Loop Resistance [as defined by TIA/EIA-568-C.2]

4.24.4.4.14)DC Resistance Unbalance within a pair [as defined by TIA/EIA-568-C.2]

4.24.5) Telecommunications Feeder Cable Testing

100% of the Category 3 cables in the installation shall be tested in accordance with the Telecommunications Industry Association (TIA) standard ANSI/TIA/EIA-568-B and with this Specification.

All pairs of the installed Telecommunications Feeder Cable shall be tested and shall be confirmed meet or exceed Category 3 specification as per TIA-568-B.

The installed Telecommunications Feeder Cable shall be tested from the telecommunications feeder patch panel, to the MDF connection block against performance limits specification as defined in ANSI/TIA/EIA-568-B.Technician Qualifications

All tests shall be executed by trained technicians who have successfully attended an appropriate training program and have obtained a certificate as proof thereof. Appropriate training programs include but are not limited to installation certification programs provided by BICSI or the ACP (Association of Cabling Professionals).

4.24.5.1) Test Equipment Accuracy

The test equipment (tester) shall comply with or exceed the accuracy requirements for enhanced level II (Level II-E) field testers as defined in TIA-568; Annex I: Section I.4. The tester including the appropriate interface adapter must meet the specified accuracy requirements

The tester shall be within the calibration period recommended by the vendor in order to achieve the vendor-specified measurement accuracy. The contractor shall provide proof that the interface has been calibrated within the period recommended by the vendor.

The tester interface adapters must be of high quality and the cable shall not show any twisting or kinking resulting from coiling and storing of the tester interface adapters. I

4.24.5.2) The Pass or Fail condition for the link-under-test is determined by the results of the required individual tests. Any Fail or Fail* result yields a Fail for the link-under-test. In order to achieve an overall Pass condition, the results for each individual test parameter must Pass or Pass*.

A Pass or Fail result for each parameter is determined by comparing the measured values with the specified test limits for that parameter. The test result of a parameter shall be marked with an asterisk (*) when the result is closer to the test limit than the accuracy of the field tester. The field tester manufacturer must provide documentation as an aid to interpret results marked with asterisks.

4.24.5.3) Performance Test Parameters

The test parameters for Category 3 are defined in ANSI/TIA/EIA standard TIA-568-B; The test of each Category 3 link shall contain all parameters as required by TIA-568-B for Category 3 installed permanent link. In order to pass the link test all measurements must meet or exceed the limit value determined in the TIA-568.B standard at each frequency in the range from 1 MHz through 16 MHz.

4.24.6) Fiber-Optic Cable Testing

This Section includes the minimum requirements for the test certification and administration of backbone and horizontal optical fiber cabling.

Contractor shall notify the Owner Project Manager and the Owner Technical Contact of any additional tests that are deemed necessary to guarantee a fully functional system as described under this Specification. The contractor shall carry out and record any additional measurement results at no additional charge.

4.24.6.1) Testing Scope

4.24.6.1.1) Testing shall be carried out in accordance with this Specification. This includes testing the attenuation and polarity of the installed cable plant with an optical loss test set (OLTS) and the installed condition of the cabling system and its components with an optical time domain reflectometer (OTDR). The condition of the fiber end faces shall also be verified.

4.24.6.1.2) Testing shall be performed on each cabling link (connector to connector).

4.24.6.1.2.1) Testing shall not include any active devices or passive devices within the link or channel other than cable, connectors, and splices, i.e. link attenuation does not include such devices as optical bypass switches, couplers, repeaters, or optical amplifiers.

4.24.6.1.3) All tests shall be documented including OLTS dual wavelength attenuation measurements for multimode and singlemode links and channels and OTDR traces and event tables for multimode and singlemode links and channels.

4.24.6.1.3.1) Documentation shall also include optical length measurements and pictures of the connector endface.

4.24.6.2) Quality Assurance

4.24.6.2.1) All testing procedures and field-test instruments shall comply with applicable requirements of:

4.24.6.2.1.1) ANSI Z136.2, ANS For Safe Use Of Optical Fiber Communication Systems Utilizing Laser Diode And LED Sources

4.24.6.2.1.2) ANSI/EIA/TIA 455 50B, Light Launch Conditions For Long-Length Graded-Index Optical Fiber Spectral Attenuation Measurements

4.24.6.2.1.3) ANSI/TIA/EIA-455-59A, Measurement of Fiber Point Discontinuities Using an OTDR

4.24.6.2.1.4) ANSI/TIA/EIA 455 60A, Measurement of Fiber or Cable Length Using an OTDR

4.24.6.2.1.5) ANSI/TIA/EIA 455 61A, Measurement of Fiber or Cable Attenuation Using an OTDR

4.24.6.2.1.6) ANSI/TIA/EIA 526 7, Optical Power Loss Measurements of Installed Singlemode Fiber Cable Plant

4.24.6.2.1.7) ANSI/TIA/EIA 526 14 A, Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant

4.24.6.2.1.8) ANSI/TIA/EIA-568-B.1, Commercial Building Telecommunications Cabling Standard, Part 1, General Requirements

4.24.6.2.1.9) ANSI/TIA/EIA 568 B.3, Optical Fiber Cabling Components Standard

4.24.6.2.1.10) TIA/EIA TSB-140, Additional Guidelines for Field-Testing Length, Loss and Polarity of Optical Fiber Cabling Systems

4.24.6.2.1.11) ANSI/TIA/EIA-606-A, Administration Standard for Commercial Telecommunications Infrastructure, in addition to the requirements specified by Owner.

4.24.6.2.2) Trained technicians who have successfully attended an appropriate training program, which includes testing with an OLTS and an OTDR and have obtained a certificate as proof thereof shall execute the tests. These certificates may have been issued by any of the following organizations or an equivalent organization:

4.24.6.2.2.1) Manufacturer of the Fiber-Optic cable and/or the Fiber-Optic connectors

4.24.6.2.2.2) Manufacturer of the test equipment used for the field certification

4.24.6.2.2.3) Training organizations (e.g., BICSI, A Telecommunications Association headquarters in Tampa, Florida; ACP [Association of Cabling Professionals™] Cabling Business Institute located in Dallas, Texas).

4.24.6.3) Submittals

Contractor shall supply the following to Owner Project Manager upon request:

4.24.6.3.1) Manufacturers catalog sheets and specifications for Fiber-Optic field-test instruments including optical loss test sets (OLTS; power meter and source), optical time domain reflectometer (OTDR) and inspection scope.

4.24.6.3.2) A schedule (list) of all optical fibers to be tested.

4.24.6.3.3) Sample test reports.

4.24.6.4) Acceptance of Test Results

4.24.6.4.1) Unless otherwise specified by the Owner Technical Contact, each cabling link shall be demonstrated via test result database to be in compliance with the test limits as specified in ANSI/TIA/EIA-568-B.1.

4.24.6.4.1.1) Optical loss testing

4.24.6.4.1.1.1) Backbone (multimode and singlemode) link

The link attenuation shall be calculated by the following formulas as specified in ANSI/TIA/EIA-568-B.1.

4.24.6.4.1.1.1.1) Link Attenuation (dB) = Cable_Attn (dB) + Connector_Attn (dB) + Splice_Attn (dB)
4.24.6.4.1.1.1.2) Cable_Attn (dB) = Attenuation_Coefficient (dB/km) * Length (Km)
4.24.6.4.1.1.1.3) Connector_Attn (dB) = number_of_connector_pairs * connector_loss (dB)
4.24.6.4.1.1.1.4) Maximum allowable connector_loss = 0.75 dB
4.24.6.4.1.1.1.5) Splice_Attn (dB) = number_of_splices * splice_loss (dB)
4.24.6.4.1.1.1.6) Maximum allowable splice_loss = 0.3 dB

4.24.6.4.1.1.1.7) The values for the Attenuation Coefficient (dB/km) as listed in referenced specifications.

4.24.6.4.1.1.2) Horizontal (multimode) link

4.24.6.4.1.1.2.1) The acceptable link attenuation for a multimode horizontal optical fiber cabling system is based on the maximum 90 m (295 ft) distance.

4.24.6.4.1.1.2.2) The horizontal link may be tested using a fixed upper limit for attenuation of 2.0 dB. This value is based on the loss of two (2) connector pairs, one pair at the telecommunications outlet/connector and one pair at the horizontal cross-connect, plus 90 m (295 ft) of optical fiber cable.

4.24.6.4.1.1.2.3) A horizontal link in an Open Office Cabling network with a consolidation point may be tested using a fixed upper limit for attenuation of 2.75 dB.

4.24.6.4.1.1.3) Centralized (multimode) link

4.24.6.4.1.1.3.1) The acceptable link attenuation for a multimode centralized optical fiber cabling system is based on the maximum 300 m (984 ft) distance.

4.24.6.4.1.1.3.2) The centralized link may be tested using a fixed upper limit for attenuation of 3.3 dB. This value is based on the loss of three (3) connector pairs, one pair at the telecommunications outlet/connector, one pair at the consolidation point and one pair at the horizontal cross-connect, plus 300 m (984 ft) of optical fiber cable.

4.24.6.4.1.1.3.3) A horizontal link in an Open Office Cabling network with a consolidation point may be tested using a fixed upper limit for attenuation of 4.1 dB.

4.24.6.4.1.2) OTDR testing

4.24.6.4.1.2.1) Reflective events (connections) shall not exceed 0.75 dB.

4.24.6.4.1.2.2) Non-reflective events (splices) shall not exceed 0.3 dB.

4.24.6.4.1.3) Magnified end face inspection

4.24.6.4.1.3.1) Fiber connections shall be visually inspected for end face quality.

4.24.6.4.1.3.2) Scratched, pitted or dirty connectors shall be diagnosed and corrected.

4.24.6.4.2) All installed cabling links and channels shall be field-tested and pass the test requirements and analysis as described in this Specification. Any link or channel that fails these requirements shall be diagnosed and corrected. Any corrective action that must take place shall be documented and followed with a new test to prove that the corrected link or channel meets performance requirements. The final and passing result of the tests for all links and channels shall be provided in the test results documentation in accordance with this Specification.

4.24.6.4.3) Acceptance of the test results shall be given in writing after the project is fully completed and tested in accordance with Contract Documents and to the satisfaction of the Owner.

Note: High Bandwidth applications such as 1000BASE-SX, 10GBASE-S, and FC1200 impose stringent channel loss limits. Where practical, certification shall consider loss length limits that meet maximum channel (transmitter to receiver) loss.

4.24.6.5) Optical Fiber Cable Tester Device Requirements

4.24.6.5.1) The field-test instrument shall be within the calibration period recommended by the manufacturer.

