RMT ENGINEERS, LLC
MECHANICAL, FIRE PROTECTION AND
CONSTRUCTION MANAGEMENT SERVICES

GMH URGENT CARE HVAC IMPROVEMENT

GUAM MEMORIAL HOSPITAL

850 GOV. CARLOS G. CAMACHO ROAD
TAMUNING, GUAM 96913

10/22/2024

SPECIFICATIONS

FINAL SUBMITTAL

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SPECIFICATIONS

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SECTION 07900

JOINT SEALERS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Sealants.

2. Backing.

3. Substrate preparation.

B. Related Documents: The Contract Documents, as defined in Section 01010 - Summary of Work, apply to the work of this Section. Additional requirements and information necessary to complete the work of this Section may be found in other Documents.

C. Related Sections:

1. Section 08310 - Access Doors and Panels: Sealant to close joint where metal edge trim meets adjacent surfaces.

2. Section 08400 - Entrances, Storefronts and Windows: Sealants for weatherproofing frame perimeters and thresholds.

3. Section 08800 - Glass and Glazing: Sealants and compound for glass and glazing installations.

4. Section 09510 - Gypsum Board: Sealant to close joint where edge trim meets vertical surfaces.

1.2 DESCRIPTION OF WORK

A. The extent of joint sealers work is indicated on the Drawings and as specified herein, and includes providing and installing sealants, complete. The principal item of work is the sealing of openings and joints indicated or specified.

B. This Section contains general specifications for sealants throughout the Project. The specific use for joint sealants is indicated in the Sealant Schedule at the end of this Section.

1.3 REFERENCES

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

B. American Society for Testing and Materials (ASTM):

1. ASTM C 717 - Terminology of Building Seals and Sealants.

2. ASTM C 834 - Specification for Latex Sealants.

3. ASTM C 920 - Specification for Elastomeric Joint Sealants.

4. ASTM C 1193 - Guide for Use of Joint Sealants.

5. ASTM C 1299 - Guide for Use in Selection of Liquid-Applied Sealants.

6. ASTM D 1056 - Specification for Flexible Cellular Materials - Sponge or Expanded Rubber.

1.4 SUBMITTALS

A. Section 01330 - Submittals: Procedures for submittals.

1. Product Data: Manufacturer's specifications, recommendations, handling, installation and curing instructions for each type of sealant and associated miscellaneous material required. Include chemical characteristics, performance criteria, substrate preparation, limitations, color availability and VOC content.

2. Samples: 2" long of each color required for each type of sealant exposed to view.

3. Assurance / Control Submittals:

a. Manufacturer's certificate that the products meet or exceed the specified requirements.

b. Manufacturer's Material Safety Data Sheets (MSDS).

c. Manufacturer's certification that the products supplied comply with applicable federal and local regulations controlling the use of volatile organic compounds (VOC).

d. Manufacturer's Instructions indicating procedures and conditions requiring special attention, and cautionary procedures required during application.

e. Documentation of experience indicating compliance with the specified qualifications requirements.

B. Section 01780 - Closeout Submittals: Procedures for closeout submittals.

1. Warranty: Provide a written special Warranty with forms completed in the name of the Owner and registered with the manufacturer.

1.5 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer: Company specializing in manufacturing the products specified with a minimum of five (5) years documented experience.

2. Installer: Company experienced in performing the work of this Section with a minimum of five (5) years documented experience.

1.6 DELIVERY, STORAGE AND HANDLING

A. Section 01600 - Product Requirements: Transport, handle, store and protect the products.

B. Deliver products to the Project Site in the manufacturer's original, new, unopened packages or containers, dry and undamaged with seals and labels intact, identifying the product and manufacturer, product designation, date of manufacture, lot number, shelf life, curing time, and mixing instructions, if applicable.

C. Handle and store materials to prevent deterioration and damage due to moisture, temperature changes, contaminants and other causes.

D. Store materials not in actual use out of the weather until ready for use. Maintain packages and containers in a clean condition, free of foreign materials and residue.

E. Store materials in a ventilated area, and in compliance with the manufacturer's printed instructions.

F. Keep storage areas neat and orderly.

G. Protect against fire hazards and spontaneous combustion.

H. Take all necessary precautions to ensure that workmen and the work areas are adequately protected from health hazards resulting from handling, mixing and installation of the materials.

1.7 JOB CONDITIONS

A. Environmental Requirements: Install sealants only during the manufacturer's recommended temperature ranges and weather conditions for proper application and cure. Consult the manufacturer if a sealant cannot be applied under the recommended conditions.

1.8 WARRANTY

A. Section 01780 - Closeout Submittals: Procedures for closeout submittals.

B. Special Warranty:

1. Submit a joint and severable written Warranty signed by the sealant manufacturer and the Installer certifying that the products and installation is free of defective materials and workmanship and agreeing to repair or replace sealants and accessories which fail because of loss of cohesion or adhesion, which do not cure properly or are improperly installed.

2. Warranty Period: Three (3) years from the date of Substantial Completion.

PART 2 PRODUCTS

2.1 MATERIALS

A. General Performance Requirements: Select materials for compatibility with the joint surfaces to be encountered and other indicated exposures, and except as otherwise indicated, select modulus of elasticity and hardness or grade recommended by the manufacturer for each application indicated.

B. Where exposed to foot traffic, select materials of sufficient strength and hardness to withstand stiletto heel traffic without damage or deterioration of the sealant system.

C. Subject to compliance with the Project requirements, manufacturers offering products which may be incorporated into the work include the following:

1. Urethanes:

a. Two-Part Urethane: Self-Leveling, ASTM C 920, Type M, Grade P, Class 25.

1) Chem-Calk 550 by Bostik.

2) Vulkem 245 by Tremco (formerly Mameco International, Inc.)

3) Vulkem 255 FM by Tremco.

4) Urexpan NR-200 by Pecora Corporation.

5) Sikaflex 2c SL by Sika Group.

b. Two-Part Urethane: Non-Sag, ASTM C 920, Type M, Grade NS, Class 25.

1) Chem-Calk 500 by Bostik.

2) Sonolastic NP 2 by Sonneborn Building Products

3) Vulkem 227 by Tremco.

4) Dynatrol II by Pecora.

5) Sikaflex-2c NS EX Mix by Sika.

c. One-Part Urethane: Self-Leveling, ASTM C 920, Type S, Grade P, Class 25.

1) Vulkem 45 by Tremco.

2) Sonolastic SL1 by Sonneborn.

3) Urexpan NR-201 by Pecora.

d. One-Part Urethane: Non-Sag, ASTM C 920, Type S, Grade NS, Class 25.

1) Chem-Calk 900 by Bostik.

2) Sonolastic NP 1 by Sonneborn.

3) Vulkem 116 by Tremco.

2. Silicones:

e. One-Part Silicones: ASTM C 920, Type S, Grade NS, Class 25. Vertical Surfaces Only.

2) 795 Silicone Building Sealant Structural Glazing, Glazing and Weatherproofing Sealant by Dow Corning. (colors only)

2) Construction 1200 Sealant by General Electric Company.

3) 999-A Silicone Building and Glazing Sealant by Dow Corning.

4) 864 Architectural Silicone by Pecora.

f. One-Part Silicones: ASTM C 920, Type S, Grade NS, Class 25.

1) 786 Mildew Resistant Silicone Sealant by Dow.

2) Sanitary 1700 Silicone Sealant by General Electric.

3) 898 Sanitary Mildew Resistant Silicone Sealant by Pecora.

3. Acrylics, Latex:

a. One-Part Acrylic Latex, Non-Sag, ASTM C 834.

1) Chem-Calk 600 by Bostik.

2) LC-130 Liquid Nails Caulk Window and Door Acrylic Latex by Macco Adhesives.

3) AC-20 Acrylic Latex Caulking, Non-Sag by Pecora.

4) Sonolac Acrylic Latex Caulk by Sonneborn.

4. Acoustical Sealants:

a. AC-20 FTR Fire and Temperature Rated Acoustical and Insulation Sealant by Pecora.

b. Sheetrock Acoustical Sealant by United States Gypsum Co.

5. Butyls:

a. One-Part Butyl, Non-Sag, FS TT-S-1657.

1) Chem-Calk 300 Butyl Rubber Caulk by Bostik.

2) BC-158 Butyl Rubber Caulk by Pecora.

6. Preformed Compressible & Non-Compressible Fillers:

a. Backer Rod - Closed cell polyethylene foam:

1) Chem-Rod / Closed by Bostik.

2) Expand-O-Foam by Williams Products.

3) HBR Backer Rod by Nomaco, Inc.

4) Sonofoam Closed-Cell Backer Rod by Sonneborn.

b. Backer Rod - Open cell polyurethane foam:

1) Denver Foam by Backer Rod Manufacturing.

2) Foam Pack II by Nomaco.

c. Neoprene compression seals:

1) WA and WE Series by Watson Bowman Acme.

d. Butyl Rod: Kirkhill Rubber Co.

7. Paving Sealants:

a. Two-Part Urethane: Self-Leveling, ASTM C 920, Type M, Grade P, Class 25.

1). Vulkem 202 by Tremco. (Jet Fuel Resistant) (FS SS-S-200E, Type H only).

2). NR-300 Urexpan by Pecora (FS SS-S-200E).

b. One-Part Urethane: Self-Leveling, ASTM C 920, Type S, Grade P, Class 25.

1). SONOMETRIC 1 Sealant by Sonneborn (FS SS-S-200E).

2). Vulkem 45 by Tremco.

D. Section 01600 - Product Requirements: Product Options: Substitutions permitted.

2.2 MISCELLANEOUS MATERIALS

A. Joint Cleaner: Provide the type of joint cleaning compound recommended by the sealant manufacturer for the joint surfaces to be cleaned.

B. Joint Primer / Sealer: Type of joint primer / sealer recommended by the sealant manufacturer for the joint surfaces to be primed or sealed.

C. Bond Breaker Tape: Polyethylene tape or other plastic tape as recommended by the sealant manufacturer, to be applied to the sealant contact surfaces where bond to the substrate or joint filler must be avoided for proper performance of the sealant. Provide self-adhesive tape where applicable.

D. Sealant Backer Rod: Compressible rod stock of polyethylene foam, polyethylene jacketed polyurethane foam, butyl rubber foam, neoprene foam or other flexible, permanent, durable non-absorbable material as recommended by the sealant manufacturer for compatibility with the sealant.

E. Masking tape and similar accessories as necessary to protect adjacent surfaces from damage.

2.3 COLORS

A. Generally use sealant colors to match the color of the material in which the joint is located. Select from the manufacturer's standard colors.

B. Where a joint occurs between two materials of differing colors and the Contractor cannot determine which material to match, contact the Owner's representative for a decision.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01700 - Contract Closeout: Verification of existing conditions before starting the work.

B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive the work.

1. Verify that joint widths are in conformance with the sealant manufacturer's allowable limits.

2. Verify that contaminants capable of interfering with adhesion have been cleaned from joints.

3. Verify that joints has been properly prepared.

C. Report, in writing, prevailing conditions that will adversely affect satisfactory execution of the work of this Section. Do not proceed with the work until the unsatisfactory conditions have been corrected.

3.2 JOINT PREPARATION

A. Prepare and size joints in accordance with the manufacturer's instructions.

B. Clean joint surfaces immediately before installation of sealant. Remove dust, dirt, laitance, unsecured coatings, mortar, moisture and other substances which could interfere with bond of sealant or caulking compounds using a solvent or abrasion as recommended by the manufacturer. Remove loose materials and foreign matter which could impair adhesion of the sealant.

C. Etch concrete and masonry joint surfaces as recommended by the sealant manufacturer.

D. Roughen vitreous and glazed joint surfaces as recommended by the sealant manufacturer.

E. Prime or seal joint surfaces where indicated, and where recommended by the sealant manufacturer.

F. Verify that the sealant is suitable for the substrate.

G. Verify that joint backing and release tapes are compatible with the sealant.

H. Verify that the sealant is paintable if a paint finish is indicated.

3.3 INSTALLATION

A. Install in accordance with the manufacturer's printed instructions, except where more stringent requirements are shown or specified, and except where the manufacturer's technical representative directs otherwise. Perform the work in accordance with ASTM C 1193 for latex base sealants.

B. Prime or seal joint surfaces where recommended by the sealant manufacturer. Do not allow the primer or sealer to spill or migrate onto adjoining surfaces.

A. Set joint filler units at the proper depth or position to coordinate with other work, including the installation of bond breakers, backer rods and sealants. Do not leave voids or gaps between the ends of joint filler units.

B. Install sealant backer rods, except where shown to be omitted or recommended to be omitted by the sealant manufacturer for the application indicated.

C. Install pre-formed compressible and non-compressible fillers in accordance with the manufacturer's published instructions.

D. Install bond breaker tape where indicated and where required by the manufacturer's recommendations to ensure that elastomeric sealants will perform properly.

E. Employ only proven installation techniques which will ensure that the sealants are deposited in uniform, continuous ribbons without gaps or air pockets, foreign embedded matter, ridges and sags, with complete "wetting" of joint bond surfaces equally on both sides.

F. Except as otherwise indicated, fill sealant rabbet to a slight concave surface, slightly below the adjoining surfaces. Where horizontal joints are between a horizontal surface and a vertical surface, fill the joint to form a slight cove so the joint will not trap moisture and foreign matter.

G. Dry tool joints. Do not use soap, water or solvent to tool the joints.

H. Seal joints before adjacent surfaces are waterproofed or painted.

I. Install sealants to the depths shown or, if not shown, as recommended by the sealant manufacturer, but within the following general limitations, measured at the center (thin) section of the bead:

1. For normal moving joints sealed with elastomeric sealants not subject to traffic, fill joints to a depth equal to 50% of the joint width, but not less than 1/4" deep or more than 2" deep.

2. For joints sealed with non-elastomeric sealants, fill the joints to a depth in the range of 75% to 125% of the joint width.

3.4 SPILLAGE

A. Protect materials surrounding the work of this Section from damage and disfigurement. Do not allow sealants to overflow or spill onto adjacent surfaces, or to migrate into the voids of adjoining surfaces.