4.24.6.5.2) Optical loss test set (OLTS)

4.24.6.5.2.1) Multimode optical fiber light source
4.24.6.5.2.2) Provide dual LED light sources with central wavelengths of 850 nm (±30 nm) and 1300 nm (±20 nm)
4.24.6.5.2.3) Output power of –20 dBm minimum.
4.24.6.5.2.4) The light source shall meet the launch requirements of ANSI/EIA/TIA 455 50B, Method A. This launch condition can be achieved either within the field test equipment or by use of an external mandrel wrap (as described in clause 11 of ANSI/TIA/EIA-568-B.1) with a Category 1 light source.

4.24.6.5.3) Singlemode optical fiber light source

4.24.6.5.3.1) Provide dual laser light sources with central wavelengths of 1310 nm (±20 nm) and 1550 nm (±20 nm).
4.24.6.5.3.2) Output power of –10 dBm minimum.

4.24.6.5.4) Power Meter

4.24.6.5.4.1) Provide 850 nm, 1300/1310 nm, and 1550 nm wavelength test capability.
4.24.6.5.4.2) Power measurement uncertainty of ± 0.25 dB.

4.24.6.5.4.3) Store reference power measurement.
4.24.6.5.4.4) Save at least 100 results in internal memory.
4.24.6.5.4.5) PC interface (serial or USB).

4.24.6.5.5) Optional length measurement

4.24.6.5.5.1) It is preferable to use an OLTS that is capable of measuring the optical length of the fiber using time-of-flight techniques.

4.24.6.5.6) Optical Time Domain Reflectometer (OTDR)

4.24.6.5.6.1) Multimode OTDR
4.24.6.5.6.1.1) Wavelengths of 850 nm (± 20 nm) and 1300 nm (± 20 nm).
4.24.6.5.6.1.2) Event deadzones of 3.7 m maximum at 850 nm and 1300 nm.
4.24.6.5.6.1.3) Attenuation deadzones of 10 m maximum at 850 nm and 13 m maximum at 1300 nm.
4.24.6.5.6.1.4) Distance range not less than 2000 m.

4.24.6.5.6.1.5) Dynamic range at least 10 dB at 850 nm and 1300 nm

4.24.6.5.6.2) Singlemode OTDR
4.24.6.5.6.2.1) Wavelengths of 1310 nm (± 20 nm) and 1550 nm (± 20 nm).
4.24.6.5.6.2.2) Event deadzones of 3.5 m maximum at 1310 nm and 1550 nm.
4.24.6.5.6.2.3) Attenuation deadzones of 10 m maximum at 1310 nm and 12 m maximum at 1550 nm.
4.24.6.5.6.2.4) Distance range not less than 10000 m.
4.24.6.5.6.2.5) Dynamic range at least 10 dB at 1310 nm and 1550 nm

4.24.6.5.7) Fiber Microscope

4.24.6.5.7.1) Magnification of 200X or 400X for endface inspection.
4.24.6.5.7.2) Test equipment shall be capable of saving and reporting the endface image.

4.24.6.5.8) Integrated OLTS, OTDR and fiber microscope
4.24.6.5.8.1) Test equipment that combines into one instrument an OLTS, an OTDR and a fiber microscope may be used.

4.24.6.6) Administration

4.24.6.6.1) Administration of the documentation shall include test results of each fiber link and channel.

4.24.6.6.2) The test result information for each link shall be recorded in the memory of the field-test instrument upon completion of the test.

4.24.6.6.3) The test result records saved within the field-test instrument shall be transferred into a Microsoft Windows™-based database utility that allows for the maintenance, inspection and archiving of these test records.

4.24.6.7) Execution of Optical Fiber Cable Testing

4.24.6.7.1) All outlets, cables, patch panels and associated components shall be fully assembled and labeled prior to field-testing. Any testing performed on incomplete systems shall be redone on completion of the work.
4.24.6.7.2) All tests performed on optical fiber cabling that use a laser or LED in a test set shall be carried out with safety precautions in accordance with ANSI Z136.2.
4.24.6.7.3) Field-test instruments shall have the latest software and firmware installed.
4.24.6.7.4) Link and channel test results from the OLTS and OTDR shall be recorded in the test instrument upon completion of each test for subsequent uploading to a PC in which the administrative documentation (reports) may be generated.
4.24.6.7.5) Fiber endfaces shall be inspected at 200X or 400X magnification. 200X magnification is suitable for inspecting multimode and singlemode fibers. 400X magnification may be used for detailed examination of singlemode fibers. Scratched, pitted or dirty connectors shall be diagnosed and corrected.
4.24.6.7.5.1) Endface images shall be recorded in the memory of the test instrument for subsequent reporting.
4.24.6.7.6) Testing shall be performed on each cabling segment (connector to connector).
4.24.6.7.7) Testing shall be performed on each cabling channel (equipment to equipment) that is planned for use per the Owner’s instructions.

4.24.6.7.8) Testing of the cabling shall be performed using high-quality test cords of the same fiber type as the cabling under test. The test cords for OLTS testing shall be between 1 m and 5 m in length. The test cords for OTDR testing shall be approximately 100 m for the launch cable and at least 25 m for the receive cable.

4.24.6.7.9) Optical loss testing

4.24.6.7.9.1) Backbone link

4.24.6.7.9.1.1) Multimode backbone links shall be tested at 850 nm and 1300 nm in accordance with ANSI/EIA/TIA-526-14A, Method B, One Reference Jumper or the equivalent method.

4.24.6.7.9.1.2) Singlemode backbone links shall be tested at 1310 nm and 1550 nm in accordance with ANSI/TIA/EIA-526-7, Method A.1, One Reference Jumper or the equivalent method.

4.24.6.7.9.1.3) Link attenuation does not include any active devices or passive devices other than cable, connectors, and splices, i.e. link attenuation does not include such devices as optical bypass switches, couplers, repeaters, or optical amplifiers.

4.24.6.7.9.1.4) Use the One Reference Jumper Method specified by ANSI/TIA/EIA-526-14A, Method B and ANSI/TIA/EIA-526-7, Method A.1 or the equivalent method. The user shall follow the procedures established by these standards or application notes to accurately conduct performance testing.

4.24.6.7.9.2) Horizontal (multimode) link

4.24.6.7.9.2.1) The horizontal optical fiber cabling link segments need to be tested at only one wavelength. Because of the short length of cabling, attenuation deltas due to wavelength are insignificant. The horizontal link shall be tested at 850 nm or 1300 nm in one direction in accordance with ANSI/EIA/TIA-526-14A, Method B, One Reference Jumper method or the equivalent method.

4.24.6.7.9.3) Centralized (multimode) link

4.24.6.7.9.3.1) The centralized optical fiber cabling link segments need to be tested at only one wavelength. Because of the short length of cabling, attenuation deltas due to wavelength are insignificant. The horizontal link shall be tested at 850 nm or 1300 nm in one direction in accordance with ANSI/EIA/TIA-526-14A, Method B, One Reference Jumper method or the equivalent method. Testing at 850 nm is recommended unless otherwise specified by the Owner.

4.24.6.7.10) OTDR Testing

4.24.6.7.10.1) Backbone, horizontal and centralized links shall be tested at the appropriate operating wavelengths for anomalies and to ensure uniformity of cable attenuation and connector insertion loss.

4.24.6.7.10.1.1) Backbone multimode: 850 nm and 1300 nm

4.24.6.7.10.1.2) Backbone singlemode: 1310 nm and 1550 nm

4.24.6.7.10.1.3) Horizontal multimode: 850 nm or 1300 nm

4.24.6.7.10.1.4) Centralized multimode: 850 nm or 1300 nm (850 nm recommended unless otherwise specified by the end user)

4.24.6.7.10.2) Each fiber link and channel shall be tested in one direction.

4.24.6.7.10.3) A launch cable shall be installed between the OTDR and the first link connection.

4.24.6.7.10.4) A receive cable shall be installed after the last link connection.

4.24.6.7.11) Magnified Endface Inspection

4.24.6.7.11.1) Fibers shall be inspected at 250X or 400X magnification. 250X magnification is suitable for inspecting multimode and singlemode fibers. 400X magnification may be used for detailed examination of singlemode fibers.

4.24.6.7.12) Length Measurement

4.24.6.7.12.1) The length of each fiber shall be recorded.

4.24.6.7.12.2) It is preferable that the optical length be measured using an OLTS or OTDR.

4.24.6.7.13) Polarity Testing

4.24.6.7.13.1) Paired duplex fibers in multi-fiber cables shall be tested to verify polarity in accordance with subclause 10.3 of ANSI/TIA/EIA 568 B.1. The polarity of the paired duplex fibers shall be verified using an OLTS.

4.24.7) Security/Surveillance Power Cable Testing

100% of the Security/Surveillance cables in the installation shall be tested.

All conductors of the installed Security/Surveillance cable shall be tested and shall be confirmed continuous.

The installed Security/Surveillance cable shall be tested from the point of termination, to the Security/Surveillance patch panel.

4.24.8) Additional Requirements

4.24.8.1) The test results documentation shall be available for inspection by the Owner Project Manager and the Owner Technical Contact during the installation period and shall be passed to the Owner Project Manager and the Owner Technical Contact representative within 5 working days of completion of tests on cabling served by a Communications Room or of backbone cabling. The installer shall retain a copy to aid preparation of as built information.

4.24.8.2) Circuit IDs reported by the test instrument shall match the Cable Marking Label on the patch panel end of the tested cable, in accordance with the Cable Installation Labeling Convention, described in this Specification.

4.25) Documentation

4.25.1) Category 6 / 6A Test Results

Contractor will supply test results from test equipment for all cables that Contractor installs.

The test results information for each link shall be recorded in the electronic memory of the field tester equipment upon completion of the test.

The test results records saved by the field tester shall be transferred into a Microsoft Windows™-based database utility that allows for the maintenance, inspection, archiving, and plain-text exporting of these test records. A guarantee must be made that the measurement results are transferred to the PC unaltered (i.e., “as saved in the field-test instrument”) and that these results cannot be modified at a later time. Testers that transfer the numeric measurement data from the tester to the PC in a non-printable format in this regard offer superior protection. The file format, CSV (comma separated value), does not provide adequate protection of these records and shall not be used.

The database for the completed job and all source tester data files shall be stored and delivered on CD-ROM prior to Owner acceptance of the tested cable. This CD-ROM shall include the software tools required to view, inspect, and print any selection of the test reports.

A paper hard copy shall be submitted, containing a test results summary of each installed link.

4.25.1.1) Hard Copy

A paper copy of the test results shall be provided that lists all the links that have been tested with the following summary information:

4.25.1.1.1) The identification of the link in accordance with the Cable Installation Labeling Convention, described in this Specification
4.25.1.1.2) The overall Pass/Fail evaluation of the link-under-test including the NEXT Headroom (overall worst case) number
4.25.1.1.3) The date and time the test results were saved in the memory of the tester

4.25.1.2) Database General Information

General Information to be provided in the electronic database with the test results information for each link:

4.25.1.2.1) The identification of the customer site as specified by Owner
4.25.1.2.2) The identification of the link in accordance with the Cable Installation Labeling Convention, described in this Specification
4.25.1.2.3) The overall Pass/Fail evaluation of the link-under-test
4.25.1.2.4) The name of the standard selected to execute the stored test results
4.25.1.2.5) The cable type and the value of NVP used for length calculations
4.25.1.2.6) The date and time the test results were saved in the memory of the tester
4.25.1.2.7) The brand name, model and serial number of the tester
4.25.1.2.8) The identification of the tester interface
4.25.1.2.9) The revision of the tester software and the revision of the test standards database in the tester
4.25.1.2.10) The test results information must contain information on each of the required test parameters that are listed in Section **Error! Reference source not found.** (“Performance Test Parameters”) and as further detailed below under paragraph 4.25.1.3) (“Database Detailed Information”)

4.25.1.3) Database Detailed Information

The detailed test results data to be provided in the electronic database for each tested Category 6 / 6A link must contain the following information:

For each of the frequency-dependent test parameters, the minimum test results documentation shall be stored for each wire-pair or wire-pair combination as observed from each end of the link. The minimum test results documentation for each test parameter shall be in compliance with the information in Section **Error! Reference source not found.** (“Performance Test Parameters”)

4.25.1.3.1) The name of the test limit selected to execute the stored test results
4.25.1.3.2) The name of the personnel performing the test
4.25.1.3.3) The date and time the test results were saved in the memory of the tester
4.25.1.3.4) The manufacturer, model and serial number of the field-test instrument
4.25.1.3.5) The version of the test software and the version of the test limit database held within the test instrument
4.25.1.3.6) Length: Identify the wire-pair with the shortest electrical length, the value of the length rounded to the nearest foot and the test limit value
4.25.1.3.7) Propagation delay: Identify the pair with the shortest propagation delay, the value measured in nanoseconds (ns) and the test limit value
4.25.1.3.8) Delay Skew**:** Identify the pair with the largest value for delay skew, the value calculated in nanoseconds (ns) and the test limit value
4.25.1.3.9) Insertion Loss (Attenuation): Minimum test results documentation as explained in Section **Error! Reference source not found.** (“Performance Test Parameters”) for the wire pair with the worst insertion loss
4.25.1.3.10) Return Loss: Minimum test results documentation as explained in Section **Error! Reference source not found.** (“Performance Test Parameters”). Identify as detected from each end of the link, the wire pair that exhibits the worst-case margin and the wire pair with the worst RL. Each reported case shall include the frequency at which it occurs as well as the test limit value at this frequency.
4.25.1.3.11) NEXT, ELFEXT, ACR: Minimum test results documentation as explained in Section **Error! Reference source not found.** (“Performance Test Parameters”). Identify as measured from each end of the link, the wire pair combination that exhibits the worst case margin and the wire pair combination that delivers the worst case value. Each reported case shall include the frequency at which it occurs as well as the test limit value at this frequency.
4.25.1.3.12) PSNEXT, PSELFEXT, and PSACR: Minimum test results documentation as explained in Section **Error! Reference source not found.** (“Performance Test Parameters”). Identify as detected from each end of the link, the wire pair that exhibits the worst-case margin and the wire pair with the worst value. Each reported case shall include the frequency at which it occurs as well as the test limit value at this frequency.
4.25.1.3.13) Link length, propagation delay, and delay skew shall also be reported for each wire pair as well as the test limit for each of these parameters.

4.25.2) Telecommunications Feeder Cable Test Results

Contractor will supply test results from test equipment for all Telecommunications Feeder Cables that Contractor installs.

The test results information for each pair of the installed Telecommunications Feeder Cable shall be recorded in the electronic memory of the field tester equipment upon completion of the test.

The test results records saved by the field tester shall be transferred into a Microsoft Windows™-based database utility that allows for the maintenance, inspection, archiving, and plain-text exporting of these test records. A guarantee must be made that the measurement results are transferred to the PC unaltered (i.e., “as saved in the field-test instrument”) and that these results cannot be modified at a later time. Testers that transfer the numeric measurement data from the tester to the PC in a non-printable format in this regard offer superior protection. The file format, CSV (comma separated value), does not provide adequate protection of these records and shall not be used.

The database for the completed job and all source tester data files shall be stored and delivered on CD-ROM prior to Owner acceptance of the tested cable. This CD-ROM shall include the software tools required to view, inspect, and print any selection of the test reports.

A paper hard copy shall be submitted, containing a test results summary of each installed pair.

4.25.2.1) Hard Copy

A paper copy of the test results shall be provided that lists all the pairs that have been tested with the following summary information:

4.25.2.1.1) The identification of the pair in accordance with the Cable Installation Labeling Convention, described in this Specification
4.25.2.1.2) The overall Pass/Fail evaluation of the pair-under-test
4.25.2.1.3) The date and time the test results were saved in the memory of the tester

4.25.2.2) Database General Information

General Information to be provided in the electronic database with the test results information for each pair:

4.25.2.2.1) The identification of the customer site as specified by Owner
4.25.2.2.2) The identification of the pair in accordance with the Cable Installation Labeling Convention, described in this Specification
4.25.2.2.3) The overall Pass/Fail evaluation of the link-under-test
4.25.2.2.4) The name of the standard selected to execute the stored test results
4.25.2.2.5) The cable type
4.25.2.2.6) The date and time the test results were saved in the memory of the tester
4.25.2.2.7) The brand name, model and serial number of the tester
4.25.2.2.8) The identification of the tester interface
4.25.2.2.9) The revision of the tester software and the revision of the test standards database in the tester
4.25.2.2.10) The test results information must contain information on each of the required test parameters as detailed below under “Database Detailed Information”

4.25.2.3) Database Detailed Information

The detailed test results data to be provided in the electronic database for each tested Category 3 pair must contain the following information:

For each of the frequency-dependent test parameters, the minimum test results documentation shall be stored for each wire-pair or wire-pair combination as observed from each end of the pair. The minimum test results documentation for each test parameter shall be in compliance with TIA568-B specification for Category 3 cable.

4.25.2.3.1) The name of the test limit selected to execute the stored test results
4.25.2.3.2) The name of the personnel performing the test
4.25.2.3.3) The date and time the test results were saved in the memory of the tester
4.25.2.3.4) The manufacturer, model and serial number of the field-test instrument
4.25.2.3.5) The version of the test software and the version of the test limit database held within the test instrument
4.25.2.3.6) Insertion Loss (Attenuation)
4.25.2.3.7) Return Loss: Identify as detected from each end of the pair, the wire pair that exhibits the worst-case margin and the wire pair with the worst RL. Each reported case shall include the frequency at which it occurs as well as the test limit value at this frequency.

4.25.3) Fiber-Optic Cable Test Results

Contractor will supply test results from test equipment for all Fiber-Optic cables that Contractor installs.

The test results information for each terminated or fused strand shall be recorded in the electronic memory of the field tester equipment upon completion of the test.

The test results records saved by the field tester shall be transferred into a Microsoft Windows™-based database utility that allows for the maintenance, inspection, archiving, and plain-text exporting of these test records. A guarantee must be made that the measurement results are transferred to the PC unaltered (i.e., “as saved in the field-test instrument”) and that these results cannot be modified at a later time. Testers that transfer the numeric measurement data from the tester to the PC in a non-printable format in this regard offer superior protection. The file format, CSV (comma separated value), does not provide adequate protection of these records and shall not be used.

The database for the completed job and all source tester data files shall be stored and delivered on CD-ROM prior to Owner acceptance of the tested cable. This CD-ROM shall include the software tools required to view, inspect, and print any selection of the test reports.

A paper hard copy shall be submitted, containing a test results summary of each strand.

4.25.3.1) Hard Copy

A paper copy of the test results shall be provided that lists all the links that have been tested with the following summary information:

4.25.3.1.1) The identification of the strand in accordance with the Cable Installation Labeling Convention, described in this Specification
4.25.3.1.2) The overall Pass/Fail evaluation of the strand-under-test
4.25.3.1.3) The date and time the test results were saved in the memory of the tester

4.25.3.2) Database General Information

General Information to be provided in the electronic database with the test results information for each link:

4.25.3.2.1) The identification of the customer site as specified by Owner
4.25.3.2.2) The identification of the pair in accordance with the Cable Installation Labeling Convention, described in this Specification
4.25.3.2.3) The overall Pass/Fail evaluation of the strand-under-test
4.25.3.2.4) The name of the standard selected to execute the stored test results
4.25.3.2.5) The cable type
4.25.3.2.6) The date and time the test results were saved in the memory of the tester
4.25.3.2.7) The brand name, model and serial number of the tester
4.25.3.2.8) The identification of the tester interface
4.25.3.2.9) The revision of the tester software and the revision of the test standards database in the tester
4.25.3.2.10) The test results information must contain information on each of the required test parameters as detailed below under “Database Detailed Information”

4.25.3.3) Database Detailed Information

Detailed test results documentation data is to be provided in an electronic database for each tested optical fiber and shall contain the following information:

4.25.3.3.1) The identification of the customer site as specified by Owner
4.25.3.3.2) The name of the test limit selected to execute the stored test results
4.25.3.3.3) The name of the personnel performing the test
4.25.3.3.4) The date and time the test results were saved in the memory of the tester
4.25.3.3.5) The manufacturer, model and serial number of the field-test instrument
4.25.3.3.6) The version of the test software and the version of the test limit database held within the test instrument
4.25.3.3.7) Circuit ID - as reported by the test instrument and matching the label on test tested cable, in accordance with the Cable Installation Labeling Convention, described in this Specification
4.25.3.3.8) The fiber strand identification number
4.25.3.3.9) The length for each optical fiber
4.25.3.3.10) Optionally the index of refraction used for length calculation when using a length capable OLTS
4.25.3.3.11) Test results to include OLTS attenuation link and channel measurements at the appropriate wavelength(s) and the margin (difference between the measured attenuation and the test limit value).
4.25.3.3.12) Test results to include OTDR link and channel traces and event tables at the appropriate wavelength(s).
4.25.3.3.13) The length for each optical fiber as calculated by the OTDR.
4.25.3.3.14) The overall Pass/Fail evaluation of the link-under-test for OLTS and OTDR measurements
4.25.3.3.14.1) A picture or image of each fiber end-face
4.25.3.3.15) A pass/fail status of the end-face based upon visual inspection.

Part 5: Documentation

5) **As-Built Documentation**

Contractor shall provide as-built documentation in electronic format, describing all work performed. As-built documentation shall follow apparent documentation standards and formats of existing data wiring documentation and building plans, submitted to Contractor by Owner.

5.1) Circuit Endpoint Table

Contractor shall submit a completed “Circuit Endpoint Table.xls” document, entering as-built labeling information for 100% of installed cables into this Microsoft Excel document. A blank “Circuit Endpoint Table.xls” form shall be provided to Contractor by Owner upon request.

Contractor shall submit completed spreadsheet to Owner as both electronic document (Microsoft Excel spreadsheet), and as hard-copy.