B. Recess exposed edges of exposed joint fillers slightly behind the adjoining surfaces, unless otherwise shown, so the compressed units will not protrude from the joints.

C. Bond ends of joint fillers together with an adhesive or "weld" by other means recommended by the manufacturer to ensure a continuous watertight and airtight installation.

3.5 CURING

A. Cure sealants in compliance with the manufacturer's published instructions.

3.6 FIELD QUALITY CONTROL

A. Section 01450 - Quality Control: Field inspection.

B. Inspect sealant work for proper installation, depth and adhesion.

3.7 CLEANING

A. Section 01700 - Execution Requirements: Cleaning the installed work.

B. Remove excess and spillage of sealants promptly as the work progresses using the materials and methods recommended by the sealant and substrate manufacturers.

C. Clean adjoining surfaces to eliminate evidence of spillage without damage to the adjoining surfaces and finishes.

3.8 SEALANT SCHEDULE

A. Interior Joints:

1. Perimeters of interior aluminum and hollow metal frames.

2. For all of the above interior joints:

a. Sealant No. 2.1, C.1.b

b. Sealant No. 2.1, C.1.d

c. Sealant No. 2.1, C.1.a (for pre-finished materials only).

3. Exposed interior control joints in drywall and concealed joints:

a. Sealant No. 2.1, C.3.a

b. Sealant No. 2.1, C.4

c. Sealant No. 2.1, C.4.c

d. Sealant No. 2.1, C.6.a

4. Perimeters of suspended acoustical ceilings where edge trim meets vertical surfaces:

a. Sealant No. 2.1, C.2.b

5. Painted metal lap joints:

a. Sealant No. 2.1, C.2

B. Glass and Glazing:

1. General Purpose Glazing.

a. Sealant 2.1, C.2.b

END OF SECTION

SECTION 08400

ENTRANCES, STOREFRONTS, DOORS, AND WINDOWS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Aluminum storefronts.

2. Aluminum sliding doors.

3. Glass and glazing in-fill and vision panels.

4. Door hardware.

5. Perimeter sealants.

B. Related Documents: The Contract Documents, as defined in Section 01010 - Summary of Work, apply to the work of this Section. Additional requirements and information necessary to complete the work of this Section may be found in other Documents.

C. Related Sections:

1. Section 08710 - Door Hardware: Hardware not specified in this Section.

2. Section 08800 - Glass and Glazing: Glazing for entrances, storefronts, sidelites, doors and windows including those specified herein to be factory-glazed.

3. Section 09110 - Non-Load Bearing Steel Framing: Non-structural framing for adjacent wall and ceiling finishes.

4. Section 09250 - Gypsum Board: Adjacent wall and ceiling finish material.

5. Section 09900 - Painting: Field painting of components.

1.2 DESCRIPTION OF WORK

A. The extent of the work of this Section is indicated on the Drawings and Schedules and as specified herein, and includes providing and installing aluminum interior storefronts and sliding doors; tubular aluminum sections, shop-fabricated, factory-finished; glass and glazing in-fill; related flashings; anchorage and attachment devices; hardware; sealants.

B. Provide complete operating door assemblies including door curtains, guides, hardware, operators, motors, and installation accessories. Coordinate with other hardware requirements in Section 08700.

C. The systems are standard units to the shapes indicated, combined with extruded sections to create the profiles indicated.

D. Provide assemblies that have been designed and fabricated to comply with requirements of the system performance characteristics below, as demonstrated

by testing the manufacturer's corresponding stock systems in accordance with the test methods designated.

E. Preparation of openings, structural support, access panels, finish and trim for openings, construction of storage pockets and painting shall be furnished and installed under other Sections herein.

1.3 REFERENCES

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

B. Aluminum Association (AA):

1. AA DAF45 - Designation System for Aluminum Finishes.

C. American Architectural Manufacturers Association (AAMA):

1. AAMA 101 - Specification for Windows, Doors and Skylights.

2. AAMA 501.1 - Methods of Test for Exterior Walls.

3. AAMA 605.2 - Specification for High Performance Organic Coating on Architectural Extrusions and Panels.

4. AAMA 607.1 - Specifications and Inspection Methods for Clear Anodic Finishes for Architectural Aluminum.

5. AAMA 608.1 - Specification and Inspection Methods for Electolytically Deposited Color Anodic Finishes for Architectural Aluminum.

6. AAMA 611 - Specification for Anodized Architectural Aluminum.

7. AAMA 701.2 - Specifications for Pile Weatherstripping and Replaceable Fenestration Weatherseals.

8. AAMA 1503.1 - Test Method for Condensation Resistance of Windows.

9. Manual #10 - Care and Handling of Architectural Aluminum From Shop to Site.

10. SFM-1-87 - Aluminum Storefront and Entrance Manual- AAMA Technical Reference Manual - Volume III.

D. American National Standards Institute (ANSI):

1. ANSI A 117.1 - Safety Standards for the Handicapped.

2. A156.4 - Door Controls - Closers.

3. ANSI A 156.5 - Standard for Auxiliary Locks and Associated Products.

4. ANSI Z97.1 - Safety Glazing Materials Used in Buildings - Methods of Test.

E. American Society of Civil Engineers (ASCE):

1. ASCE / SEI 7 - Minimum Design Loads for Buildings and Other Structures.

F. American Society for Testing and Materials (ASTM):

1. ASTM A 36 / A 36M - Specification for Carbon Structural Steel.

2. ASTM B 209 - Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

3. ASTM B 221 - Specification for Aluminum and Aluminum-Alloy Extended Bars, Rods, Wire, Profiles, and Tubes.

4. ASTM B 308 / B 308M - Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles.

5. ASTM E 283 - Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Difference Across the Specimen.

6. ASTM E 330 - Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.

7. ASTM E 331 - Test Method for Water Penetration of Exterior Windows, Skylight, Doors, and Curtain Walls by Uniform Static Pressure Difference.

8. ASTM E 547 - Test Method for Water Penetration of Exterior Window, Skylights, Doors, and Curtain Walls by Cyclic Static Air Pressure Difference.

9. ASTM E 1996 - Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes.

10. ASTM F 588 - Test Methods for Measuring the Forced Entry Resistance of Window Assemblies, Excluding Glazing Impact.

11. ASTM F 842 - Test Methods for Measuring the Forced Entry Resistance of Sliding Door Assemblies, Excluding Glazing Impact.

G. Americans with Disabilities Act Accessibility Guidelines (ADAAG).

H. American Welding Society (AWS):

1. AWS A5.10 / A5.10M - Specification for Bare Aluminum and Aluminum-Alloy Welding Electrodes and Rods.

2. AWS D1.1 / D1.1M - Structural Welding Code - Steel.

I. Code of Federal Regulations:

1. 16 CFR 1201 - Safety Standards for Architectural Glazing Materials.

J. Glass Association of North America:

1. Glazing Manual.

K. International Code Council:

1. International Building Code (IBC), 2009.

L. International Organization for Standards (ISO):

1. ISO 9001 - Quality Management Systems.

M. National Association of Architectural Metal Manufacturers (NAAMM):

1. Metal Finishes Manual for Architectural and Metal Products.

N. SSPC: Society for Protective Coatings (formerly Structural Steel Painting Council):

1. Paint 12 - Cold-Applied Asphalt Mastic (Extra Thick Film).

O. Underwriters Laboratories, Inc. (USA & Canada) UL 1784 Air Leakage Test of Door Assemblies

P. Intertek Warnock Hersey (ETL): Testing Laboratory and Certification Agency joined with ETL Semko

Q. 2018 Facilities Guidelines Institute (FGI) for Design and Construction of Airborne Infection Isolation Rooms (AIIR) in Healthcare Facilities (FGI): Ref: A2.1-7.2.2.3 (2)(a)(i)(ii) Minimum Slide Door Opening Height & Width

1.4 PERFORMANCE TESTING

A. General:

1. Perform tests on complete assembly mock-ups. Comply with the requirements indicated below. Perform tests prior to the start of fabrication.

2. Where the manufacturer's standard system complies with the requirements, and has been tested in accordance with the specified tests, provide certification by the manufacturer showing compliance with such tests.

B. Performance Requirements: Provide the capacity to withstand the following loading requirements as defined in IBC 2009 Chapter 16:

1. Seismic Loads: According to IBC 2009, Section 1613 and ASCE 7

a. Seismic Design Category: D

b. Seismic Importance Factor: Per ASCE 7

2. Thermal Movement:

a. Provide for thermal movement resulting from the following maximum change in ambient and surface temperatures to prevent buckling, opening of joints, over stressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculations on surface temperatures of the materials due to both solar heat gain and nighttime heat loss.

i. Ambient temperature range: 120° F.

ii. Materials surface: 180° F.

C. Air Infiltration: Air infiltration rate shall not exceed 0.15 cfm / sq. ft. and 0.37 cfm / ft. of crack length when tested at a static air pressure differential of 6.24 psf when tested per ASTM E 283.

D. Forced Entry Resistance: ASTM F 588 or ASTM F 842, performance level 10.

E. Uniform Load: No deflection in excess of L / 175 of the span of any framing member at a structural test load equal to 1.5 times the specified design windload; no glass breakage or permanent set in the framing members in excess of 0.2% of their clear spans with a static air design load of 20 psf applied in the positive and negative directions in accordance with ASTM E 330.

F. Component Structural Tests: Perform operating, hardware, sash rail rigidity and other tests called for by AAMA AVoluntary Guide Specification for Aluminum Architectural Windows".

1.5 SUBMITTALS

A. Section 01330 - Submittal Procedures: Procedures for submittals.

1. Product Data: Manufacturer's technical product data, specifications, standard details, and installation recommendations for the components required. Provide component dimensions; describe components within the assembly, anchorage and fasteners, glass and glazing in-fill, hardware, and internal drainage details.

2. Shop Drawings: Drawings for fabrication and installation of the required systems; indicate the system dimensions, framed opening requirements, tolerances, and affected related work; include plans, elevations, detailed sections of typical composite members, hardware mounting heights, reinforcement, and expansion and contraction joint locations. Show anchors, hardware and other components not included in the manufacturer's Product Date; include glazing details.

3. Samples:

a. Aluminum Extrusions: Two (2) samples of each required aluminum finish on 12" long sections of the extrusion shapes required for the system.

b. The Architect reserves the right to require additional samples which show fabrication techniques, workmanship of component parts, design of the hardware and other exposed auxiliary items.

c. Glazing: Submit samples per Section 08800 - Glass and Glazing.

4. Assurance / Control Submittals:

a. Manufacturer's certification or test reports certifying that the products have been tested and comply with the performance testing requirements.

b. Calculations indicating that the system and anchorages meet the Performance Requirements and the Building Code indicate anchor spacing. Indicate the number and placement of weld-in anchors and supplemental steel jamb and frame reinforcing, as necessary.

c. Certification that the door system meets the performance design criteria in accordance with the following:

i. ANSI A 156.10.

ii NFPA 101

iii. UL 325.

iv. IBC - 2009.

d. Documentation of experience indicating compliance with the specified qualifications requirements.

f. Manufacturer's Operation and Maintenance Data..

B. Section 01780 - Closeout Submittals: Procedures for closeout submittals.

1. Manufacturer's Operation and Maintenance Manual.

2. Warranty: Submit a written special Warranty with forms completed in the name of the Owner and registered with the manufacturer.

1.6 COORDINATION

A. Pre-Installation Meeting: Convene a Pre-Installation Meeting at the Project Site prior to beginning the work of this Section.

1. Require attendance of the Contractor, Owner's representative, Architect, and representative of the Installer.

2. Review the coordination required for proper installation.

3. Review preparation and installation procedures, and the coordination and scheduling required with other related work.

B. Check Shop drawings for other work to confirm that adequate provisions are made for locating and installing doors in compliance with the requirements.

1.7 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer:

a. Company specializing in manufacturing the products specified with a minimum of five (5) years documented experience.

b. Company capable of providing field service representation during installation, approving an acceptable installer, and approving the installation.

2. Installer:

a. Company experienced in performing the work of this Section with a minimum of five (5) years documented experience.

b. Company with supervisory staff trained and approved by the door

manufacturer and with the trained supervisory personnel observing and directing the work.

c. Company capable of providing field service after installation.

B. Furnish complete units produced by a single manufacturer, including hardware, accessories, tracks, mountings, and installation components.

C. Unless otherwise acceptable to the Architect, furnish all units and assemblies for the entire Project by one manufacturer.

D. Design Criteria: The Drawings are based on Kawneer's standard aluminum entrance, storefront, sidelite, sliding door and operable and fixed window systems. Other manufacturer's standard system of similar and equivalent nature may be acceptable when the difference does not materially detract from the design concept or required performance, as judged solely the Architect. The plans, elevations and details show the spacing of members as well as profiles and similar dimensional requirements, and the entrance, storefront, sidelights, and door and windows work.

1.8 DELIVERY, STORAGE AND HANDLING

A. Section 01600 - Product Requirements: Transport, handle, store, and protect the products.

B. Protect finished aluminum surfaces with a strippable coating. Do not use adhesive papers or sprayed coatings which bond when exposed to sunlight or weather.

C. Pack, box, ship, unload, store and protect products in a manner to avoid breakage, abuse, damage and defacement.

D. Deliver products to the Project Site in the manufacturer's original, unopened protective packaging.

E. Store inside, protected from weather.

F. Stack vertically on edge to provide for water drainage and air circulation.

G. Break seals to permit ventilation.

1.9 WARRANTY

A. Section 01780 - Closeout Submittals: Procedures for closeout submittals.

B. Special Warranty:

1. Provide a joint and severable written Warranty signed by the manufacturer, Contractor and Installer, certifying that the products and installation is free of defective materials and workmanship, and agreeing to repair or replace any defective component, or the system, in whole or in part, as necessary, to restore the product to its original intended state and integrity. Warranty shall include responsibility for removal and replacement of other work which may conceal door parts.

2. Warranty Period: Two (2) years from the date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with the Project requirements, manufacturers offering products which may be incorporated into the work include the following:

1. Kawneer Company, Inc. components are referenced within this Section to establish the level of quality required.

2. HORTON AUTOMATICS, a division of Overhead Door Corporation, shall manufacture sliding door(s) of type(s) and size(s) specified on plans and door schedule.