5.2) As-Built Drawings

Contractor shall provide a full set of as-built drawings in electronic format as a Microsoft Visio document, in file format of most recent commercially-available version of Microsoft Visio.

As-built drawings shall convey an accurate depiction of the entire installation superimposed on a drawing of the building. As-built drawings must be to scale.

All edits and additions by Contractor shall be placed in a new layer, which shall have a name clearly identifying Contractor name, and date of job completion.

The as-built drawings shall include, but shall not be limited to, the following information for all materials installed by Contractor and for all existing materials used by Contractor:

5.2.1) Inside Service Plant (ISP) drawings, depicting all installed materials, as well as any existing materials utilized, along with building envelope, walls, and features. These shall include, but not be limited to:

5.2.1.1) Station outlet location and label
5.2.1.2) Details of cable path
5.2.1.3) Locations of cable termination points
5.2.1.4) Locations of pull boxes
5.2.1.5) Locations and diameter of conduits/sleeves
5.2.1.6) Locations and manufacturer/model number of raceways
5.2.1.7) Locations of penetrations and installed firestopping
5.2.1.8) Block diagrams
5.2.1.9) Frame and cable labeling
5.2.1.10) Locations of cabinets/racks
5.2.1.11) Equipment room layouts and frame installation details

5.2.2) Outside Service Plant (OSP) drawings, depicting all installed materials, as well as any existing materials utilized, along with campus building envelopes and landmarks. This shall include, but not be limited to:

5.2.2.1) Photographic aerial image of campus or accurate plan that includes:
5.2.2.1.1) Label/name of each utilized or installed manhole, handhole, and pole as per existing documentation or else as directed by Owner Technical Contact,
5.2.2.1.2) Label/name of each utilized or installed manhole any label evident in the utilized manhole or on its cover
5.2.2.1.3) Precise locations of each utilized manhole, handhole, and pole, as determined by the Global Positioning System (GPS), expressed as longitude and latitude in DMS (degrees◦ minutes' seconds"), and accurate to one-hundredth of a minute.
5.2.2.1.4) Location of any trench with type of:
5.2.2.1.4.1) Conduit(s) Installed
5.2.2.1.4.2) Backfill(s) Used
5.2.2.1.5) Location(s) of any Conduit(s) used

5.2.2.2) Cable schematic diagram, with:
5.2.2.2.1) Label/name of each utilized or installed manhole, handhole, and pole as per existing documentation or else as directed by Owner Technical Contact,
5.2.2.2.2) Label/name of each utilized or installed manhole any label evident in the utilized manhole or on its cover

5.2.2.2.3) Precise locations of each utilized manhole, handhole, and pole, as determined by the Global Positioning System (GPS), expressed as longitude and latitude in DMS (degrees◦ minutes' seconds"), and accurate to one-hundredth of a minute.
5.2.2.2.4) Measured pull distances between manholes, as evident from markings on installed pull tape and/or cable jacket
5.2.2.2.5) The type of cable that was installed between manholes, handholes and poles. e.g. 24-strand-SM-fiber, OSP-CAT6, etc., etc.
5.2.2.2.6) The cable labels installed on ends of cables shown

5.2.2.3) Manhole fold-out drawings for any installed manhole(s), and for any manhole(s) in which splice enclosure has been installed

5.2.3) The as built drawings shall also include accurate depiction of all field-directed changes made up to construction completion. These shall include, but not limited to:
5.2.3.1) field-directed changes to pull schedule
5.2.3.2) field-directed changes to cross connect and patching schedule
5.2.3.3) horizontal cable routing changes
5.2.3.4) backbone cable routing or location changes
5.2.3.5) associated detail drawings

5.3) Firestopping Locations

Contractor shall provide a table of as-built firestopping locations in Microsoft Excel format as in the following example:

Example:

	A	B	C	D
1	**Location**	**Description**	**Manufacturer**	**Material**
2	LI1005C-FL01	Above Cable tray	Hilte	Intumescent putty
3	LI1005C-FL02	Around 4" Conduit	Hilte	Mortar
4	LI1005C-FL03	Inside 4" conduit	Hilte	Vermiculite Pillow
…				
…				
…				
37	LI0003F-PP01-22	3" Cabinet penetration	PRC-DeSoto	PR-855 Chase Foam

5.4) Submission of Manufacturer Warranty Information

Contractor shall submit Manufacturer Warranty documents on installed cable plant upon completion of installation. Warranty documents must state specific terms of Warranty, including:

5.4.1) Start date
5.4.2) Length of Warranty (years)
5.4.3) Contact information
5.4.4) What is Covered

5.4.5) Exclusions

5.5) Punch Lists

Owner Project Manager and Owner Technical Contact shall inspect all work with Contractor at a punch list inspection tours, to take place as determined by Owner Project Manager.

Additional punch list inspection tours shall be performed as deemed necessary by Owner Project Manager, whereby prior punch list items shall be inspected, and additional punch list items may be generated.

The punch lists shall be conveyed in writing by Owner Project Manager to Owner Technical Contact, and to Contractor.

Contractor shall provide all materials and labor to repair, replace, or complete each punch list item that is within the Scope of Work (if provided) and the original RFQ/RFP/Project.

Contractor shall respond to all punch list items in writing, either by stating that the item has been addressed/completed or by claiming that the item is outside of the Scope of Work (if provided) and the original RFQ/RFP/Project..

Final payment shall not be released by Owner until after such a time that all punch list items have been completed to the satisfaction of Owner Project Manager and Owner Technical Contact.

5.6) Unused materials

At completion of work, Contractor shall deliver to Owner Technical Contact any materials of significant value that were included in Contractor’s cost quotation/proposal for the work, but neither delivered, installed, nor credited by Contractor to Owner.

This shall include, but not be limited to:

5.6.1) Spooled/reeled/boxed copper cable greater than 150’ in length
5.6.2) Unused or trimmed Fiber-Optic cable greater than 1000’ in length
5.6.3) Unused jacks and faceplates
5.6.4) Unused patch panels
5.6.5) Unused patch cables
5.6.6) Unused racks/cabinets
5.6.7) Unused cable management
5.6.8) Unused conduit, raceway and cable tray, greater than 5’ in length
5.6.9) Unused conduit, raceway, and cable tray fittings
5.6.10) Unused fire stopping
5.6.11) Unused wireless access point brackets/enclosures

*** **END OF DOCUMENT** ***

SECTION 28 05 13

ELECTRONIC SECURITY CONDUCTORS AND CABLING

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Applicable requirements of Division 01 - General Requirements and Division 28, Section 28 00 00 shall be considered a part of this section and shall have the same force as if printed herein full.

B. Strict adherence to SUNY Purchase Network Cable Installation Specification contained in its entirety within technical specification 271000 of these contract documents is required. Any deviation from these requirements will require prior owner/consultant approval before installation, no exceptions.

C. The work to be done under this section of the Specifications shall include the furnishing of labor, material, equipment, and tools required for the complete installation of the work indicated on the Drawings, as specified herein, or as noted in other sections of Division 28 – Electronic Safety and Security.

D. All materials, obviously a part of the electronic security infrastructure and necessary to its proper operation, but not specifically mentioned or shown on the Drawings, shall be furnished and installed without additional charge.

E. The Drawings and Specifications are complementary to each other and what is called for by one shall be as binding as if called for by both. If a discrepancy exists between the Drawings and Specifications, the higher cost and/or higher level of functionality shall be included to meet the design intent.

1.2 RELATED SECTIONS

A. Network Cable Installation – Section 27 10 00

B. Access Control – Section 28 13 00

C. Access Control Field Devices – Section 28 13 26

1.3 WORK INCLUDED

A. The Security Management System (SMS) shall consist of:

1. Access Control and Alarm Monitoring System
2. Security Equipment Racks, Cabinets, and Consoles
3. Wire and cable to install all equipment as specified herein
4. Miscellaneous conduit and back boxes (not shown on the Documents as provided, but required for a complete installation)

1.4 REFERENCES

A. All work shall be in accordance with, but not limited to, the following:

1. The National Electrical Code

2. American National Standards Institute (ANSI)
3. National Electrical Manufacturers Association (NEMA)
4. Telecommunications Industries Association (TIA)
5. Electronic Industries Association (EIA)
6. Institute of Electrical & Electronics Consultants (IEEE)
7. Underwriters Laboratories (UL)
8. American Standards Association (ASA)
9. Federal Communications Commission (FCC)
10. Occupational Safety and Health Administration (OSHA)
11. American Society of Testing Material (ASTM)
12. Americans with Disabilities Act (ADA)
13. Local city and county ordinances

B. In the event of conflicts, the more stringent provisions shall apply.

PART 2 PRODUCTS

2.1 GENERAL

A. All products not provided by the end-user shall be new and unused and shall be of manufacturers' current and standard production.

B. Where two or more equipment items of the same kind are provided, all shall be identical and provided by the same manufacturer.

C. Drawings and Specifications indicate major system components, and may not show every component, connector, module, or accessory that may be required to support the operation specified. Contractor shall provide all components needed for complete and satisfactory and intended operation.

D. Product Availability

1. Contractor, prior to submitting a proposal, shall determine product availability and delivery time, and shall include such considerations into his proposed Contract Time.
2. Certain products specified may only be available through factory authorized dealers and distributors. Contractor shall verify his ability to procure the products specified prior to submitting a proposal.

E. Wire and Cable

1. Strict adherence to SUNY Purchase Network Cable Installation Specification contained in its entirety within technical specification 271000 of these contract documents is required. Any deviation from these requirements will require prior owner/consultant approval before installation, no exceptions.
2. General: Provide all wire and cable required to install systems as indicated. Wire and cable shall be sized to provide minimum voltage drop and minimum resistance to the devices being supplied.
3. All cables shall be specifically designed for their intended use (direct burial, aerial, etc.).
4. Comply with equipment manufacturers recommendations for wire and cable size and type.
5. Comply with all applicable codes and ordinances.

F. Conduit and Raceway Systems

1. General: The placing of surface mounted conduit on the exterior of any building shall be approved by end-user prior to its installation.
2. Interior Conduit:
   a. Electrical Metallic Tubing (EMT)
   b. Flexible Metal Conduit
   c. Provide fittings and connectors as required for installation of EMT or flexible conduit.
3. Surface Raceways:
   a. Sheet metal channel with fitted cover, suitable for use as surface metal raceway, WIREMOLD, or approved equal.
   b. Provide fittings, elbows, and connectors designed for use with raceway system.
4. Exterior Conduit: (any of the following as determined by local code requirements):
   a. Rigid Steel Conduit
   b. Rigid Aluminum Conduit
   c. Rigid Nonmetallic Conduit (only if buried 18" below ground surface).
   d. Intermediate Metal Conduit
   e. Provide rain-tight fittings and connectors as required for installation of exterior conduit.
5. Exterior Flexible Conduit:
   a. Liquid-tight Flexible Conduit: Flexible metal conduit with PVC jacket.
   b. Provide rain-tight fittings and connectors as required for installation of Liquid-tight Flexible Conduit.

G. Junction and Pull Boxes

1. Interior Boxes: Sheet Metal Outlet Boxes: Sizes to be determined in accordance with code requirements for conductor fill. Provide box covers as required.
2. Exterior Boxes: All exterior boxes shall NEMA 4 or NEMA 3R, water-tight and dust-tight
3. All interior and exterior boxes shall have their covers fastened using security screws.

H. Lightning Protection

1. The Contractor shall provide suitable lightning protection for all processors/controllers.
   a. All lightning protection equipment shall be UL listed.

2.2 WIRE AND CABLE

A. General Requirements:

1. Provide wire and cable as required to install the Security System as indicated on the Drawings and specified herein.
2. All wire and cable shall be Underwriter’s Laboratories (UL) listed, and shall meet all national, state, and local code requirements for its application.
3. All wire and cable shall meet individual system or subsystem manufacturer Specifications.
4. All wire and cable shall be Plenum type cable and shall conform to the minimum requirements of Insulated Cable Engineers Association (ICEA) Standards.
5. Wire and cable shall comply with the applicable requirements of the National Electrical Code (NEC), latest edition, in regard to cable construction and usage.
6. The conductors of wires shall be copper and have conductivity in accordance with the standardization rules of the Institute of Electrical and Electronics Engineers, Inc. (IEEE). The conductor and each strand shall be round and free of kinks and defects.
7. All cable carrying data or voice transmissions shall be shielded. All other cable shall be shielded where necessary for interference-free signals.
8. Insulation shall be rated for a minimum of 300V.

9. Color-coding shall be accomplished by using solidly colored insulation. Grounding conductors, where insulated, shall be colored solid green or identified with green color as required by the National Electric Code (NEC).

B. Wire Types and Sizes

1. Signal Cable (Non-Power): Wire size shall be a minimum of 20 AWG, twisted, shielded, stranded, insulated, and jacketed.
2. Signal Cable (Low Voltage Power): Wire size shall be a minimum of 18 AWG, stranded, insulated, and jacketed.
   a. Wire size shall be a minimum of 18 AWG, twisted, stranded, insulated and jacketed and shall be used for cable runs less than 500 feet.
   b. Wire size shall be a minimum of 16 AWG, twisted, stranded, insulated and jacketed and shall be used for cable runs in excess of 500 feet, but less than 750 feet.
   c. Wire size shall be a minimum of 14 AWG, twisted, stranded, insulated and jacketed and shall be used for cable runs in excess of 750 feet, but less than 1,250 feet.

C. Composite Cable for Door Devices

1. Composite cable shall contain the following cable types: 22 AWG 6 Conductor (QTY 1), 22 AWG 2 Conductor (QTY 1), 22 AWG 4 Conductor (QTY 1), 18 AWG 2 Conductor (QTY 1)
2. Acceptable Manufacture: Belden 658AFS, or approved equal

D. Card Reader, Single Cable

1. Cable shall be a 22 AWG 6 Conductor
2. Acceptable Manufacture: West Penn 253270B, or approved equal

E. Electric Lock Cable

1. Cable shall be an 18AWG 2 Conductor
2. Acceptable Manufacture: West Penn 25224B, or approved equal

F. Door Contact Cable

1. Cable Shall be an 22AWG 2 Conductor
2. Acceptable Manufacture: West Penn 25221B, or approved equal

G. Request to Exit or Accessory Cable

1. Cable Shall be and 18AWG 4 Conductor
2. Acceptable Manufacture: West Penn 25244B, or approved equal

H. Security IP Network Cabling

1. Refer to specification 271000 for Network Cable Installation requirements.
2. Strict adherence to SUNY Purchase Network Cable Installation Specification contained in its entirety within technical specification 271000 of these contract documents is required. Any deviation from these requirements will require prior owner/consultant approval before installation, no exceptions

I. IP Network Patch Cables for Security Equipment

1. Refer to specification 271000 for Network Cable Installation requirements.
2. Strict adherence to SUNY Purchase Network Cable Installation Specification contained in its entirety within technical specification 271000 of these contract documents is required. Any deviation from these requirements will require prior owner/consultant approval before installation, no exceptions

PART 3 EXECUTION

3.1 SITE INSPECTIONS

A. Continuously verify that the site conditions are in agreement with the Documents and the design package. Submit a report to the Architect documenting changes to the site or conditions that affect the performance of the System to be installed. For those changes or conditions, which affect System installation or performance, provide (with the report) specification sheets, or written functional requirements to support the findings, and a cost estimate to correct the deficiency. No deficiency shall be corrected without written permission from the owner/consultant.

B. Specific mounting locations, exact wire and cable runs, and conduit routing have not been specified or delineated on the Documents. Coordinate all aspects of the Work with the owner/consultant.

3.2 COORDINATION

A. Coordinate with the owner/consultant to ensure that adequate conduit is provided and that equipment back-boxes are adequate for System installation.

B. Coordinate with the owner/consultant to ensure that adequate power has been provided and properly located for the security System equipment.

C. Coordinate with the owner/consultant to ensure that doors and doorframes are properly prepared for electric locking hardware and door position switches.

D. Coordinate locations of all devices with the owner/consultant prior to installation.

END OF SECTION

SECTION 28 13 00

ACCESS CONTROL

PART 1 - GENERAL

1.1 WORK INCLUDED

A. The Work shall include installation and commissioning of the following:
   1. Integrated Security Management System (SMS) consisting of electronically access controlled openings that are added to the existing campus wide security system (Genetec).
   2. Security Equipment Racks, Cabinets, and Consoles
   3. Wire and cable to install all equipment as specified herein
   4. Miscellaneous conduit and back boxes (not shown on the Documents as provided, but required for a complete installation)

1.2 SCOPE OF WORK

A. The scope of work to be included in this contract does not necessarily include every item of work. The Contractor shall supply and install items that meet the specified requirements/needs of the construction documents. The Security Management System (SMS) Servers and Workstations are all existing. As per this contract, the contractor will provide all pertinent software updates to make the system and its components current with manufacturer requirements. All software and software licenses for all devices will be provided by the contractor.

B. Dedicated, secure equipment space shall be provided to accommodate distributed processing equipment (access control panels) and power supplies for electric locking hardware. This will ideally be in separately locked cabinets in the same space(s) that serve(s) space-wide data communications needs. Equipment (including batteries and other serviceable devices) shall not be located above ceilings. SMS controllers shall be installed within the access-controlled space and above ceiling in a locked and monitored enclosure with local battery backup and full functionality at controlled space if communications are lost. Any new SMS network shall be compatible for direct interconnection with current and planned networks installed in the space.

C. All doors with access control shall have a position switch to allow notification to designated personnel of forcing door open without authorized entry, propping of the door, or opening of selected doors during times when they should not be accessed. All designated security doors, with or without card readers shall have position switch(es) to allow indication of status, with alarming software applications that provides for alarming by time of day and for door being held opened in excess of a user selectable time period or opening of selected doors during times when there should not be accessed.

D. The work to be provided, in addition to designing, furnishing, and installing the additions to the existing SMS, shall include the following:
   1. Provide complete system design and engineering.
   2. Provide software that meets specified contract requirements.
   3. Verification that proposed equipment and devices furnished are adequate for the intended purpose.
   4. Installation, set-up, and programming of SMS server and any related ancillary equipment.

5. Perform a layout check to ensure that adequate access is available for construction, installation, and maintenance of equipment and devices furnished.
6. Perform acceptance tests to show system is properly installed and that it meets the specifications and applicable codes.
7. Provide option for system integration with the digital video surveillance system.
8. SMS system administration will be by client. The System Administrator shall be responsible to configure and maintain the system after system acceptance. System utilities shall be provided for the System Administrator to use. Software for database backups and log file maintenance shall also be provided.

E. The SMS contractor shall be responsible for all initial programming, software configuration, and graphics development to provide a complete operating SMS System as described heir in. Client will be responsible for the creation/modification of the personnel database and assigning access levels and privileges to individual cardholders.

F. Client currently standardizes on Genetec Access Control System. Contractor shall coordinate with client and consultant to ensure version match on all software and components of the access control system to ensure there is no mismatch of software/hardware between client site and secondary monitoring site.

1.3 QUALIFICATIONS

A. The system programmer shall have attended manufacturer training and obtained certification in Genetec Technical Certification.

B. The system programmer (actual onsite personnel performing the install) shall have attended manufacturer training and obtained certification in Genetec - Enterprise Technical Certification or equivalent.

C. The system programmer shall be a Genetec certified partner with all pertinent certifications.

D. The system programmer shall submit proof of certifications.

PART 2 - PRODUCTS

2.1 GENERAL

A. All products not provided by the end-user shall be new and unused and shall be of manufacturers' current and standard production.

B. Where two or more equipment items of the same kind are provided, all shall be identical and provided by the same manufacturer.

C. Drawings and Specifications indicate major system components, and may not show every component, connector, module, or accessory that may be required to support the operation specified. Contractor shall provide all components needed for complete and satisfactory and intended operation.

D. Product Availability

1. Contractor, prior to submitting a proposal, shall determine product availability and delivery time, and shall include such considerations into his proposed Contract Time.

2. Certain products specified may only be available through factory authorized dealers and distributors. Contractor shall verify his ability to procure the products specified prior to submitting a proposal.

E. Wire and Cable

1. Strict adherence to SUNY Purchase Network Cable Installation Specification contained in its entirety within technical specification 271000 of these contract documents is required. Any deviation from these requirements will require prior owner/consultant approval before installation, no exceptions.
2. General: Provide all wire and cable required to install systems as indicated. Wire and cable shall be sized to provide minimum voltage drop and minimum resistance to the devices being supplied.
3. All cables shall be specifically designed for their intended use (direct burial, aerial, etc.).
4. Comply with equipment manufacturers recommendations for wire and cable size and type.
5. Comply with all applicable codes and ordinances.

F. Conduit and Raceway Systems

1. General: The placing of surface mounted conduit on the exterior of any building shall be approved by end-user prior to its installation.
2. Interior Conduit:
   a. Electrical Metallic Tubing (EMT)
   b. Flexible Metal Conduit
   c. Provide fittings and connectors as required for installation of EMT or flexible conduit.
3. Surface Raceways:
   a. Sheet metal channel with fitted cover, suitable for use as surface metal raceway, WIREMOLD, or approved equal.
   b. Provide fittings, elbows, and connectors designed for use with raceway system.
4. Exterior Conduit: (any of the following as determined by local code requirements):
   a. Rigid Steel Conduit
   b. Rigid Aluminum Conduit
   c. Rigid Nonmetallic Conduit (only if buried 18" below ground surface).
   d. Intermediate Metal Conduit
   e. Provide rain-tight fittings and connectors as required for installation of exterior conduit.
5. Exterior Flexible Conduit:
   a. Liquid-tight Flexible Conduit: Flexible metal conduit with PVC jacket.
   b. Provide rain-tight fittings and connectors as required for installation of Liquid-tight Flexible Conduit.