B. Section 01600 - Product Requirements: Product Options: Substitutions permitted.

2.2 MATERIALS AND ACCESSORIES

A. Aluminum Members: Alloy and temper as recommended by the manufacturer for strength, corrosion resistance, and application of the required finish; ASTM B 221 for extrusions, ASTM B 209 for sheets and plates.

B. Steel Sections: ASTM A 36 / A 36M; shaped to suit the mullion sections.

C. Reinforcement: Where fasteners screw-anchor into aluminum less than 0.125" thick, reinforce the interior with aluminum or non-magnetic stainless steel to receive the screw threads, or provide standard non-corrosive pressed-in splined grommet nuts.

D. Brackets and Reinforcements: Manufacturer's high-strength aluminum units where feasible, otherwise, non-magnetic stainless steel. Steel reinforcing shapes to be stainless steel or hot-dip galvanized steel complying with ASTM A 123 / A 123M.

E. Concealed Flashings: Dead-soft stainless steel, 26-gauge minimum, or extruded aluminum, 0.062" minimum, of an alloy and type selected by the manufacturer for compatibility with other components.

F. Anchors: Drill-in expansion bolts or weld-in type with in-place steel anchors welded to steel plates anchoring the frame.

G. Fasteners:

1. Aluminum, non-magnetic stainless steel, or other materials warranted by the manufacturer to be non-corrosive, and compatible with aluminum components.

2. Do not use exposed fasteners for the attachment of hardware, except where unavoidable and where clearly noted on submittal shop drawings.

3. Provide Phillips flat-head machine screws for exposed fasteners. Finish shall match the finish of the adjoining metal.

H. Glass and Glazing Materials: Provide glass and glazing materials which comply with the requirement of Section 08800 - Glass and Glazing, including for doors and windows specified to be factory-glazed.

I. Sealant and Backing Materials: Unless otherwise indicated for sealants required within fabricated window units, provide a type recommended by the product manufacturer for the joint size and movement, to remain permanently elastic, non-shrinking and

non-migrating. Comply with Section 07900 - Joint Sealers, for installation of sealants and backing materials.

2.3 FABRICATION

A. Sizes and Profiles: The sizes for units, including profile requirements, shall be as indicated and as required to meet the Performance Requirements. Any variable dimensions are indicated, together with maximum and minimum dimensions required to achieve the design requirements and coordination with other work.

B. Field Measurement: Wherever possible take field measurements prior to the preparation of Shop Drawings and fabrication to ensure proper fitting of the work. Proceed with fabrication and coordination, as necessary, when the taking of field measurements might delay the work.

C. Prefabrication: To the greatest extent possible, complete fabrication, assembly, finishing, hardware application, and other work before shipment to the Project Site. Disassemble components only as necessary for shipping and installation.

1. Pre-glaze door and window units to the greatest extent possible, in coordination with the installation and hardware requirements.

2. Do not drill and tap for surface-mounted hardware items until the time of installation at the Project Site.

3. Perform fabrication operations, including cutting, fitting, forming, drilling and grinding of metal work in a manner to prevent damage to exposed finish surfaces. For hardware, perform these operations prior to the application of finishes.

4. Fabricate framing for glazing from the inside, except for large plates of glass which may be glazed from the outside.

D. Glazing: Provide for the following edge clearances:

	Single Glazed
Nominal edge cover (bite)	5/16"
Minimum nominal edge clearance	1/8"
Minimum face clearance	1/8"

1. Glass must be edge blocked to prevent contact with the metal framing.

E. Reinforcing: Install reinforcing, as necessary, to meet the Performance Requirements.

F. Welding: Comply with AWS recommendation to avoid discoloration; grind exposed welds smooth and restore mechanical finish.

G. Continuity: Maintain accurate relationship of planes and angles, with hairline fit at contacting members.

H. Fasteners: Conceal fasteners wherever possible.

I. Structural Silicon Sealant: As recommended by the manufacturer.

2.4 ALUMINUM STOREFRONTS

A. Provide a system combined with extruded aluminum sections to the profiles indicated designed to meet the Performance Requirements.

B. Storefront Framing System: Trifab Versa Glaze 451 / 451T by Kawneer, 2" x dimension shown, extruded aluminum; minimum wall thickness of 0.080"; flush glazed.

C. Column Covers: 0.040" aluminum by Kawneer. Finish to match the storefront system.

D. Receptor Channel: Model No. 450-038 and 65-025 by Kawneer; finish to match the storefront system.

E. Provide aluminum entrances fabricated to comply with the elevations and details shown on the Drawings.

F. Hardware:

1. Locking handles, cases, keepers, catches and fasteners shall be of a corrosion-resistant material compatible with aluminum.

2. Hardware shall meet AAMA tests and be suitable for its intended use.

2.5 MANUAL ALUMINUM SLIDING DOORS

A. Basis of Design Product: Subject to compliance with requirements, provide Horton Profiler ® Smoke Rated Manual Slide Door; Type 010 or approved equal. Web: www.hortondoors.com

B. Equipment

1. MANUFACTURED DOOR UNITS: Shall include header with roller track, carrier assemblies, framing jambs, sliding door panel, sidelite (for perimeter mounted) and accessories required for complete installation.
   a. Configuration: Single Slide
   b. Mounting Type: Surface mounted (X-P) onto face of wall.
   c. Door Types: Type 010; Slide panel 'X' shall slide alongside wall utilizing floor mounted guide.

2. HEADER: Shall be aluminum with removable faceplate. Header size to be 4" deep by 2 1/2".

3. HEADER TRACK: Shall be be aluminum, 1/4" wide, nylon covered, and replaceable. Rollers will be steel, high quality ball bearing wheels 1-1/4" diameter Anti-Derailing shall be accomplished by means of a continuous aluminum extrusion full length of slide panel travel.

4. SLIDING PANEL: Shall be aluminum, 1-3/4" deep with narrow stile construction. Weather-stripping to be along vertical rails of sliding panel and sidelite. Concealed guides to stabilize bottom of sliding panel. Standard bottom rail shall be 4" tall. Standard glazing prep to be for 1/4" glass. Wet glazed with red high temperature silicone sealant at corners.
   a. Sliding Panel Options shall be:
      i. Medium stile construction: 3 3/4" wide vertical rails with 6 1/2" tall bottom rail.

ii. Horizontal muntin(s) of size and type indicated.

iii. Prep for glazing 5/16" to 1".

b. Locking Hardware: shall be provided as follows:

i. Positive Latch: shall be provided on lead/initial slide-swing panel. Panel will latch in place when closed. A lever handle shall be provided on each side of this sliding panel to unlock the door. Optional antimicrobial coating available for lever handle.

5. JAMBS/FRAME: Shall be aluminum, 1 3/4" deep by 4" wide x .125" thickness.

C. RELATED WORK REQUIREMENTS

GLASS AND GLAZING: Glass stops, glazing vinyl and setting blocks for field glazing as per Safety Glazing standard ANSI Z97.1.2.

D. MATERIALS, FINISHES AND FABRICATION

1. EXTRUDED ALUMINUM: ASTM B221, 6063-T5 alloy and temper, anodized:

a. Structural Header Sections: Minimum 3/16" thickness.

b. Structural Frame Sections: Minimum 1/8" thickness.

c. Structural Panel Sections: Commercial grade.

2. FINISHES (for all exposed aluminum surfaces): Shall be one of the following:

a. 204-R1 Clear: Arch. Class 2 Clear Anodized Coating, AA-MI2C22A31.

b. 313-R1 Dark Bronze: Arch. Class 1 Anodized Coating, AA-MI2C22A44.

c. 312-R1 Light Bronze: Arch. Class 1 Anodized Coating, AA-MI2C22A44.

d. 315-R1 Black: Arch. Class 1 Anodized Coating, AA-MI2C22A44.

e. Special Paint Coating: Color as selected.

3. PANEL CONSTRUCTION:

a. Corner block type with 3/16" steel backup plate construction, mechanically secured with minimum of four hardened steel screws. Sash consists of snap-in glass stops, snap-in glazing beads and vinyl gaskets. Gasketing material is high temperature silicone and is to be captured in extruded aluminum door panel. Floor Smoke Seal is high temperature brush. All seals to be factory installed to maintain UL 1784 rating.

b. Weatherstripping material captured in extruded aluminum door panel. Surface applied self-adhesive weatherstripping not acceptable.

c. Slide-swing doors to be supplied with adjustable glass setting block to allow for adjusting of door to meet site conditions eliminating the need for additional shims.

4. FRAME CONSTRUCTION: Butt joints, mechanically secured by means of screws and formed aluminum corner brackets.

2.6 MANUAL ALUMINUM SLIDING DOORS - TELESCOPING

A. Basis of Design Product: Subject to compliance with requirements, provide Horton Profiler ® - ICU Self-Closing Telescoping-IDS Manual ICU/CCU Entrance; Type 310T Trackless or approved equal. Web: www.hortondoors.com

B. Equipment

1. MANUFACTURED DOOR UNITS: Shall include header with roller track, carrier assemblies, framing jambs, sliding door panels, sidelite and accessories required for complete installation. Leading slide panel will open twice as fast as adjacent sliding panel. Units to provide minimum of 45.5" of clear slide opening width and 83.5" minimum clear opening height in compliance with 2018 FGI AIIR.
   a. Configuration: Single Slide Telescopic, 3-panel, SO-SX-SX.
   b. Mounting Type: Perimeter mounted within rough opening.
   c. Door Type: 310T Trackless: Slide-swing panel fast 'SX' shall slide along interior side of trailing slow 'SX' and of swing-out sidelite 'SO' utilizing trackless floor system with no floor track/guide or recess required.

2. TELESCOPING HEADER: Shall be 8" deep by 6" high. Header shall be aluminum construction with removable face plate.

3. SELF-CLOSING MECHANISM: Shall be mechanical requiring no electrical power & shall be fully concealed within header. Coiled spring under tension attached to sliding door shall work with hydraulic damper to provide adjustable 6-8 lbs. of closing force. Manual opening force shall not exceed 12 lbs. Hold-Open shall be engaged when 8-12 lbs. of force is applied to door panel in full-open position and disengaged when 6-8 lbs. of force is applied to door panel.

4. CARRIER ASSEMBLIES AND HEADER ROLLER TRACK: Shall be double track system that will provide for two-speed travel of sliding panels. Carrier assemblies shall support door panels with four rollers per panel. Rollers will be non-metallic, high quality ball bearing wheels 2" (51 mm) diameter. Anti-Derailing shall be accomplished by means of two additional adjustable rollers per panel. Overhead header roller track shall be continuous aluminum and replaceable.

5. SLIDE-SWING PANELS AND SWING-OUT SIDELITE. Shall be aluminum, 1 3/4" deep with narrow stile construction and with perimeter seals. An intermediate, horizontal rail (muntin bar), 2 1/4" wide, shall be furnished for safety and division of glass. Floor Seals to be field applied and adjusted from 1/8" to 1/2" above finished floor to required positive/negative pressure. Standard bottom rail shall be 4" tall. Concealed guides to stabilize bottom of sliding panel. Standard glazing prep to be for 1/4" glass.
   a. Bottom Rails Options: 6 ½", 8" or 10" tall.
   b. Glazing Prep. Options: 5/16" to 1 ½".
   c. Constant Latching Flush Bolt shall be provided for 'SO' swing-out sidelite. Swing-out sidelite will thus be locked in place under normal conditions.

6. SWING-OUT FEATURE: In full slide-open position, after 'SO' flush bolt has been released, panels can swing out 90° with maximum 50 lbs. of force applied at the strike rail. Breakout mechanism shall provide support across full width of the door, in normal operating mode. In breakout mode, torsion assembly shall support weight of the door to minimize drop.

7. JAMBS/FRAME: Shall be aluminum. Jamb dimensions to be: 1 3/4" deep by 6" wide. Optional Jambs shall be: 1 3/4" deep by 7" pocketed or non-pocketed.

C. Work Related Requirements

GLASS AND GLAZING: Glass stops, glazing vinyl and setting blocks for field glazing as

per Safety Glazing standard ANSI Z97.1.2, ASTM E283-04 and UL 1784. Contractor to coordinate acquisition of glass in thickness and type in accordance with manufacturer's recommendations for prescribed design.

C. Materials, Finishes, and Fabrication

1. EXTRUDED ALUMINUM: ASTM B221, 6063-T5 alloy and temper, anodized:
   a. Structural Header Sections: Minimum 3/16" thickness.
   b. Structural Frame Sections: Minimum 1/8" thickness.
   c. Structural Panel Sections: Commercial grade.

2. FINISHES (for all exposed aluminum surfaces):
   a. 215-R1 Clear: Architectural Class 1 Clear Anodized Coating, AA-MI2C22A41.
   b. Antimicrobial coating.

3. PANEL CONSTRUCTION:
   a. Corner block type with 3/16" steel backup plate construction, mechanically secured with minimum of four hardened steel screws. Sash consists of snap-in glass stops, snap-in glazing beads and vinyl gaskets. Gasketing material to be captured in extruded aluminum door panel. Floor seal is brush material and sent loose. Perimeter seals to be factory installed to maintain ASTM E283-04.
   b. Slide-swing doors to be supplied with adjustable glass setting block to allow for adjusting of door to meet site conditions eliminating the need for additional shims.

4. FRAME CONSTRUCTION: Butt joints, mechanically secured by means of screws & formed aluminum brackets.

2.7 GLASS AND GLAZING MATERIALS

A. Glazing: As specified in Section 08800 - Glass and Glazing.

B. Double wet glaze with Dow 995, or approved equal.

2.8 SEALANT

A. Sealant and Backing Materials:

1. Perimeter Sealant: Type as specified in Section 07900 - Joint Sealers.

2. Sealant Used Within the System (Not for Glazing): Type as specified in Section 07900 - Joint Sealers.

2.9 HARDWARE

A. General: Provide the manufacturer's standard heavy-duty hardware units, as indicated, scheduled, or as required for the operation of each door and window, as recommended by the manufacturer for the service required; finish to match the frame unless otherwise indicated.