G. Junction and Pull Boxes

1. Interior Boxes: Sheet Metal Outlet Boxes: Sizes to be determined in accordance with code requirements for conductor fill. Provide box covers as required.
2. Exterior Boxes: All exterior boxes shall NEMA 4 or NEMA 3R, water-tight and dust-tight
3. All interior and exterior boxes shall have their covers fastened using security screws.

H. Lightning Protection

1. The Contractor shall provide suitable lightning protection for all processors/controllers.
2. All lightning protection equipment shall be UL listed.

2.2 ACCESS CONTROL SYSTEM - SYSTEM SPECIFICATIONS

A. Head-end Hardware and Software:
   1. Upgrade as needed to comply with the ACS manufacturer's recommendations and/or specifications.

B. Acceptable Manufacturer: Genetec, no exceptions.
   1. Genetec access control software and licensing to be provided by contractor.

PART 3 - EXECUTION

3.1 SITE INSPECTIONS

A. Continuously verify that the site conditions are in agreement with the Documents and the design package. Submit a report to the owner/consultant documenting changes to the site or conditions that affect the performance of the System to be installed. For those changes or conditions, which affect System installation or performance, provide (with the report) specification sheets, or written functional requirements to support the findings, and a cost estimate to correct the deficiency. No deficiency shall be corrected without written permission from the owner/consultant.

B. Specific mounting locations, exact wire and cable runs, and conduit routing have not been specified or delineated on the Documents. Coordinate all aspects of the Work with the owner/consultant.

3.2 COORDINATION

A. Coordinate with the owner/consultant to ensure that adequate conduit is provided, and that equipment back-boxes are adequate for System installation.

B. Coordinate with the owner/consultant to ensure that adequate power has been provided and properly located for the security System equipment.

C. Coordinate with the owner/consultant to ensure that doors and doorframes are properly prepared for electric locking hardware and door position switches.

D. Coordinate locations of all devices with the owner/consultant prior to installation.

E. Coordinate and verify the location of each piece of rack-mounted equipment with the owner/consultant.

F. Coordinate custom SMS report requirements with the owner/consultant. Submit report formats to the owner/consultant for review and acceptance.

G. Coordinate all initial database partitioning and setup with the owner/consultant prior to initial programming and cardholder data entry.

H. Coordinate finishes and colors of all equipment with the Architect. Submit all finish and graphics for all equipment in public areas to the owner/consultant for approval prior to installation.

1. Provide all initial System programming and setup of the SMS including, but not limited to the following:
   a. Graphical Maps and Icons: Coordinate with the owner/consultant to obtain AutoCAD architectural backgrounds for implementation as graphical maps. Import all AutoCAD background information provided by the owner/consultant and produce a complete set of graphical maps depicting all SMS points.
   b. SMS Card Reader Information: Coordinate all card reader values and text, including descriptors, alarm messages, camera call up, map call-up, and identification with the owner/consultant.
   c. Input and Output Points: Coordinate all input and output priorities and text, including descriptors, alarm messages, camera call up, and map call up and identification with the owner/consultant.
   d. Initial System Users and Levels of Access: This shall include the designation of an Owner’s representative at the "Super User" level immediately upon SMS initialization.
   e. Initial camera call-up and alarm information for interface with the VSS.
   f. Initial camera call-up and alarm information for interface with the intercom system.
   g. Alarm monitoring and automatic shutdown information for the UPS interface.

END OF SECTION

SECTION 28 13 26

ACCESS CONTROL FIELD DEVICES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. The Work shall include installation and commissioning of the following:

1. Access Control and Alarm Monitoring System
2. Security Equipment Racks, Cabinets, and Consoles
3. Wire and cable to install all equipment as specified herein
4. Miscellaneous conduit and back boxes (not shown on the Documents as provided, but required for a complete installation)

1.2 SCOPE OF WORK

A. The scope of work to be included in this contract does not necessarily include every item of work. The Contractor shall supply and install items that meet the specified requirements/needs of the construction documents. The Security Management System (SMS) Servers and Workstations are all existing. As per this contract, the contractor will provide all pertinent software updates to make the system and its components current with manufacturer requirements. All software and software licenses for all devices will be provided by the contractor.

B. Dedicated, secure equipment space shall be provided to accommodate distributed processing equipment (access control panels) and power supplies for electric locking hardware. This will ideally be in separately locked cabinets in the same space(s) that serve(s) space-wide data communications needs. Equipment (including batteries and other serviceable devices) shall not be located above ceilings. SMS controllers shall be installed within the access-controlled space and above ceiling in a locked and monitored enclosure with local battery backup and full functionality at controlled space if communications is lost. Any new SMS network shall be compatible for direct interconnection with current and planned networks installed in the space.

C. All doors with access control shall have a position switch to allow notification to Security of forcing door open without authorized entry, propping of the door, or opening of selected doors during times when they should not be accessed. All designated security doors, with or without card readers shall have position switch(es) to allow indication of status, with alarming software applications that provides for alarming by time of day and for door being held opened in excess of a user selectable time period or opening of selected doors during times when there should not be accessed.

D. The work to be provided, in addition to designing, furnishing, and installing the SMS, shall include the following:
   1. Provide complete system design and engineering.
   2. Provide software that meets specified contract requirements.
   3. Verification that proposed equipment and devices furnished are adequate for the intended purpose.
   4. Installation, set-up, and programming of SMS server and any related ancillary equipment.

5. Perform a layout check to ensure that adequate access is available for construction, installation, and maintenance of equipment and devices furnished; however, the Contractor is not responsible for furniture.
6. Perform acceptance tests to show system is properly installed and that it meets the specifications and applicable codes.
7. Provide option for system integration with the digital video surveillance system.
8. SMS system administration will be by client. The System Administrator shall be responsible to configure and maintain the system after system acceptance. System utilities shall be provided for the System Administrator to use. Software for database backups and log file maintenance shall also be provided.

E. The contractor shall be responsible for all initial programming (including access levels/permissions), software configuration, and graphics development to provide a complete operating SMS System as described heir in. Contractor will be responsible for the creation/modification of the personnel database and assigning access levels and privileges to individual cardholders.

1.3 SYSTEM DESCRIPTION

A. Basic System Characteristics

1. The SMS is existing, and the contractor is responsible for all modifications/additions/licenses of the existing SMS for the new access control locations as per this contract.
2. This SMS shall provide true multi-tasking, multi-workstation client-server owner/consultant ure based on PC-based client platforms
3. The SMS client-server owner/consultant ure shall communicate with native TCP/IP Security Access Controllers (SAC) over an Ethernet TCP/IP enterprise network with encrypted Ethernet.
4. Card information shall be stored in the SAC and shall not depend on a network controller or PC to perform the card access functions.

B. Components

1. The Contractor shall provide the required additions/modifications to the SMS as specified herein including but not limited to the following:
   a. UPS systems (if facility UPS power is not provided)
   b. Badge Printer
   c. Power supplies
   d. Access control and alarm monitoring controller(s)
   e. Software modules required for specification operation
   f. Access control equipment enclosures

1.4 INSPECTION FEES AND PERMITS

A. Obtain and pay for all necessary permits and inspection fees required for electrical installation.

B. As a NY State entity, Purchase College SUNY is a self-permitting agency.

1.5 **BID SUBMITTALS**

A. Contractor shall carefully review the project drawings and specifications and immediately report any possible omissions or conflicts.

B. Contactor shall provide a narrative of their understanding of the scope, schedule, ability and resources to be provided to complete the work, and an acknowledgement that their solution is in full compliance with these plans and specifications, and/or a brief description of equals being offered.

C. Bid submittal shall identify all subcontractors and a brief description of the services they will be providing.

D. Provide qualifying documentation required per the General Division 1 and these specifications, such as proof of insurance, certifications, references, and any other required documentation.

E. Provide a complete Bill of Materials (BoM) per section that details quantities for each part, part number, and description.

F. Provide line-item pricing for each item shown on the “Cameras-Cards-Bid-Estimators-Workbook.xlsx”

G. Provide pricing per section to include costs broken down by materials and labor.

H. Complete the “cameras-cards-Bid-Estimators-Workbook.xlsx” to provide a clear and concise pricing worksheet that summarizes the pricing of all sections and then a grand total for the entire project. If voluntary alternatives are provided, the add/deduct pricing shall be detailed separately.

I. Product Data: Submit manufacturer's data on equipment and materials, and shop drawings, as listed below. Clearly indicate proposed substitutions and deviations from drawings and specifications. Approval of product data and shop drawings is not to be interpreted as permitting departure from the contract documents.

J. Submission

1. Electronic copies of all bid submittal materials shall be provided on memory stick or similar medium. All files must be clearly organized and clearly named.
2. Submit bid response documents in a single binder with tabs and a title sheet separating each section. Do NOT submit data in separate binders. Data submitted separately will be rejected without comment.

K. SECTIONS:

28 13 16 – Access Control Systems and Database Management
28 13 26 – Access Control Remote Devices
28 16 16 – Intrusion Detection Systems Infrastructure

1.6 **WARRANTY**

A. All parts and labor shall be warrantied against defect in product and workmanship for a period of 1 year from substantial completion.

B. All manufacturer warranties on equipment shall be extended to the college for the duration of the factory warranty.

C. Spare parts shall be provided in the quantities specified within these documents.

D. Warranty shall include the Software Service Agreement (SSA) for all devices and other applicable licensing to be synchronized with the overall campus-wide Genetec SSA.

1.7 **CLOSEOUT DOCUMENTATION**

A. Operating and Maintenance Manuals: Provide three sets of the following data. Arrange each set of data in an orderly way, and bind each set in a separate 3-ring, hard-cover binder to be provided within 30 Days of system acceptance:

1. Operating and maintenance instructions.
2. Copies of approved submittal data.

B. Update existing drawings showing any adjustment in the location of devices

1. Hard copy 11x17 – 2 full sets.
2. Full set in a single PDF document plotted at the correct scale and page size.
3. Autocad .dwg or Visio (preferred) format.

C. Spreadsheet listing all installed devices, panels, servers, computers, etc. to include labeling nomenclature of device, model, location, controller port, switch port, cable types, power source, and comments. Provide both 2 hard copies in a binder and electronically in Microsoft Excel format.

D. All electronic closeout documents shall be unlocked and editable by the Owner.

1.8 QUALITY ASSURANCE

A. Electrical and electronic Components, Devices, and Accessories: UL Listed and labeled and marked for intended use.

B. Comply with applicable requirements of recognized industry associations which promulgate standards for the various trades.

C. Assign only qualified technicians who are factory trained and certified on the products and work to be provided under this Contract. Employ a competent project manager to oversee and supervise the work.