2.10 FINISHES

A. Exposed Aluminum Surfaces: Clear anodized or as selected from the manufacturer's standard finishes.

B. Maintain same color range on doors, frames and other components. Do not mix light and dark shades within an assembly.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01700 - Execution Requirements: Verification of existing conditions before starting the work.

B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive the work.

1. Verify that related work performed under other Sections has been completed, and is in accordance with approved Shop Drawings.

2. Verify that openings are dimensionally within allowable tolerances, plumb, level, clean and provide for proper anchoring.

C. Report in writing, prevailing conditions that will adversely affect satisfactory execution of the work of this Section. Do not proceed with the work until the unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install doors and windows, complete, with all necessary hardware, jamb and head mold strips, anchors, inserts, hangers, and equipment supports in accordance with approved Shop Drawings, manufacturer's instructions, to meet the Performance Requirements, and as specified herein.

B. Attach to the structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

C. Anchor and weld securely in place; provide alignment attachments and shims to permanently fasten systems and units to the building structure. Anchorages shall be concealed.

D. Comply with AWS recommendation to avoid discoloration; grind exposed welds smooth and restore the mechanical finish.

E. Align assemblies and units plumb, level and true to line, without warp or rack of framing members, doors, windows and panels. Maintain assembly dimensional tolerances; align with adjacent work.

F. Install sill flashings with turned up edges and ends; seal to adjacent work to form a water tight dam.

G. Install compensating channels at door and window heads where indicated.

H. Ensure water drainage away from glazing.

I. Coordinate the attachment and seal of perimeter air and vapor barrier materials.

J. Provide thermal isolation where components penetrate or disrupt the building insulation. Pack fibrous insulation in shim spaces at the perimeter of assemblies and units to maintain continuity of the thermal barrier.

K. Install hardware using templates provided, and in accordance with the installation requirements in Section 08710 - Door Hardware.

L. Drill and tap frames, doors and windows and apply surface-mounted hardware items in compliance with the hardware manufacturer's instructions and templates. Use concealed fasteners wherever possible.

M. Set sill members, thresholds and other members in a bed of sealant, as indicated, or with joint fillers or gaskets, as indicated, to provide a weathertight installation. Coordinate the installation with wall flashings and other components of the work. Comply with the requirements of Section 07900 - Joint Sealers.

N. Set thresholds in a bed of mastic, and secure.

O. Refer to Section 08800 - Glass and Glazing for the installation of glass and other panels shown to be glazed into doors, windows and framing, and not pre-glazed by the manufacturer.

P. Separate aluminum and other corrodible metal surfaces from sources of corrosion and electrolytic action at points of contact with other metals. Isolation Requirements:

1. Dissimilar Metals: Where aluminum surfaces are in contact with, or fastened to dissimilar metals except stainless steel, zinc or zinc coating, protect aluminum from the dissimilar metal. Where aluminum contacts another metal, paint the dissimilar metal with epoxy paint. Where drainage from a dissimilar metal passes over aluminum, paint the dissimilar metal with a non-lead pigmented paint.

2. Cementitious Materials: Paint aluminum where in contact with mortar, concrete or other cementitious material, with an alkali-resistant coating such as heavy-bodied bituminous paint or epoxy paint.

3. Wood Contact: Isolate aluminum from cedar, redwood, oak and acid-treated lumber by means of unbroken 6-mil polyethylene construction sheet or a heavy coating of metal-protective paint.

4. Surfaces in contact with sealants after installation shall not be coated with any type of protective material.

3.3 ADJUSTING

A. Section 01700 - Contract Closeout: Adjusting installed work.

B. Adjust operating hardware to function properly, without binding, and to prevent tight fit at contact points and weatherstripping.

C. Doors operation shall meet ADAAG requirements for opening force.

D. Repair damaged finishes to match the original finish.

3.4 FIELD QUALITY CONTROL

A. Section 01450 - Quality Control: Field testing and inspection.

B. Inspect installations for alignment, level, plumb, secure attachment to the structure, and smooth and proper operation.

C. On-Site Tests:

1. If the units do not appear to meet air or water infiltration requirements, the Owner, may require on-site tests shall be conducted for both air and water infiltration, with the door manufacturer's representative present. The Owner's representative will select the unit(s) to be tested. If such unit(s) fail to meet the specified air and water requirements, the reason for failure shall be jointly determined.

2. Tests shall be conducted in accordance with AAMA 101-88.

3. The responsible Contractor shall correct tested units that do not meet the specified requirements, and all units with similar deficiencies, at no additional cost to the Owner.

4. The cost for all successful tests, both original and retest shall be paid by the Owner. All unsuccessful tests, both original and retest, shall be paid for by the responsible Contractor.

5. The testing shall be done by an AAMA-accredited testing agency, selected by the Owner's representative and the manufacturer, and shall be employed by the responsible Contractor.

3.5 CLEANING

A. Section 01700 - Contract Closeout: Cleaning the installed work.

B. Remove protective material from pre-finished aluminum surfaces.

C. Promptly after the installation of glass and sealants, clean the completed system, inside and out, exercise care to avoid damage to coatings and finishes.

D. Remove excess glazing and joint sealants, dirt, and other substances from aluminum surfaces by a method acceptable to the sealant manufacturer.

E. Wash down exposed surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean and dry.

3.6 PROTECTION

A. Implement and maintain protective measures, and take other precautions necessary to ensure that all assemblies will be without damage and deterioration at the time of Substantial and Final Completion.

END OF SECTION

SECTION 08710

DOOR HARDWARE

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Finish Hardware items required for swing, sliding and folding doors, except special types of unique and non-matching hardware specified in the same Section as the doors and windows.

2. Hinges.

3. Locks, latches and bolts.

4. Push / Pull units.

5. Exit devices. (Panic Hardware).

6. Closers.

7. Stops, holders and bumpers.

8. Thresholds.

9. Weatherstripping.

10. Miscellaneous hardware.

B. Related Documents: The Contract Documents, as defined in Section 01110 - Summary of Work, apply to the Work of this Section. Additional requirements and information necessary to complete the Work of this Section may be found in other Documents.

C. Related Sections:

1. Section 08400 - Aluminum Doors and Windows: Door and window hardware.

1.2 DESCRIPTION OF WORK

A. The extent of the finish hardware work is indicated on the Drawings and as specified herein, and includes furnishing and installing all finish hardware, trim, attachments and fastenings specified complete and proper. Under this Section include all hardware that is not specified in other Sections, whether or not such hardware is herein scheduled.

1.3 REFERENCES

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

B. American National Standards Institute (ANSI);

1. ANSI A117.1 - Specifications for Making Buildings and Facilities Accessible to and Usable by Physically Handicapped People.

2. ANSI A156.1 - National Standard for Butts and Hinges.

3. ANSI A156.2 - National Standard for Locks and Lock Trim.

4. ANSI A156.3 - National Standard for Exit Devices.

5. ANSI A156.4 - National Standard for Closers.

6. ANSI A156.6 - National Standard for Architectural Door Trim.

7. ANSI A156.13 - National Standard for Mortise Locks & Latches.

8. ANSI A156.16 - Standard for Auxiliary Hardware.

C. Americans with Disabilities Act Accessibility Guidelines (ADAAG):

1. Accessibility Guidelines for Buildings and Facilities.

D. Door Hardware Institute (DHI):

1. Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames.

E. National Fire Protection Association (NFPA):

1. NFPA 80 - Standard for Fire Doors and Other Opening Protectives.

2. NFPA 101 - Life Safety Code.

3. NFPA 252 - Standard Methods for Fire Tests of Door Assemblies.

F. Underwriters Laboratories (UL):

1. UL 10B - Standard for Safety Fire Tests for Door Assemblies.

2. UL 305 - Panic Hardware.

1.4 SUBMITTALS

A. Section 01330 - Submittal Procedures: Procedures for submittals.

1. Product Data. Manufacturer's technical product data for each item of hardware. Include information necessary to show compliance with requirements, instructions for installation, and maintenance of operating parts and finishes.

2. Hardware List: Prepare and submit three (3) copies of a Hardware List for review. One (1) copy will be returned. The List shall identify each hardware item by manufacturer, manufacturer's catalog number, and the exact location in the work. Indicate applicable scheduled door data, including the door numbers shown on the Drawings, the number of doors, hand of operation with an explanation of how the hand is determined, and indicate the active leaf where a pair of doors are required. Indicate hardware finishes.

a. Fastening Data: Indicate and clearly highlight "exposed on surface of hardware" fasteners, and through fastenings which would be exposed on the opposite door face when other than Phillips flat-head devices are proposed.

b. The Hardware List shall be in a suitable form to facilitate ready review by the Owner's representative. Acceptance of the List will not relieve the Hardware Supplier from the responsibility for furnishing the job complete.

3. Catalog Cuts: Submit three (3) catalog cuts of every item to be furnished. One (1) copy will be returned. Show all finishes, sizes, catalog numbers and pictures, include information necessary to show compliance with the requirements, instructions for installation, and maintenance of operating parts and finishes. Explain all abbreviations fully.

4. Mounting Locations: Submit mounting locations data for each type of hardware required.

5. Hardware Schedule: Submit a Hardware Schedule as indicated below. Coordinate hardware with the doors, frames and related work to ensure proper size, thickness, backset, hand, function and finish.

   a. Final Hardware Schedule Content: Based on the finish hardware indicated, organize a Hardware Schedule into "Hardware Sets", indicating a complete designation of every item required for each door. Provide the following information:

      1). Type, style, function, size and finish of each hardware item.

      2). Name and manufacturer of each item.

      3). Fastenings and other pertinent information.

      4). Location of the hardware set cross-referenced to the Drawings, both on the Floor Plans and Door Schedule.

      5). Explanation of all abbreviations, symbols, codes, etc. contained in the Hardware Schedule.

      6). Mounting locations for hardware.

      7). Door and frame sizes and materials.

      8). Keying and master keying information.

   b. Submittal Sequence: Submit the Hardware Schedule at the earliest possible date, particularly where acceptance of the Schedule must precede the fabrication of other work (e.g., aluminum frames) critical to maintaining the Project Construction Schedule. Include with the Schedule, product data, samples, Shop Drawings of other work affected by the finish hardware, and other information essential for a coordinated review of the Schedule. Acceptance of the Hardware List does not relieve the Hardware Supplier from the responsibility of furnishing the job complete for its intended purpose.

6. Keying Schedule: Submit with the final Hardware Schedule. Door designations to be the same as those on the Drawings.

7. Samples: Prior to submittal of the Final Hardware Schedule, and prior to ordering of the finish hardware, submit one (1) sample of each type of exposed hardware, as selected, with the required finish, including fasteners, and tagged with a full description for coordination with the Hardware Schedule.

   a. Samples will be returned to the supplier. Units which are acceptable and remain undamaged through submittal, review and field comparison procedures may, after final check of the operation, be used in the work, within limitations of the keying coordination requirements.

B. Maintenance Related Items: Provide one (1) set of adjusting tools, two (2) sets of Maintenance Manuals, including lubrication requirements, parts list, manufacturers contact for ordering replacement parts and basic installation instructions for locksets, door closers, floor hinges and panic devices to the Owner's representative. Provide four (4) blanks for each key type.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with the following requirements:

1. ANSI A117.1
2. NFPA 80.
3. NFPA 101.
4. NFPA 252.
5. UL 10B.
6. UL 305.
7. ADAAG.

B. Regulatory Requirements.

1. Conform to the Building Code for requirements applicable to fire-rated doors and frames.
2. Conform to ADAAG for operation, mounting heights, and location of accessories.

C. Manufacturer: Company specializing in manufacturing the products specified with a minimum of five (5) years documented experience.

D. Installer: Company experienced in performing the work of this Section with a minimum of five (5) years documented experience.

E. Supplier: A recognized architectural finish hardware supplier, who has been furnishing hardware to similar projects for a period of not less than five (5) years, and who employs an experienced architectural hardware consultant (AHC) for the preparation of Hardware Schedules, and consultation about project hardware requirements.

F. Obtain each type of hardware (latch and lock sets, hinges, closers, etc.) from a single manufacturer.

1.6 DELIVERY, STORAGE AND HANDLING

A. Section 01600 - Product Requirements: Transport, handle, store and protect the products.

B. Supplier to deliver the appropriate hardware, at the proper time and to the proper location (shop or Project Site) for installation.

C. Deliver products to the Project Site in the manufacturer's original, unopened packages, dry and undamaged, bearing the manufacturer's name and identification of the hardware item.

D. Retain the manufacturer's original packaging. Ensure that the products are complete, including basic installation instructions. Label each product separately to be readily identifiable with the products indicated in the Hardware Schedule.

E. Supplier to identify sets with the appropriate hardware set number.

F. Contractor to catalogue the delivered hardware and store in a secure lockable enclosure, i.e. room, storage cabinet, etc.; store off the ground and on shelving. Set up procedures for limited access to the locked storage.

G. Store products in their original protective packaging to prevent soiling, wetting and physical damage to materials, finishes and operating mechanisms.

H. Handle to prevent damage to finish surfaces.

I. Maintain protective covers on all units until installation has been completed. Remove coverings during final clean-up.

PART 2 PRODUCTS

2.1 HARDWARE, GENERAL

A. Comply with ANSI / BHMA 156 Series standards applicable to the type and grade of hardware required.

B. Hardware Characteristics: Requirements for design, grade, function, finish, size and other distinctive qualities of each type of finish hardware are indicated in the Hardware Schedule at the end of this Section.

C. Complete Assemblies: Scheduled hardware indicates the primary types and quality of hardware required and is not necessarily descriptive of all the components required. Provide standard accessory components, as necessary, to complete the assembly for a fully functional unit when installed. Provide finishes matching the primary unit where accessory components are exposed-to-view.

D. Anchorage Devices: Furnish with each hardware type required.

1. Types: Wood and machine screws and other appropriate anchorage devices applicable to the type of substrate the item is to be fastened to. Do not provide exposed through-bolts or nuts unless clearly noted on the Hardware Schedule submittal, and approved by the Architect.

2. Head Style: Phillips flat-head devices.

3. Finish: Match the finish of the primary fastened hardware.

E. Finish of Hardware: The finish of hardware shall be as stated herein below. Special care shall be taken to coordinate the finish of the various manufacturers to insure a uniform acceptable finish throughout. The finish of all hardware shall match the finish of the locksets, unless otherwise specified.

F. Hardware manufacturers are listed, within each item Article below, for each hardware item to establish a standard of quality, and minimum functional requirements.

2.2 HINGES

A. Subject to compliance with the Project requirements, manufacturers offering products which may be incorporated into the work include the followings, as specified below:

1. Hager.

2. McKinney.

3. Stanley.

4. Henry Soss.

B. Material:

1. Door Butts: Hinges shall be full mortise, template type, unless half mortise hinges are required; stainless steel. Hinges shall have non-rising loose pins, ball or oilite bearings, and flat button tips with matching plugs, except where otherwise specified. Provide hinges with stainless steel pins; steel pins with steel hinges; non-removable pins (NRP) for exterior and public interior exposures, non-rising for non-security exposure.

2. Where necessary to keep the door leaf clear of walls, casings, jambs or reveals in the door opening, furnish wide throw hinges of an approved type shall be furnished. For out-swinging doors, hinges shall have a set screw in the barrel to prevent removal of the pin when the door is closed. All doors over 7'-6" tall shall have one extra hinge for each additional two (2) feet of height, or fraction thereof.

3. Ball Bearing Type: Swaged, inner leaf beveled, square corners.

4. ANSI 156.1, Grade 1.

2.3 LOCKS, LATCHES AND BOLTS

A. Subject to compliance with the Project requirements, manufacturers offering products which may be incorporated into the work include the followings, as specified below:

1. Yale.

2. Corbin Russwin.

3. Schlage.

4. Best.

5. Sargent.

B. Materials:

1. Lock Uniformity: Except where otherwise specified, all locksets, latchsets, padlocks, cylinders and component parts, as specified hereinunder, shall be by one manufacturer. All internal parts of locksets, latchsets, padlocks and cylinders shall be brass or stainless steel to resist corrosion, and shall be marine function for exterior doors; US 32D finish.

2. Lockset Style: All hardware shall have lever handles with rose.

3. Locksets: ANSI A156.2, Series 4000 Grade 1, with removable cores.

4. Mortise Locks and Latches: ANSI / BHMA A156.13, Series 1000, Operational Grade 1, Security Grade 2; equip with 6-pin tumbler; 2-3/4" backset; keyed alike, or as approved. Levers and roses shall have screwless shanks, and no exposed fasteners.

5. Bored Locks and Latches: ANSI / BHMA A156.2, Series 4000, Grade 1. Locks for exterior doors shall have threaded roses or concealed machine screws.

6. Latch Sets: Provide release by turning lever, closing door, or turning emergency release key through a hole in the outside knob.

7. Cores: All lockset shall have removable cores to facilitate easy replacement.

   a. To maintain the established existing master key system, all cylinder, locksets and padlocks shall be furnished with keyways to match the keyway of record.

   b. Furnish with construction cores for use during construction and until Substantial Completion, or until a portion of the work has been accepted by the Owner and the Owner's representative has directed the cores to be change out.

8. Hospital Latches: Push / pull latchsets similar and equal to Glynn-Johnson HL6; ½" throw, 2-3/4" backset, to 161 cutout. Cover approximately 2-1/2", covers and handles of stainless steel, BHMA 630 finish, engraved "PUSH" and "PULL" on handles, push handle pointing up, pull handle pointing down.

9. Combination Locks: Heavy-duty, mechanical combination locksets with five pushbuttons, standard sized knobs, 3/4" deadlocking latch, 2-3/4" backset. Lock shall be operated by pressing two or more of the buttons in unison or individually in the proper sequence. The inside knob shall always operate the latch. Provide a keyed cylinder on the interior to permit setting the combination.

10. Strikes: ANSI Strikes, 1-1/4" x 4-7/8". All lock strikes shall have a curved lip of sufficient length to protect the trim and jamb, and shall be furnished with wrought box strikes with extended lip for latch bolts, except open strike plates may be used in wood frames. Provide dustproof strikes for foot bolts.

11. Door Bolts: ANSI / BHMA 156.16. Provide dustproof strikes for bottom bolts, except for doors having metal thresholds. Automatic latching flush bolts: ANSI / BHMA A156.3, Type 25.

12. Door Hardware: Hand of lock shall be as shown on the Drawings. If the door hand is changed during construction, the Contractor shall make the necessary changes in the hardware at no additional cost to the Owner.

13. Lever Handles: All latch and locksets shall have lever handles with a rose. Lever handles for exit devices shall meet the test requirements of ANSI / BHMA A156.13 for mortise locks. Provide knurled or abrasive coated lever handles for doors accessible to blind persons, and those which lead to dangerous areas.

C. Keying, General:

1. All locksets, padlocks and cylinders shall be keyed, master keyed and grand master keyed at the factory where records shall be established and maintained, as directed.

   a. All master keys and grand master keys shall be identified with a registry number, not stamped with "Master" or the letter "M".

   b. Individual room keys shall not be stamped with a key cut, but with a plain identification number only.

2. Maintain a security system to ensure that keys used during construction will not open doors after occupancy.

3. Provide three (3) keys for each lockset.

4. A Keying Schedule will be provided after the initial Hardware Schedule submittal. Keyed alike and master keying will be finalized at that time.

5. Furnish exterior door lock sets with removable I/C core cylinders and cylinder guards.

6. Restrict the distribution of construction keys. Maintain a record of all persons who receive keys and provide a copy of the record to the Owner's representative upon request.

7. When directed by the Owner's representative, remove the construction cores, install permanent cores, and return the construction cores to the manufacturer.

2.4 PUSH / PULL UNITS

A. Subject to compliance with the Project requirements, manufacturers offering products which may be incorporated into the work include the followings, as specified below:

1. H. B. Ives.

2. Quality Hardware Manufacturing Co., Inc.

3. Trimco.

4. Rockwood.

B. Materials: ANSI A156.6 for 0.050 inch thickness.

2.5 EXIT DEVICES (PANIC HARDWARE)

A. Subject to compliance with the Project requirements, manufacturers offering products which may be incorporated into the work include the followings, as specified below:

1. Corbin Russwin.

2. Yale.

3. Von Duprin.

4. Adams Rite.

5. Monarch.

6. Sargent.

B. Materials:

1. Exit Devices: ANSI / BHMA A156.3,Grade 1. Provide adjustable strikes for rim type and vertical rod devices. Provide open back strikes for pairs of doors with mortise and vertical rod devices.

2. Exit Locks With Alarm: ANSI / BHMA A156.5, Type E0431 (with full-width horizontal actuating bar) for single doors: Type E0431 (with actuating bar) or E0471 (with actuating bar and top and bottom bolts, both leaves active) for pairs of doors, unless otherwise specified. Provide terminals for connection to a remote indicting panel. Provide outside control key. Coordinate with the electrical subcontractor.

3. All exposed metal shall match the hardware.

4. Size and mount the units as indicated or, if not indicated, to comply with the manufacturer's recommendations for the exposure condition. Reinforce the substrate as recommended.

5. ANSI A156.3 Exit Device and Trim, Grade 1, surface-mounted vertical rod device with dust-proof strike at the head and threshold.

2.6 CLOSERS

A. Subject to compliance with the Project requirements, manufacturers offering products which may be incorporated into the work include the followings, as specified below:

1. LCN.

2. Norton.

3. Sargent.

4. Corbin Russwin.

5. Rixon-Firemark.

6. Yale.

7. Dorma.

B. Materials and features:

1. ANSI A156.4, Grade 1.

2. ANSI A117.1.

3. Non-Sized; adjustable 1-5.

4. 180 degree door opening.

5. Heavy-duty parallel arm.

6. Standard cover.

7. Exposed metal to match the hardware.

8. Mounting: Hinge face mounting. Do not mount closers on the exterior side of doors.

9. Size and mount units as indicated or, if not indicated, comply with the manufacturer's recommendations for the exposure condition. Reinforce the substrate as recommended.

10. Provide drop brackets, mortise shoes, and long arms, as required.

11. Closers attached to mineral core or particle filled doors shall be installed with sex bolts.

12. Closers to be installed to allow the door to swing as shown on the Drawings.

13. All closers shall be ADAAG type, adjustable for spring setting, latch and sweep speed, and backcheck.

2.7 STOPS, HOLDERS AND BUMPERS

A. Subject to compliance with the Project requirements, manufacturers offering products which may be incorporated into the work include the followings, as specified below:

1. H. B. Ives.

2. Quality Hardware Manufacturing Co., Inc.

3. Trimco.

4. Dor-O-Matic.

5. Glenn-Johnson.

B. Materials:

1. Door Stop Mounting: Utilize the appropriate anchor method for the substrate encountered (plastic anchor, drywall anchor, expansion shield).

2. Provide resilient grey rubber bumpers.

3. Adjust the height of floor stops to suit the undercut of the adjacent door, and for out-swinging exterior doors.

2.8 THRESHOLDS

A. Subject to compliance with the Project requirements, manufacturers offering products which may be incorporated into the work include the followings, as specified below:

1. Pemko.

2. National Guard.

3. Reese.

4. Wooster.

5. Zero.

B. Thresholds by type:

1. Type as scheduled or indicated, or where not shown provide a manufacturer's standard aluminum threshold, with standard cast or extruded non-slip profile. For out-swinging exterior doors use vinyl or silicone rubber inserts in the face of the stop. 2005V profile by Pemko, or as approved; non-slip.

2. Thresholds shall be one-piece, continuous the full width of the doorway.

3. Where not indicated, the dept of the flat portion of the threshold to be not less than the door frame depth.

4. End Returns: Mitered and returns where ends would otherwise be exposed; of material / finish to match the primary threshold unit.

5. Height: As indicated, except do not exceed 1/2" in height where handicapped access is required. Comply with ADAAG.

6. Method of fastening: Provide the manufacturer's special concealed fastener system for installation for single units.

7. Sealant: For thresholds, single component, urethane complying with Section 07900 - Joint Sealers.

2.9 WEATHERSTRIPPING

A. Subject to compliance with the Project requirements, manufacturers offering products which may be incorporated into the work include the followings, as specified below:

1. Pemko.

2. Reese.

3. Zero.

B. Continuous Adhesive-Applied Jamb & Head Weatherstripping: Continuous at jambs and head. Air leakage of weatherstripped doors shall not exceed 0.5 CFM of air per square foot or door when tested in accordance with ASTM E 283. Pemko PK88BL, or approved equal.

2.10 MISCELLANEOUS HARDWARE

A. Subject to compliance with the Project requirements, manufacturers offering products which may be incorporated into the work include the followings, as specified below:

B. Products:

1. Smoke Seals: Fire tested, continuous at jambs and head: PK 66 by Pemko, or approved equal, color as selected.

2. Bottom Sweep: 307 by Pemko, or approved equal, color as selected.

2.12 SUBSTITUTIONS

A. Section 01600 - Product Requirements: Product Options: Substitutions permitted.

2.13 FABRICATION

A. Finish and Base Material Designations: Number indicate BHMA Code or nearest traditional U.S. commercial finish.

B. Where base material and quality of the finish are not otherwise indicated, provide at least commercially recognized marine quality as specified in the applicable Federal Specifications.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01700 - Execution Requirements: Verification of existing conditions before starting the work.

B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive the work.

1. Verify that doors and frames are ready to receive the work and that dimensions are as instructed by the manufacturer.

C. Report in writing, prevailing conditions that will adversely affect satisfactory execution of the work of this Section. Do not proceed with the work until unsatisfactory the conditions have been corrected.

3.2 INSTALLATION

A. Where not specified under other Sections to be performed by the manufacturer or supplier, machine, fit and drill wood and metal doors, and frames.

B. Prepare doors of the various types to receive hardware, using templates and instructions provided with the hardware items for on-site work.

C. Install each hardware item in compliance with the manufacturer's instructions and recommendations.

D. Wherever cutting and fitting is required to install hardware onto or into surfaces which are later to be painted or finished in another way, coordinate the hardware removal, storage and reinstallation, or the application of surface protection with the finishing work specified in Section 09900 - Painting. Do not install / reinstall surface-mounted items until the finishes have been completed on the substrates.

E. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

F. Drill and countersink units not factory-prepared for anchorage fasteners, flush with the fastened surface. Space fasteners and anchors in accordance with industry standards.

G. Set thresholds for exterior doors in a full bed of sealant to ensure waterproof integrity.

3.3 ADJUSTING

A. Section 01700 - Execution Requirements: Adjusting the installed work.

B. Adjust and check each operating item of hardware and each door to ensure proper operation and function of every unit. Replace units which cannot be adjusted to operate freely and smoothly for their intended application.

C. Adjust door control devices to compensate for the final operation of cooling and ventilating equipment.

D. Door operation shall meet ADAAG requirements for opening force.

E. Adjust operating hardware to provide a tight fit at contact points and weatherstripping, for smooth operation and weathertight closure.

F. Lubricate moving components and hardware.

G. Final Adjustment: Wherever hardware installation is made more than one month prior to acceptance or occupancy of a space or area, return to the work during the week prior to acceptance or occupancy, and make a final check and adjustment of all hardware items.

3.4 FIELD QUALITY CONTROL

A. Section 01450 - Quality Control: Field inspection.

B. Inspect hardware installations for proper locations, heights, level, plumb, square, attachment to the substrate and opening force.

3.5 CLEANING

A. Section 01700 - Execution Requirements: Cleaning the installed work.

B. Clean adjacent surfaces soiled by the hardware installation.

C. Clean operating items as necessary to restore proper function and finish of the hardware and doors.

3.6 TRAINING

A. Instruct the Owner's personnel in the proper adjustment and maintenance of hardware items and finishes during final adjustment of the hardware.