D. Contractor shall employ technicians and project support persons current in the following Genetec certifications:

Security Center - Omnicast Technical Certification
Security Center - Synergis Technical Certification
Security Center - Enterprise Technical Certification

E. Perform work specified in Division 28 in accordance with standards listed below including amendments or revisions. In case of conflict, obtain a decision from the Owner's Representative:

1. International Building Code
2. Any other applicable state and local codes or industry accepted standard practices.
3. Accepted low voltage and security industry best practices.

F. Contractor will comply with all on-site construction requirements to include any necessary safety training, Occupational Safety and Health Administration Standards, all National Consensus Standards, and all other federal, state and local safety codes and regulations, and all other safety and personal conduct policies as required by SUNY Purchase College.

1.9 DISCLOSURE OF NONCONFORMING EQUIPMENT

A. Purchase College desires to make an informed decision regarding the Contractor's proposed project approach.

B. The Contractor is required to disclose, separate from any cut or advertising sheets, any functional, operational or electrical requirements of these specifications that they are not able to perform and/or which fall outside the scope of their quotation

C. The form of this disclosure shall be by letter clearly identifying these noncompliant items and describing how the Contractor intends to address these issues.

D. Absent such disclosure and subsequent acceptance of non-compliant items by the Owner, Contractors are responsible for ensuring that their systems will fully operate as outlined in these specifications without additional cost to the Owner or other parties.

E. The Contractor may elect to provide an alternate design approach if cost savings or increased functionality could be realized. This approach must be clearly outlined, priced, and tabbed separately within their bid submittal, and fully meet or exceed the objectives of the Basis of Design. All substitutions are subject to the approval process prior to acceptance. Substitutions that are not fully compatible and compliant with the Genetec Security Center platform will not be considered.

1.10 COORDINATION

A. Carefully examine specifications and drawings to be thoroughly familiar with items which require electrical connections and coordination. Bring to the attention of the Owner's Representative (Consultant) any

B. Coordinate with other trades as required for network connectivity, cabling, pathways, 120VAC power receptacles, access panels, and mounting surfaces.

C. Coordinate with the Owner regarding IP address schema, VLAN, etc.

D. Coordinate work schedule and equipment deliveries with the Owner and General Contractor.

1.11 **DELIVERY AND STORAGE**

A. Deliver items in manufacturer's original unopened packaging. Use care in loading, transporting, unloading, and storage to keep items from being damaged. Contractor is responsible to store and safeguard all supplied equipment.

B. Equipment shall be stored in environmental conditions suitable for the equipment and per the manufacturer's instructions.

C. Vendor to stage and store equipment in room NM0002 during this project.

1.12 **RECORD DRAWINGS**

A. Keep a set of the project Security drawings at the job site exclusively for recording deviations from the drawings which are necessary because of job conditions and retain as the basis for final as-built drawings.

B. Mark deviations in colored pens/pencils so that work of various systems can be easily identified.

C. Wire routing and paths shall be annotated in red.

PART 2 - ACCESS CONTROL SYSTEM (ACS)

2.1 GENERAL

A. All products not provided by the end-user shall be new and unused and shall be of manufacturers' current and standard production.

B. Where two or more equipment items of the same kind are provided, all shall be identical and provided by the same manufacturer.

C. Drawings and Specifications indicate major system components, and may not show every component, connector, module, or accessory that may be required to support the operation specified. Contractor shall provide all components needed for complete and satisfactory and intended operation.

D. Product Availability

1. Contractor, prior to submitting a proposal, shall determine product availability and delivery time, and shall include such considerations into his proposed Contract Time.
2. Certain products specified may only be available through factory authorized dealers and distributors. Contractor shall verify his ability to procure the products specified prior to submitting a proposal.

E. Wire and Cable

1. Strict adherence to SUNY Purchase Network Cable Installation Specification contained in its entirety within technical specification 271000 of these contract documents is required. Any deviation from these requirements will require prior owner/consultant approval before installation, no exceptions.
2. General: Provide all wire and cable required to install systems as indicated. Wire and cable shall be sized to provide minimum voltage drop and minimum resistance to the devices being supplied.
3. All cables shall be specifically designed for their intended use (direct burial, aerial, etc.).
4. Comply with equipment manufacturers recommendations for wire and cable size and type.
5. Comply with all applicable codes and ordinances.

F. Conduit and Raceway Systems

1. General: The placing of surface mounted conduit on the exterior of any building shall be approved by end-user prior to its installation.
2. Interior Conduit:
   a. Electrical Metallic Tubing (EMT)
   b. Flexible Metal Conduit
   c. Provide fittings and connectors as required for installation of EMT or flexible conduit.
3. Surface Raceways:
   a. Sheet metal channel with fitted cover, suitable for use as surface metal raceway, WIREMOLD, or approved equal.
   b. Provide fittings, elbows, and connectors designed for use with raceway system.
4. Exterior Conduit: (any of the following as determined by local code requirements):
   a. Rigid Steel Conduit
   b. Rigid Aluminum Conduit
   c. Rigid Nonmetallic Conduit (only if buried 18" below ground surface).

d. Intermediate Metal Conduit
e. Provide rain-tight fittings and connectors as required for installation of exterior conduit.

5. Exterior Flexible Conduit:
   a. Liquid-tight Flexible Conduit: Flexible metal conduit with PVC jacket.
   b. Provide rain-tight fittings and connectors as required for installation of Liquid-tight Flexible Conduit.

G. Junction and Pull Boxes

1. Interior Boxes: Sheet Metal Outlet Boxes: Sizes to be determined in accordance with code requirements for conductor fill. Provide box covers as required.
2. Exterior Boxes: All exterior boxes shall NEMA 4 or NEMA 3R, water-tight and dust-tight
3. All interior and exterior boxes shall have their covers fastened using security screws.

H. Lightning Protection

1. The Contractor shall provide suitable lightning protection for all processors/controllers.
2. All lightning protection equipment shall be UL listed.

2.2 SYNERGIS MASTER CONTROLLER

A. The Synergis Master Controller's IP network communication with Security Center shall be event-driven, whereby events are sent to the host when they happen. All access control logic is stored and handled directly by the SMC for local access control decision making capabilities and will operate even when communication to the host is down.

B. The SMC shall support a variety of third-party interface modules and connect to those downstream interface modules over IP or RS-485.

C. The SMC shall communicate hierarchically downstream with Mercury EP series controllers and MR series door and I/O controllers via IP and RS-485.

D. The SMC will minimally provide support for the following modules, controllers, and features:

1. HID Global Modules
2. Mercury Security Modules
3. Assa Abloy SARGENT IP locks (Wi-Fi and PoE)
4. Assa Abloy Corbin Russwin IP locks (Wi-Fi and PoE)
5. Complete offline decision-making capabilities
6. Threat level management
7. Hard and soft antipassback
8. Unrestricted number of card formats
9. Up to 100,000 cardholders and 150,000 offline events
10. Dynamic (DHCP) or static IP addressing
11. Encrypted communications with host software 128-bit
12. Secure web interface for basic configuration.

E. Basis of design is the Genetec Synergis Master Controller (SMC) SY-SMC1RAM16CF-KIT or higher.

2.3 MERCURY INTELLIGENT CONTROLLER (MIC)

A. The intelligent controller shall be an Ethernet ready, fault-tolerant host communication capable for the efficient management of a large network of access panels in any system design. The intelligent controller shall use an RS-232, 2-wire RS-485 or Ethernet link to connect to a Windows or Linux host. The intelligent controller shall be capable of elaborate processes and procedures without host intervention. Once configured, the intelligent controller shall function independently of the host, and shall be capable of controlling access, managing alarms, interfacing with an array of hardware devices, all while providing the decision-making oversight that each system configuration requires. The intelligent controller shall provide centralized biometric template management and support a wide range of reader technologies, including OSDP V2, magnetic stripe and biometric 2-wire RS-485 connectivity and capable of supporting doors in paired and or alternate reader configurations with peripheral interface devices.

B. Connectivity:
1. Primary Port: 10/100 Ethernet
2. IP Server, IP Client, DHCP Client
3. HTTP, TLS, X.509
4. Back up channel: RS-232, RS-485, Dial-up

C. Access Control:
1. 600,000 Cardholder capacity
2. 50,000 Transaction buffer
3. If/Then Macro capability

D. Card Formats:
1. Eight active card formats per intelligent controller
2. Entire card number reported on invalid read
3. 19 digit (64-bit) User ID and 15 digit PIN numbers maximum
4. PIV-II, CAC, TWIC card compatible
5. 32 Access Levels per cardholder
6. Activation/Deactivation Dates

E. Card Reader Functions
1. Multiple card format support by reader
2. Paired reader support
3. Alternate reader support
4. Elevator support
5. Turnstile support
6. Biometric device support
7. Open Supervised Device Protocol (OSDP) compliant
8. Occupancy count
9. Support of multi-occupancy rules
10. Anti-passback support
    i. Area-based, reader-based, or time based
    ii. Nested area, hard, soft, or timed forgiveness
11. Supports host-based approval rules
12. Keypad support with programmable user commands, card input

F. Database Functions

1. Configurable card database
2. Supports up to nineteen (19) digital card numbers
3. Supports pin codes up to fifteen (15) digits
4. Programmable card activation and deactivation times and dates
5. Card issue code, ADA and VIP flags (up to 32 bits); PIV (75 bits); Smart Card (200 bits)
6. Up to 128 access levels per user
7. Ability to track people and objects

G. Intrusion Alarm Functions

1. Supports entry delays and exit delays
2. Area monitoring
3. Standard alarm masking
4. Provides control and alarm processing from the keypad

H. Basis of design is the Mercury EP series controller module.

1. Mercury LP4502, Genetec Part # Sy-LP4502
2. Additional intelligent controllers based on application:
   - Mercury LP1501 intelligent network controller with single door internal ACM.
   - Mercury LP1502 intelligent network controller with dual-door internal ACM.

2.4 DOOR ACCESS CONTROL MODULE (ACM)

A. The Access (Door) Control Module (ACM) shall provide the circuitry and connections for two reader ports, support separate in/out readers of all technologies, including OSDP V2, clock and data, magnetic stripe, keypads, LCD and biometrics and all associated door status and Request to Exit inputs and relay strike outputs.

B. The ACM shall be auto-addressable and directly managed by Mercury or Genetec intelligent controllers.

C. Data communications to the intelligent controller shall be network IP.

D. The ACM shall support the following features:
1. Multi- facility code support
2. Multi-reader technology support
3. PoE enabled
4. Auto-addressable
5. AES 128 bit data encryption
6. HSPD-12/FIPS201 Compliant
7. UL 294 Recognized
8. Universal I/O device characterization
9. PoE

E. Reader bus shall be OSDP V2 and provide both audible and visual indicators at the reader when a badge is accepted or rejected.