3.7 HARDWARE SCHEDULE

A. Door Material Types:

AL	Aluminum
SLGL	Sliding Glass

B. Hardware Schedule:

HW-1 Interior Single Door, AL/Glass Storefront
Hardware by Door Manufacturer

Hinges	1/2 pr	
Lockset	1 ea	Storefront Lock
Exit Device	1 ea	
Threshold	continuous	
Pull	1 ea	
Closer	1 ea	
Seal	continuous	
Bottom Sweep		

HW-2 Interior Slide Door, Sliding Glass
Hardware by Door Manufacturer

Positive Latch
Constant Latching Flush Bolt (at swing-out sidelite where occurs)

END OF SECTION

SECTION 08800
GLASS AND GLAZING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Glazing for entrances and storefronts.

2. Glazing for sliding doors.

4. Glazing for window units.

5. Glazing sealant installation.

B. Related Documents: The Contract Documents, as defined in Section 01010 - Summary of Work, apply to the work of this Section. Additional requirements and information necessary to complete the work of this Section may be found in other Documents.

C. Related Sections:

1. Section 08400 - Entrances, Storefronts and Windows: Glazing installations.

1.2 DESCRIPTION OF WORK

A. The extent of glass and glazing work is indicated on the Drawings and Schedules and as specified herein, and includes providing and installing glazing for interior doors and windows, sealants and miscellaneous glazing materials.

1.3 REFERENCES

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

B. American Society of Civil Engineers (ASCE):

1. ASCE / SEI 7 - Minimum Design Loads for Buildings and other Structures.

C. American National Standards Institute (ANSI):

1. ANSI Z97.1 - Safety Performance Specifications and Methods of Test for Safety Glazing Material Used in Buildings.

D. American Society for Testing and Materials (ASTM):

1. ASTM C 920 - Specification for Elastomeric Joint Sealants.

2. ASTM C 1036 - Specification for Flat Glass.

3. ASTM C 1048 - Specification for Heat-Treated Flat Glass - Kind HS, Kind FT Coated and Uncoated Glass.

4. ASTM F 1233 - Test Method for Security Glazing Materials and Systems.

E. Flat Glass Marketing Association (FGMA):

1. FGMA - Glazing Manual and Glazing Sealing Systems Manual.

F. National Fire Protection Agency (NFPA):

1. NFPA 257 - Standard on Fire Tests for Window and Glass Block Assemblies.

G. International Code Council:

1. International Building Code (IBC), 2009:

H. U. S. Consumer Product Safety Commission, CPSC 16 CFR, Part 1201 - Safety Standard for Architectural Glazing Materials.

1.4 CONSTRUCTION

A. Interface with Other Work: Coordinate glazing with the installation of exterior aluminum entrances, storefronts, doors, and windows as specified in Section .

1.5 SUBMITTALS

A. Section 01330 - Submittal Procedures: Procedures for submittals.

1. Product Data:

a. Submit two (2) copies of the manufacturer's catalogs, including specifications and installation instructions for all glass products to be used and for glazing sealant and compound, gasket and miscellaneous materials required.

b. Glass: For each type of glass provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.

c. Glazing compound: Provide chemical, functional, and environmental characteristics, limitations and special application requirements.

d. Manufacturer's engineering design to meet the performance requirements.

2. Calculations indicating glazing satisfaction of performance requirements

3. Samples:

a. Glass: Two (2) samples 6" x 6" in size for each type of glazing, illustrating tinting, and finish of the glazing material. Label each sample indicating kind, quality and manufacturer as follows:

1) Laminated glass.

2) Tempered glass.

b. Glazing Sealants: Three (3) copies of the manufacturer's standard color selection.

5. Assurance / Control Submittals:

a. Manufacturer's certificate that the products meet or exceed the specified requirements.

b. Calculations indicating that the materials satisfy the performance requirements.

c. Documentation of experience indicating compliance with the specified qualifications requirements.

B. Section 01780 - Closeout Submittals: Procedures for closeout submittals.

1. Warranty: Submit a written Warranty with forms completed in the name of the Owner and registered with the manufacturer.

1.6 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer: Company specializing in manufacturing the products specified with a minimum of five (5) years documented experience.

2. Installer: Company experienced in performing the work of this Section with a minimum of five (5) years documented experience.

B. Performance Requirements: Provide the capacity to withstand the following loading requirements as defined in IBC 2009 Chapter 16:

1. Seismic Loads: According to IBC 2009, Section 1613 and ASCE 7

a. Seismic Design Category: D

b. Seismic Importance Factor: Per ASCE 7

C. Identification: Provide labels where safety glazing is required. Each unit of tempered glass shall be permanently identified by the manufacturer. The identification shall be etched or ceramic fired on the glass and shall be visible after the glazing has been installed. Label per NFPA 80.

D. Grading and Labeling: Grade and label each light stating the quality and grade of the glass and the manufacturer's name and brand designation. Leave labels intact until removal is directed by the Owner's representative. Label each individual glazing unit for fire-rated doors and windows in accordance with NFPA 80-1-7.4. Listing marks shall be visible after installation.

E. Perform the work in accordance with the FGMA, Glazing Manual.

1.7 DELIVERY, STORAGE AND HANDLING

A. Section 01600 - Product Requirements: Transport, handle, store, and protect the products.

B. Comply with the manufacturer's instructions for shipping, handling, storing and protecting glass and glazing products.

C. Deliver products to the Project Site in the manufacturer's original, unopened packaging or crates.

D. Exercise exceptional care to prevent edge damage to the glass, rainbowing, discoloration and damage to and deterioration of coatings, if any, on the glass.

1.8 JOB CONDITIONS

A. Pre-installation: Meet with the Glazier and other trades affected by the glass installation prior to beginning installation. Do not perform work under adverse weather or job conditions. Install liquid sealants only when the temperature is within the lower or middle one third of the temperature range recommended by the manufacturer.

1.9 WARRANTY

A. Section 01780 - Closeout Submittals: Procedures for closeout submittals.

B. Special Warranty:

1. Provide a manufacturer's written Warranty against cracking, breakage, staining, rainbowing, discoloration and for replacement.

2. Warranty Period: Two (2) years from the date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with the Project requirements, manufacturers offering products which may be incorporated into the work include the following:

1. Falconer Glass Industries, Inc.

2. Guardian Industries.

3. PPG Industries.

4. Libby-Owens-Ford.

5. Pilkington.

6. Viracon, Inc.

7. Oldcastle Glass.

8. National Glass Blocks.

B. Section 01600 - Product Requirements: Product Options: Substitutions permitted.

2.2 GLAZING MATERIALS

A. Standards

4. Prime Glass: FS DD-G-451, ASTM C 1036.

5. Safety Glass: CPSC 16 CFR 1201.

6. Heat-Treated Glass: FS DD-G-1403, ASTM C 1048.

B. Laminated Safety and Security Glass: Standard two-ply laminated glass with minimum 0.060" Saflex interlayer. Thickness as required to meet the Performance Requirements or security criteria for the location, height and use or as indicated, but not less than 3/8". Where glazing is double pane, the laminate shall be installed as the exterior lite. Tint color as selected.

1. Impact Loads: Comply with South Florida Building Code, Section 2315 and 3513.

C. Tempered Glass: Heat treated to strengthen the glass in bending to not less than 4.5 times the annealed strength, edges seamed, thickness as required to meet the performance requirements (3/16" thick, minimum). Exposed edges in the finished work shall be polished. Tint color as selected.

1. Where indicated as "Free of Tong Marks", provide tempered glass produced by manufacturer's special process which eliminates tong marks.

2.3 GLAZING SEALANT

A. Silicone: Single component, elastomeric, chemical curing; capable of water immersion without loss of properties; non-bleeding, non-staining, non-sag; cured Shore A hardness of 15 - 25. Color black.

2.4 MISCELLANEOUS GLAZING MATERIALS

A. Cleaners, Primers and Sealers: Type recommended by the glazing sealant or gasket manufacturer.

B. Setting Blocks: Neoprene of EPDM, 70 to 90 Shore A durometer hardness; compatible with the glazing sealant used.

C. Spacers: Neoprene of EPDM, 40 to 50 Shore A durometer hardness; self adhesive on one side; compatible with the glazing sealant used.

D. Filler Rods: Closed cell or waterproof jacketed foam rod of polyethylene, butyl, neoprene, polyurethane, or vinyl; compatible with the glazing sealant used.

PART 3 - EXECUTION

3.1 STANDARDS AND PERFORMANCE

A. Watertight and airtight installation of each glass product is required, except as otherwise shown. Each installation must withstand normal temperature changes, wind loading, and impact loading (for operating sash and doors), without failure 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. Protect glass from edge damage during handling and installation, and subsequent operation of glazed components of the work. During installation, discard units with significant edge damage or other imperfections.

C. Glazing channel dimensions, as indicated and specified, are intended to provide for the necessary bite on the glass, minimum edge clearances, and adequate sealant thickness with reasonable tolerances. Adjust as required by the job conditions at the time of installation. Do not reduce the manufacturer's recommended minimum edge bite on the glass.

D. Comply with the combined recommendations and technical reports by manufacturers of the glass and glazing products used in each glazing channel, and with recommendations of the Flat Glass Marketing Association, "Glazing Manual", except where more stringent requirements are indicated.

E. Inspect each piece of glass just prior to installation, and discard any which have observable edge damage or face imperfections.

F. Provide safety glass for all glazed panels within 48" of a door and where glazed panels are less than 60" above any floor or any walking surface and elsewhere where required by the Building Code, performance data or as indicated.

G. Clean glazing channels and other framing members to receive glass just prior to glazing. Remove coatings which are not firmly bonded to the substrate. Remove lacquer from metal surfaces where elastomeric sealants are used.

H. Apply primer or sealant to joint surfaces where recommended by the sealant manufacturer.

3.2 EXAMINATION

A. Section 01700 - Contract Closeout: Verification of existing conditions before starting the work.

B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required and ready to receive the work.

1. Verify that openings for glazing are correctly sized and within tolerance.

2. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement and that weeps are clear and ready to receive the glazing.

C. Report, in writing, prevailing conditions that will adversely affect satisfactory execution of the work of this Section. Do not proceed with the work until the unsatisfactory conditions have been corrected.

3.3 PREPARATION

A. Clean contact surfaces with solvent and wipe dry.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant.

3.4 GLAZING INSTALLATION

A. Place setting blocks of the proper size in sill rabbet located at 1/4th the glass width from each corner; set blocks in a thin course of heel and toe compound, if any.

B. Clear Anodic Finish: AAMA 611, Class I, AA-M12C22A41.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

F. Corrosion Protection: Coat concealed surfaces of aluminum that come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:

1. Cast Aluminum: Heavy coat of bituminous paint.
2. Extruded Aluminum: Two coats of clear lacquer.

3.2 INSTALLATION OF MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

3.3 INSTALLATION OF PREFABRICATED BUILDING COLUMNS

A. Install prefabricated building columns to comply with ANSI/AISC 360, "Specifications for Structural Steel Buildings," and with requirements applicable to listing and labeling for fire-resistance rating indicated.

3.4 REPAIRS

A. Touchup Painting:

1. Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

a. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.

2. Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099123 "Interior Painting."

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION 055000

SECTION 13930
WET-PIPE FIRE SUPPRESSION SPRINKLERS

PART 1- GENERAL

1.01 SUMMARY

A. Section includes minor modifications to existing wet-pipe sprinkler system, generally, to provide proper coverage to renovated areas.

1.02 REFERENCES

A. National Fire Protection Association:

1. NFPA 13 - Installation of Sprinkler Systems.

1.03 SYSTEM DESCRIPTION

A. System to provide coverage for renovated areas.

B. Provide modifications to meet NFPA 13.

C. Connect to existing sprinkler main branches.

1.04 SUBMITTALS

A. Section 01330 - Submittal Procedures: Submittal procedures.

B. Shop Drawings: The sprinkler drawings included in the construction documents are preliminary plans to be submitted for review to the authority having jurisdiction.

Submit installation shop drawings (referred to as working drawings in NFPA 13) to the Guam Fire Department for approval. Installation shop drawings must be stamped by a Guam registered Fire Protection Engineer.

Indicate layout of finished ceiling areas indicating sprinkler locations coordinated with ceiling installation. Indicate detailed pipe layout, hangers and supports, sprinklers, components and accessories. Indicate system controls.

C. Product Data: Submit data on sprinklers, and specialties, including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.05 CLOSEOUT SUBMITTALS

A. Section 01700 - Execution Requirements: Closeout procedures.

B. Project Record Documents: Record actual locations of sprinklers and deviations of piping from drawings. Indicate drain and test locations.

1.06 QUALITY ASSURANCE

A. Perform Work in accordance with NFPA 13.

B. Maintain one copy of each document on site during construction.

1.07 QUALIFICATIONS

A. Installer: Company specializing in performing Work of this section with minimum three years documented experience.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Section 01600 - Product Requirements: Product storage and handling requirements.

B. Store products in shipping containers until installation.

C. Furnish piping with temporary inlet and outlet caps until installation.

PART 2- PRODUCTS

2.01 SPRINKLERS

A. Suspended Ceiling Type:

1. Type: Concealed pendant type with matching escutcheon plate.

2. Finish: Brass.

3. Escutcheon Plate Finish: Enamel, color to match adjacent surface.

4. Fusible Link: Glass bulb type temperature rated for specific area hazard.

B. Exposed Area Type:

1. Type: Standard upright type with guard.

2. Finish: Brass.

3. Fusible Link: Glass bulb type temperature rated for specific area hazard.

C. Side wall Type:

1. Type: Standard horizontal side wall type with matching escutcheon plate.

2. Finish: Brass.

3. Escutcheon Plate Finish: Enamel, color to match adjacent surface.

4. Fusible Link: Glass bulb type temperature rated for specific area hazard.

D. Guards: Finish to match sprinkler finish.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install in accordance with NFPA 13.

B. Place pipe runs to minimize obstruction to other work.

C. Install piping in concealed spaces above finished ceilings.

D. Center sprinklers in one direction only in ceiling tile with location in other direction variable, dependent upon spacing and coordination with ceiling elements.

E. Install guards on exposed sprinklers.

F. Hydrostatically test modified and new systems before connecting to existing piping.

G. The existing sprinkler system shall remain active during the construction of this project. Freeze branch lines to connect new piping.

3.02 CLEANING

A. Section 01700 - Execution Requirements: Final cleaning.

B. Flush new piping system of foreign matter before connecting to existing piping.

3.03 PROTECTION OF INSTALLED CONSTRUCTION

A. Section 01700 - Execution Requirements: Protecting installed construction.

B. Apply masking tape or paper cover to protect concealed sprinklers, cover plates, and sprinkler escutcheons not receiving field paint finish. Remove after painting.

END OF SECTION

SECTION 15000
MECHANICAL GENERAL REQUIREMENTS

PART 1 - GENERAL

1.01 APPLICATION

A. This section applies to Section 13930 and all sections of Division 15, Mechanical of this project.

1.02 LAWS, REGULATIONS AND CODES

A. All work shall be in accordance with government laws, ordinances, rules, regulations, and orders.

B. The following shall govern where applicable: The 2009 International Building Code, The 2009 International Plumbing Code, The 2009 International Mechanical Code, 2009 International Fire Code OSHA Rules and Regulations, applicable NFPA Standards and all other codes and standards referenced in these specifications. Where requirements differ in these codes and standards, the more stringent shall apply.

1.03 TRADE NAMES

A. Mentioning of a trade name indicates that the manufacturer is acceptable to the Engineer. However, certain specified construction and details may not be regularly included in the manufacturer's catalogued product. The Mechanical Contractor shall provide the material or equipment complete as specified.

1.04 AVAILABILITY OF EQUIPMENT AND MATERIALS

A. Specified equipment and materials may not be available locally and must be ordered off-island. This does not give Contractor the option to substitute non-complying materials or equipment that are locally available.

1.05 DEFINITIONS

A. "As directed" shall mean that the Mechanical Contractor shall seek instructions of the Architect or Engineer.

B. "As indicated" shall mean as shown on plans.

C. "As necessary" shall mean that the item shall be provided if necessary to have all systems complete, tested, and ready for operation.

D. "Furnish" shall mean that the Mechanical Contractor shall furnish item indicated, installation will be done under another work.

E. "Mechanical Contractor" shall mean the Sprinkler Contractor, Plumbing Contractor, or the Air Conditioning Contractor.

F. "Provide" shall mean the Mechanical Contractor shall furnish and install item indicated.

G. "Or approved equal" used after a trade name shall mean that the trade name mentioned will be used as a basis of comparison and that all makes of similar item will be considered, provided that, in the opinion of the Architect, substituted item has equal or better quality than

the trade name mentioned.

H. "Or approved equivalent as manufactured by" shall mean that only products of manufacturers mentioned in the paragraph are acceptable to the Architect.

1.06 SUBMITTALS

A. Submit six sets of shop drawings, manufacturer's data and certificates for equipment, materials and finish, and pertinent details for each system where specified in each individual section, and have them approved before procurement, fabrication, or delivery of the items to the job site. Partial submittals will not be acceptable and will be returned without review. Submittals shall include the manufacturer's name, trade name, catalog model or number, nameplate data, size, layout dimensions, capacity, project specification and paragraph reference, applicable industry, and technical society publication references, and other information necessary to establish contract compliance of each item the Contractor proposes to furnish.

1. Shop Drawings: Drawings shall be a minimum of 8.5 inches by 11 inches in size, except as specified otherwise. Drawings shall include floor plans, sectional views, wiring diagrams, and installation details of equipment; and equipment spaces identifying and indicating proposed location, layout and arrangement of items of equipment, control panels, accessories, piping, ductwork, and other items that must be shown to assure a coordinated installation. Wiring diagrams shall identify circuit terminals, and indicate the internal wiring for each item of equipment and the interconnection between each item of equipment. Drawings shall indicate adequate clearance for operation, maintenance, and replacement of operating equipment devices. If equipment is disapproved, drawings shall be revised to show acceptable equipment and be resubmitted.

2. Manufacturer's Data: Submittals for each manufactured item shall be manufacturer's descriptive literature of cataloged products, equipment drawings, diagrams, performance and characteristic curves, and catalog cuts.

3. Standards Compliance: When materials or equipment must conform to the standards of organizations such as the American National Standards Institute (ANSI), American Society for Testing and Materials (ASTM), National Electrical Manufacturers Association (NEMA), and Underwriters Laboratories (UL), proof of such conformance shall be submitted to the Architect for approval. If an organization uses a label or listing to indicate compliance with a particular standard, the label or listing will be acceptable evidence, unless otherwise specified in the individual sections.

4. Certificates of Conformance or Compliance: Submit certification from the manufacturer attesting that materials and equipment to be furnished for this project comply with the requirements of this specification and of the reference publications. Pre-printed certification will not be acceptable; certifications shall be in the original. The certification shall not contain statements that could be interpreted to imply that the product does not meet all requirements specified, such as "as good as"; "achieve the same end use and results as materials formulated in accordance with the referenced publications"; "equal or exceed the service and performance of the specified material". The certification shall simply state that the product conforms to the requirements specified.

1.07 OPERATION AND MAINTENANCE MANUAL

A. For each equipment, furnish an operation and maintenance manual. Furnish three copies of the manual bound in hardback binders or an approved equivalent. Furnish one complete manual prior to the time that equipment tests are performed and furnish the remaining manuals before the contract is completed. Inscribe the following identification on the cover: the words OPERATION AND MAINTENANCE MANUAL, the name and location of the equipment or the building and the name of the Contractor. The manual shall include the names, addresses, and telephone numbers of each subcontractor installing equipment, and of the local representatives for each item of equipment. The manual shall have a table of contents and be assembled to conform to the table of contents with the tab sheets placed before instructions covering the subject. The instructions shall be legible and easily read, with large sheets of drawings folded in. The manual shall include: wiring and control diagrams with data to explain detailed operation and control of each item of equipment; a control sequence describing start-up, operation and shut-down; description of the function of each principal item of equipment; the procedure for starting; the procedure for operation; shut-down instructions; installation instructions; maintenance instructions; lubrication schedule including type, grade, temperature range, and frequency; safety precautions, diagrams, and illustrations; test procedures; performance data; and parts list. The parts lists for equipment shall indicate the sources of supply, recommended spare parts, and the service organization which is reasonably convenient to the project site. The manual shall be complete in all respects for equipment, controls, accessories, and associated appurtenances provided.

1.08 DELIVERY AND STORAGE

A. Equipment and materials shall be carefully handled, properly stored, and adequately protected to prevent damage before and during installation. Damaged or defective items shall be replaced.

1.09 CATALOGED PRODUCTS

A. Materials and equipment shall be cataloged products of manufacturers regularly engaged in production of such materials or equipment and shall be manufacturer's latest design that complies with the specification requirements. Materials and equipment shall duplicate items that have been in satisfactory commercial or industrial use at least two years prior to bid opening. Where two or more items of the same class of equipment are required, these items shall be products of a single manufacturer; however, the component parts of the items need not be the products of the same manufacturer. Each item of equipment shall have the manufacturer's name, address, model number, and serial number on the nameplate securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

1.10 SAFETY REQUIREMENTS

A. Belts, pulleys, chains, gears, couplings, projecting setscrews, keys and other rotating parts located so that any person can come in close proximity thereto shall be fully enclosed or properly guarded. High-temperature equipment and piping so located as to endanger personnel or create a fire hazard shall be properly guarded or covered with insulation of a type as specified herein.

1.11 MANUFACTURER'S RECOMMENDATIONS

A. Where installation procedures or any part thereof are required to be in accordance with the recommendations of the manufacturer of the material being installed, printed copies of these recommendations shall be furnished to the Architect prior to installation. Installation of the item will not be allowed to proceed until the recommendations are received. Failure to furnish these recommendations can be cause for rejection of the material.

1.12 WORK INCLUDED IN OTHER SECTIONS

A. The following are included in the General Contract Work and all pertinent information required shall be provided by the Mechanical Contractor.

1. Access Doors and Panels: Concealed equipment, valves, and control devices shall be provided with access doors or panels not less than 2' x 2' to properly service or operate such items. Mechanical Contractor shall provide General Contractor with all locations and sizes of access doors and panels.

2. The following are included under Electrical Work

a. Power Wiring: All power wiring, including final hook-up to all mechanical equipment will be provided under the Electrical Work. Where control devices are required on power wiring such as a high temperature limit control for an exhaust fan, the control devices shall be installed by the Mechanical Contractor but shall be wired by the Electrical Contractor.

Division 16, ELECTRICAL WORK, is based on electrical ratings of equipment indicated on the mechanical drawings. Any deviation by the Mechanical Work which requires a change in the Electrical Work shall be paid for by the Mechanical Contractor.

1.13 WORK TO BE DONE IN ACCORDANCE WITH OTHER SECTIONS

A. All electrical work and control wiring, included under Mechanical Work, shall be in accordance with Division 16, ELECTRICAL WORK.

B. Painting shall be done in accordance with the PAINTING Section of these specifications.

1. All ductwork exposed in finished areas shall be painted to match adjacent surface color. All piping exposed in finished areas shall be color coded in accordance with ANSI Standards.

2. All exposed threads at joints of screw-jointed piping shall be painted.

3. All ferrous metals that has not been factory finish coated shall be painted, unless covered with insulation or embedded in concrete.

1.14 EXISTING CONDITIONS

A. Existing conditions were taken from available design drawings and limited site verifications.

B. Contractor shall verify existing site conditions before planning his installation. Ensure that here is adequate space to receive new work.

1.15 AS-BUILT DRAWINGS

A. The Contractor shall maintain at the site one copy of all Drawings, Specifications, Addenda, approved Shop Drawings, Change Orders, and other modifications, in good order and marked to record all changes made during construction. These shall be made available to the Architect.

B. At the conclusion of the work, the Mechanical Contractor will be furnished by the Architect, at the Mechanical Contractor's expense, a set of reproducibles made from original contract plans. The Mechanical Contractor shall then incorporate all changes made, as recorded, the

set of reproducibles in a clear, legible and reproducible manner. All underground stub-outs shall be dimensionally located from the building structure. As a condition for acceptance of work, "as-built" reproducibles shall be signed by Mechanical Contractor attesting that all changes have been incorporated, dated and delivered to the Architect.

C. As-built drawings required for

SECTION 13930 – WET-PIPE FIRE SUPPRESSION SPRINKLERS
SECTION 15400 - INTERIOR PLUMBING SYSTEM
SECTION 15500 - AIR CONDITIONING AND VENTILATION SYSTEMS

END OF SECTION

SECTION 15500
AIR CONDITIONING AND VENTILATION SYSTEMS

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Work included: Air conditioning and ventilation required for this Work is indicated on the Drawings and includes, but is not necessarily limited to:

1. Air conditioning and ventilation equipment.

2. Ductwork and accessories.

3. Diffusers, Grilles, and Registers.

5. Chilled Water Piping and Accessories.

6. Condensate Drain Piping.

7. Insulation.

8. Controls.

9. All other items required for a complete and operating air conditioning and ventilation systems.

B. Related work described elsewhere: Power wiring, Section 16400.

1.02 QUALITY ASSURANCE

A. Qualifications of installers

1. For the actual fabrication, installation, and testing of work under this Section, use only thoroughly trained and experienced workmen completely familiar with the items required and shall be under full supervision of Manufacturer's Technical Representative.

2. In acceptance or rejection of installed work, the Architect will make no allowance for lack of skill on the part of workmen.

B. Codes and standards: In addition to complying with all pertinent codes and regulations, comply with all pertinent recommendations contained in the Standards listed below, latest edition, as published by the Sheet Metal and Air Conditioning Contractor's National Association.

1. HVAC Metal Duct Standards.

2. HVAC Systems Testing, Adjusting, and Balancing.

1.03 SUBMITTALS

A. General: Comply with the provisions of Section 15000.

B. Product Data: Within 35 calendar days after award of the Contract, submit:

1. Following items proposed to be furnished and installed under this section.

a. All air conditioning and ventilating equipment

b. Diffusers, Grilles and Registers

c. Electric Duct Heater

d. Insulation

2. Shop Drawing showing all details of the proposed installation, and the interface of ducts, piping and equipment with all other items.

3. Manufacturer's recommended installation procedures which, when approved by the Architect, will become the basis for inspecting and accepting or rejecting actual installation procedures used on the Work.

C. Record Documents: During progress of the Work, maintain an accurate record of all changes made in the air conditioning and ventilating systems from the layout and materials shown on the approved submittals.

D. Manual: Upon completion of this portion of the Work, and as a condition of its acceptance, deliver to the Owner and the Architect each three copies of the operations and maintenance Manual. Include in each copy of the Manual a copy of the Record Documents.

E. Control Wiring Diagrams: Submit for approval along with shop drawings.

1.04 PRODUCTS HANDLING

A. Protection: Use all means necessary to protect the materials of this Section before, during, and after installation and to protect the work and materials of all other trades.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

PART 2 - PRODUCTS

2.01 EQUIPMENT

A. General: All equipment shall be the capacity and types shown on the Equipment Schedule in the Drawings and shall be the listed manufacturer and model number or shall be an equal approved in advance by the Architect.

B. Single Source: For ease of maintenance and parts replacement, to the maximum extent possible use equipment of a single manufacturer.

C. The Architect reserves the right to reject any materials list which contains equipment from various manufacturers if suitable materials can be secured from fewer manufacturers, and to require source of materials to be unified to the maximum extent possible.

D. Air Handling Units/DOAS

1. Unit shall be factory-assembled, horizontal, draw-thru type air-handling unit. Unit shall be complete with water coils, fan, U. L. approved motor, belt drive, drain pan, filter, and accessory UV germicidal lamps.

2. Casing shall be double-walled heavy-gage galvanized steel, with 1-inch thick glass fiber thermal/acoustical insulation in between. Insulation and adhesive shall meet NFPA 90A requirement for flame spread and smoke generation. Supply and return duct connection shall be provided for access to the fan/motor assembly. Removable side panels shall be provided for access to the fan/motor assembly. Drain pan shall be constructed of stainless steel, extending under the full length and width of the coil and pitched for positive drainage. The inside surface of the drain pan shall be coated with closed sell fire-retardant, foam insulation. Provide with secondary drain pan connected to condensate drain, materials to match with primary drain pan. DOAS casings shall be provided with factory applied 10,000 hrs salt spray test corrosion protection coatings.