F. Door status and other alarm inputs shall employ end of line resistors.

G. Relay output for the door lock shall be rated at 2A @ 24VDC minimum.

H. Vendor will provide additional locking cabinets, power supplies, etc. as needed.

I. **Basis of design Mercury MR62e, Genetec Part # Sy-MR62e.**

3. Additional controllers based on application:
   - Mercury MR50-S3 Single-Door RS-485 connected controller.
   - Mercury MR52-S3 Dual-Door RS-485 connected controller.
   - Mercury MR16IN-S3 16-input RS-485 connected controller.
   - Mercury MR16OUT-S3 16-output RS-485 connected controller.

K. MR62e (in-field) enclosures shall be LideSafety Power Flexpower E5M MCLASS Enclosure with tamper switch. See security device schedules by building for number of MR62e controllers per enclosure.

2.5 ACCESS CONTROL CARD READER

1. The card reader shall be multi-technology and shall read encoded data from access cards and transmit the data to the ICs. The operating frequency shall meet all local regulations.

2. A two-color LED on the face of the card reader and an audible tone shall indicate authorized and unauthorized reader uses.

3. No system compromise shall be possible from circuitry located in the reader unit.

4. The card reader shall have provision to operate as specified in environments of electromagnetic and radio frequency interference as well as spurious electrical line interference. When installed according to manufacturer's instructions the reader shall operate properly when mounted adjacent to or directly on any material including metal without the use of standoff or space.

5. Provide manufacturer recommended power to each card reader directly from the IC or a secondary supply. The power supply shall be UL Class 2, power limited and shall provide necessary output voltage to allow the card reader to operate at its maximum specified read range.

6. Contractor shall provide visual check of connections, and maintenance of the system per Manufacturer's specification.

7. Contractor shall provide at least (5) spare card readers to be stored onsite at a location to be determined by the client.

8. Acceptable Manufacturers: HID multiCLASS SE® RPK40 or current HID equal**.**

2.6 ELECTRIFIED LOCKING MECHANISMS

A. Electrified locking mechanisms shall be provided as indicated on the Documents.

B. The security system shall interface with electrified locking mechanisms as indicated on the Documents.

C. Provide fail-safe/fail-secure operation of electrified locking mechanisms as required by local codes.

D. Fail-secure locks shall remain operational during a fire alarm condition or power failure.

2.7 ELECTRIFIED LOCKING MECHANISM POWER SUPPLY

A. Refer to Division 08 Door Hardware specifications.

2.8 REQUEST-TO-EXIT DEVICE, INFRARED

A. The motion detector shall be specifically designed for Request to Exit applications and be UL listed under the UL-294 standard.

B. The motion detector shall feature two Form “C” contacts with latch times adjustable from 0.5 to 60 seconds.

C. The PIR shall feature a dip switch to select the relay mode to resettable/non-resettable. The PIR shall be set to non/resettable mode so that relay outputs resets after its timeout period even there is still motion detected.

D. Basis of design is the Bosch DS150i/DS151i or equal.

2.9 REQUEST-TO-EXIT DEVICE, PUSHBUTTON

A. Refer to Division 08 Door Hardware specifications.

2.10 DEVICE POWER SUPPLIES

A. Provide Power Supplies for all ACAMS equipment.

B. Monitor low battery and power fail alarms for each power supply.

C. Minimum Specifications:

1. Type: UL Listed Class II power limited
2. Input: 120VAC 60 Hz hard wired
3. Output: Regulated and filtered 24VDC
4. Output rating: 150% of the actual connected load
5. Battery backup: Four (4) hours of rechargeable backup
6. Battery: Sealed gel type
7. Alarm outputs: Low battery and power fail
8. Enclosure: Key lockable wall mount housing with tamper switch

D. Acceptable Manufacturers: Altronix or approved equal.

2.11 DOOR POSITION SWITCHES

A. Wide gap, closed loop or form C contacts, designed for steel doors, rare earth magnets.

B. Recessed Steel Door Contact w/Wire Leads, 3/4" Diameter, Closed Loop, Wide Gap, 3/4" Gap Size

C. Surface mounted and overhead door contacts to be constructed with an aluminum housing, armored cable, Closed Loop, Wide Gap, 3" Gap Size.

D. Basis of design

1. Aritech Industrial Wide Gap Surface Mount Magnetic Contacts 2500 Series
2. products from Interlogix (Formerly Sentrol/GE):
   - Interlogix 1078CW concealed door contact.
   - Interlogix 2505A-L Surface-mounted door contact.
   - Interlogix 2202A-L Overhead Door Contact

2.12 **END-OF-LINE (EOL) RESISTOR**

A. The EoL resistor (EoL resistor pack) supervises the wiring between the control panel and the field device and is required for monitoring purposes for all devices in the system.

B. If one detection device is on a single detection circuit, the EoL should be installed at the detection device.

C. If more than one detection device is on a single detection circuit, the EoL should installed be at the last detection device in the loop.

D. Do not install EoL resistors at the controller or panel location(s).

E. The input circuit shall be monitored by EoL resistors to provide detection of the following four (4) states:

1. Normal
2. Alarm
3. Open
4. Short
   a. The Contractor is to use the required EoL resistors particular for the system being furnished to provide the required four (4) state supervision.
   b. Acceptable Manufacturers: GRI 6644 EoL resistor pack or approved equal.

2.13 ELECTRIC DOOR LOCKS (POE LOCKSETS)

A. Refer to Division 08 Door Hardware specifications.

PART 3 - EXECUTION

3.1 **SITE INSPECTIONS**

A. Continuously verify that the site conditions are in agreement with the Documents and the design package. Submit a report to the owner/consultant documenting changes to the site or conditions that affect the performance of the System to be installed. For those changes or conditions, which affect System installation or performance, provide (with the report) specification sheets, or written functional requirements to support the findings, and a cost

estimate to correct the deficiency. No deficiency shall be corrected without written permission from the owner/consultant.

B. Specific mounting locations, exact wire and cable runs, and conduit routing have not been specified or delineated on the Documents. Coordinate all aspects of the Work with the owner/consultant.

3.2 COORDINATION

A. Coordinate with the owner/consultant to ensure that adequate conduit is provided, and that equipment back-boxes are adequate for System installation.

B. Coordinate with the owner/consultant to ensure that adequate power has been provided and properly located for the security System equipment.

C. Coordinate with the owner/consultant to ensure that doors and doorframes are properly prepared for electric locking hardware and door position switches.

D. Coordinate locations of all devices with the owner/consultant prior to installation.

E. Coordinate and verify the location of each piece of rack-mounted equipment with the owner/consultant.

F. Coordinate custom SMS report requirements with the owner/consultant. Submit report formats to the owner/consultant for review and acceptance.

G. Coordinate all initial database partitioning and setup with the owner/consultant prior to initial programming and cardholder data entry.

H. Coordinate finishes and colors of all equipment with the owner/consultant. Submit all finish and graphics for all equipment in public areas to the owner/consultant for approval prior to installation.

1. Provide all initial System programming and setup of the SMS including, but not limited to the following:
    a. Graphical Maps and Icons: Coordinate with the owner/consultant to obtain AutoCAD owner/consultant ural backgrounds for implementation as graphical maps. Import all AutoCAD background information provided by the Owner/consultant and produce a complete set of graphical maps depicting all SMS points.
    b. SMS Card Reader Information: Coordinate all card reader values and text, including descriptors, alarm messages, camera call up, map call-up, and identification with the Owner/consultant .
    c. Input and Output Points: Coordinate all input and output priorities and text, including descriptors, alarm messages, camera call up, and map call up and identification with the Owner/consultant .
    d. Initial System Users and Levels of Access: This shall include the designation of an Owner’s representative at the "Super User" level immediately upon SMS initialization.
    e. Initial camera call-up and alarm information for interface with the VSS.
    f. Initial camera call-up and alarm information for interface with the intercom system.
    g. Alarm monitoring and automatic shutdown information for the UPS interface.

3.3 **TRAINING**

A. Coordinate with the Owner to establish a training outline and schedule.

B. SMS

1. Provide a minimum of 20 hours of SMS operator training/administrative training, and 8 hours of door peripheral device maintenance (readers, locks, sensors ,etc) training either on or off site on a complete and fully operational System parallel and equal to the System being provided, to representatives of the Owner.
2. Operator training shall include, but not be limited to the following:
   a. All operating System procedures
   b. System configuration
   c. Alarm acknowledgment, alarm response logging, and map graphics functionality.
3. Administrative training shall include, but not be limited to the following:
   a. All operating System procedures and configuration variables
   b. Database functions and setup
   c. Card holder input and deletion procedures
   d. Report generation
   e. Applications programs (as applicable)
   f. Map graphics generation and manipulation.

3.4 **EQUIPMENT**

A. Provide equipment as indicated on the Documents and specified herein. Additional specific installation requirements are as follows:

1. Security Equipment Room and IC Locations
   a. Configure security equipment as indicated in the Documents.
   b. Wire all power supply power fail alarm contacts in each equipment room as a single alarm input to the SMS.
   c. Wire each power supply low battery alarm contact as individual alarm inputs to the SMS.
2. Controllers
   a. Configure the System such that devices can be connected to spare input points, output points and card reader inputs on the controller without requiring reconfiguration of the system.
3. Card Readers
   a. Wire card reader LEDs to indicate valid and invalid card reads, and door locked and unlocked conditions. All card reader LED indicators shall operate identically.
4. Electric Locking Mechanisms
   a. Interface with electric locking mechanisms provided by the door hardware supplier.
   b. Wire electric locking mechanisms as indicated on the Documents.
   c. Wire fail-safe electric locking mechanisms in accordance with local codes.
   d. Wire fail-secure electric locking mechanisms and power supplies such that a fire alarm condition or building power failure shall not affect operation of the lock.
5. Delayed Egress Locking Devices
   a. Interface with delayed egress locking devices provided by the door hardware supplier.
   b. Wire delayed egress locking devices as indicated on the Documents.
   c. Wire delayed egress locking devices for fail-safe operation in accordance with local codes.

d. Interface with a normally closed alarm contacts that shall open upon activation of the unlock timer.
e. Interface with sounder bypass control contacts. Wire control output contacts to bypass sounder by system workstation.
f. Interface with lock control contacts activated by system workstation and/or time schedule. Wire control output contacts to lock/unlock devices by time schedule and/or system workstation.

6. Fire Alarm Interface
   a. Connect (hard wire) fail-safe electric and time delay locking mechanical to the building fire alarm System for fail-safe release upon any fire alarm.
   b. Interface with a single low voltage/low current normally closed dry contact from the fire alarm System provided by the fire alarm contractor in the Fire Command Center. The contact shall open on any fire alarm condition.
   c. Provide all additional UL listed fail-safe relays and power supplies necessary to interface to this contact and unlock all fail-safe doors.
   d. Connect fail-safe relays and power supplies to standard building power. Connection of fail-safe devices to emergency or UPS power shall not be acceptable.
   e. Reference the Documents for fire alarm interface requirements.

END OF SECTION