3. Fans shall be belt-driven, double-width fan wheels shall have forward-curved blades and be statically and dynamically balanced. Fan drive shall consist of variable-pitch motor pulley, fixed-pitch fan pulley belt and V-belt. Fans and scrolls shall be of galvanized steel.

4. Unit shall be equipped with a cooling coil suitable for installation a 2-pipe system. Coils shall have copper tubes with aluminum fins bonded to the tubes by mechanical expansion and have a working pressure of 250 psig. Each coil shall have a manual air vent. DOAS cooling coils shall be provided with factory applied 10,000 hrs salt spray test corrosion protection coatings.

5. Fans motors shall be open, drip proof, variable speed, suitable for continuous duty at 104 F (40 C).

6. Air handling unit shall be "Carrier" 39 L Series or approved equal as manufactured by "Trane" or "York".

E. HEPA Filter/UV and Blower (BUV)

1. HEPA Filter/UV unit shall consist of pre-filters, high efficiency particulate filters, 4-2 watt germicidal UV lamps with on/off UV indicator light, variable fan motor, minihelic gauge and electronic hour meter, all in a 16 gauge galvanized steel housing design for ceiling mounting.

2. Steel housing shall have side mounted 10" duct connections, suspension hangers at four corners, and 20 gauge stainless perforated swing-down grille which will also be serve as access to the inside components. Housing shall be 29.75" wide, 23.75" long, and 12" high.

3. Blower shall be forward curved, centrifugal fan with 1/5 Hp shaded pole motor, with variable frequency drive, sleeve bearings that allow installation in any position. Motor shall have automatic reset thermal protection and electrical junction box. Blower capacity shall be 545-760 CFM at 0" static pressure. Fan speed shall be 1,100 to 1,450 rpm. Housing shall be 13.5" wide, 13.5" long, and 13.5" high.

4. HEPA filters shall be certified at 99.97% efficiency on 0.3 micron particles. Filter media shall be glass micro fiber, 100% water proof, with fire retardant/adhesive

sealant.

5. Pre-filter shall be 1", two ply, synthetic.

7. HEPA filter/UV Unit and Blower shall be Microcon BUV model EXC7-UV as manufactured by RGF Biological Controls or approved equal.

F. Accustat

1. Accustat shall be a room pressure differential monitor, sensitive to monitor either positive or negative pressure to within 0.001" water gage static pressure. Setting shall be adjustable up to 0.005" water gage static pressure.

2. The accustat shall have audio and visual alarms that will alert personnel if room condition deviates from pre-set conditions. The alarms should have built-in false alarm delay.

3. At rooms with HEPA filter/UV Unit (BUV), the accustat shall be wired to the HEPA filter/UV Unit which controls fan speed to obtain designed room pressure.

4. Accustat shall be product of RGF Biological Controls or approved equal.

G. Motor Control

1. Air conditioning equipment shall be provided with combination starters-circuit breakers.

2. Control wiring and relays not provided by air conditioning equipment manufacturers shall be provided by Electrical Contractor.

3. Provide engraved plastic nameplate for each unit and for each switch on the motor controller.

4. The Mechanical Contractor shall verify from electrical drawings the extent of electrical work to be provided by Electrical Contractor and shall provide all other work necessary to complete the installation.

5. All control and power wiring shall be in accordance with electrical section of these specifications.

H. In-line Fans

1. Units shall be factory-assembled in-line fan, AMCA rated, with capacities as indicated. Each unit shall consist of a housing, fan and motor. Unit shall be selected to operate at the lower half of its capacity range.

2. Housing shall be square, of steel construction, with baked enamel finish internally lined with acoustical insulation, with diagonal bracings and hanging brackets with spring isolators. Fan shall be centrifugal, backward-curved, with spun venturi throat overlapped by the fan. Motor shall be isolated from the air stream by a motor enclosure and shall draw cooling air from outside the fan housing. Motor and fan assembly shall be mounted on a hinged side of the housing allowing the assembly to swing out for inspection, cleaning or service.

I. Electric Duct Heater

Duct Heater shall be slip-on type capacity and performance shown on the equipment schedule. Shall be tested and certified to UL STD 1996. Heating elements shall be open coil type, 80% nickel 20% chromium, type A resistance wire. Other alloys are not acceptable. Coils shall be supported by steatite ceramic bushings securely fastened to the element support brackets. The duct heater frame, control enclosure and element support brackets shall be of 20 gauge (minimum) galvanized steel. The controls enclosure shall be NEMA-1 construction with standard door interlocking disconnect switch. The electric heater frame will have flanged or slip-in duct connection. Heater shall be furnished with disc type, primary automatic reset thermal cut-off with secondary manual reset thermal cut-off. Shall have an integral air flow switch. Electric supply wiring shall have insulation rating of 221 deg. F. Terminal blocks and ground lugs shall be furnished on heaters for field wiring. A line voltage to 24 Volt, class II transformer shall be provided and mounted inside the control enclosure. Heater shall have a disconnecting magnetic contactor with a 24-volt holding coil as standard.

2.02 CHILLED WATER PIPING AND ACCESSORIES

A. Chilled Water Piping aboveground shall be Schedule 40 black steel pipes, conforming to ASTM A-120 or A-53 with mechanical joint fittings for pipes 2-1/2" and bigger and 125-lb. cast iron screwed fittings for pipes 2" and smaller. Unions for pipes 2" and smaller shall be black malleable iron, ground joint, brass seat, 150-lb., ANSI B2.1.

B. All shut-off valves on chilled water lines shall be full-port ball valves.

C. Plug Valves shall have semi-steel bodies with bronze eccentric plugs, bronze bearings, and compressible resilient molded seals. Valves 3" and smaller shall have screwed ends and lever operators with memory stops. Valves bigger than 3" shall have flanged ends and worm gear actuated, handwheels. All valves shall be rated for 200 lbs. W.O.G.

D. All gage cocks and manual air vents shall be 1/4" gate valves.

E. Piping Accessories

1. Thermometers: Thermometers shall be of the liquid filled, universal angle type dial thermometer with brass thermometer wells, 4-1/2" diameter, white faced dial, aluminum case, and brass stems. Thermometer range shall be 0 to 100 degrees F. Thermometers shall be "Trerice" No. L80742 or approved equal as manufactured by "Marsh", "Marshalltown" or "U.S. Gage".

2. Pressure Gage: Gages shall be of the bourdon spring type with 4-1/2" diameter, white dial face, aluminum case, gage cocks and snubbers, 30" Hg. vacuum to 60 psig scale range at pump suction, 0 to 100 psig scale range elsewhere. "Trerice" No. 500X, or approved equal as manufactured by "Marsh", "Marshalltown" or "U.S. Gage".

3. Strainers: Strainers shall be rated for 200 psig W.O.G., of the wye pattern type, with cast iron body, heavy gage perforated brass strainer with 1/8" perforations, blow-off connections provided with 1" blow off valves, bolted cover flange, and flanged connections. Strainer connections shall be of the same size as the line where the strainer is located.

4. Flexible Pipe Connections on chilled water lines shall be of the two arch bellows type, complete with molded teflon bellows, reinforcing rings, ductile flanges, limit bolts, and gaskets, as manufactured by "Resistoflex" or approved equivalent as manufactured by "Vibration Mounting & Controls" or "Belmont Packing & Rubber Co.".

5. Two-way Control Valves:

   a. Valves for Chilled Water Service: Bodies for valves 1 ½ inches and smaller shall be brass or bronze, with threaded or union ends. Bodies for valves from 2 inches to 3 inches inclusive shall be of brass, bronze or iron. Bodies for 2 inch valves shall have threaded ends. Bodies for valves from 2 ½ to 3 inches shall have flanged-end connections. Internal valve trim shall be brass or bronze except that valve stems may be Type 316 stainless steel. Water valves shall be sized for a 3 psi differential through the valve at rated flow, except as indicated otherwise. Select valve flow coefficient (Cv) for an actual pressure drop not less than 50 percent or greater than 125 percent of the design pressure drop at design flow.

   b. Electric Actuators: Connect to existing Direct Digital Control (DDC) system. Provide direct drive electric actuators for all control applications, except where indicated otherwise. When operated at rated voltage, each actuator shall be capable of delivering torque required for continuous uniform motion and shall have end switch to limit travel, or shall withstand continuous stalling without damage. Actuators shall function properly with range of 85 to 110 percent of line voltage.

      Provide gears manufactured from steel, copper alloy, fiber, or reinforced nylon. Provide hardened steel running shafts in sleeve bearing of copper alloy, hardened steel, nylon, or ball bearing. Provide two-position actuators of the single direction, spring return, or reversing type. Provide proportioning actuators capable of stopping at all points in the cycle and starting in either direction, from any point.

      Provide reversing and proportioning actuators with limit switches to limit travel in either direction unless operator is stall type. Actuators shall have a simple switch for reversing direction, and a button to disengage clutch for manual adjustments. Provide reversible shaded pole, split capacitor, synchronous, or stepper type electric motors.

2.03 CONDENSATE DRAIN PIPING

A. Condensate drain piping shall be polyvinyl chloride DWV pipes and fittings conforming to ASTM D2665 with solvent weld joints inside the building, schedule 40 galvanized steel pipes conforming to ASTM A53 or A120 with screwed cast iron drainage fittings when exposed outdoors.

2.04 DUCTWORK

A. Air conditioning ducts shall be rated ASTM A653 – G90 galvanized steel sheets.

2.05 DUCTWORK ACCESSORIES

A. Volume dampers shall be factory fabricated of galvanized steel, at least 2 gauges heavier than duct where dampers are installed, single-bladed for duct depths up to 10", opposed blade type for ducts with depths more than 10" complete with indicating locking quadrants. Volume dampers for installation above plaster ceilings shall have remote damper operators mounted on plaster ceilings.

B. Turning vanes shall be factory fabricated of galvanized steel, with double-walled blades rolled from a single sheet of metal, assembled over precision-formed tenons on the side pieces. Turning vanes shall be screwed or riveted into the duct elbow.

2.06 AIR INLETS AND OUTLETS

A. The following items are products of "Tuttle and Bailey" (Hart & Cooley), similar and equal units as manufactured by "Carnes", "J and J", or "Waterloo" are acceptable. All air outlets shall be factory-finish painted to match adjacent surface color. Contractor shall submit manufacturers color chart for color selection by the Architect.

1. Supply air registers shall be Series A-64 extruded aluminum registers with removable core, double deflection, vertical outer bars, A45 frame, opposed-blade dampers, and type VLR vectrol air extractors.

2. Return, outside air and exhaust registers shall be Series A110 aluminum registers with A45 frame, 1-1/4" margin, horizontal bars set at 40 degrees, and opposed blade volume dampers.

3. Return and transfer grilles shall be as specified for return registers except without volume dampers.

4. Square ceiling diffusers with square necks shall be Type AMA aluminum construction ceiling diffusers with pattern control as shown, M-7 opposed blade damper, M-6 grid.

5. Square ceiling diffusers with round necks shall be Type AMASR, aluminum construction, baked white enamel finish, with opposed blade volume damper.

2.07 INSULATION, ADHESIVES, TAPES, SEALERS

A. All insulation, adhesives, tapes and sealers shall have a flame spread rating of not more than 25 and a smoke developed rating of not more than 50 when tested in accordance with ASTM E84.

B. External Air Conditioning Duct Insulation shall be 1-1/2" thick faced fiberglass duct wrap, Type FRK25, Series ED-100 as manufactured by "Owens-Corning" or approved equal as manufactured by "Johns-Manville" or "Certain Teed".

C. Chilled Water Piping insulation shall be 1-1/2" thick foamglass insulation, product of "Pittsburgh-Corning" or approved equal, with Pitt-wrap jacketing. All insulation outdoors shall have additional stainless steel jacketing.

D. Condensate drain insulation shall be ¾" thick foam rubber insulation.

E. Insulation for valves, fittings, and flanges shall be pre-molded precut foamglass insulation, of the same thickness as used on adjacent piping. Jacketing shall be as specified for piping above.

F. Adhesives, sealers and tapers, for use in the application of insulation shall be as recommended by the insulation manufacturer, products of "Minnesota Mining and Manufacturing Co.", "Benjamin Foster", or "United Sheet Metal Company".

2.08 OPERATING AND TEMPERATURE CONTROLS

A. Air conditioning systems shall be connected to the existing DDC system. Provide remote start/stop and monitoring of air handling unit and exhaust fans.

B. 2-Way chilled water control valve at the pre-cooling unit shall be controlled by leaving air duct thermostat set at 70^0 F (adjustable).

C. 2-Way chilled water control valve at main air handling units shall be controlled by room temperature sensor to main room temperature at 75 ± 2^0 F.

2.09 UV GERMICIDAL LAMP

A. Ultraviolet lights shall be designed to kill bacteria, fungi, and mold that can grow on the air-conditioning coil. Germicidal UV-C energy measured at a distance of 18" perpendicular to the center of the lamp shall be greater than 470 uM/cm2 @ 253.7 nm when measured in a galvanized steel duct with 70^0 F air moving at 500 fpm. UV lights shall be registers with the FDA as Class II medical device UL and CL classified.

2.10 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation, shall be as selected by the Contractor subject to the approval of the Architect.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

A. Inspection

1. Prior to all work of this Section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

2. Verify that the work of this Section may be completed in strict accordance with all pertinent codes and regulations, the approved Shop Drawings, and the manufacturers' recommendations.

B. Discrepancies

1. In the event of discrepancy, immediately notify the Architect.

2. Do not proceed in areas of discrepancy until all such discrepancies have been fully resolved.

3.02 PIPING SYSTEMS

A. Piping shall be installed straight and plumb, parallel to building walls and columns, with due

allowance for expansion and contraction.

B. Risers shall be provided with hangers at the horizontal line, within 6" of the riser.

C. All connections to equipment, valves and accessories shall be provided with unions or flanged joints, unless such items have flanged connections for easy removal.

D. Connections between piping of dissimilar metals shall be provided with dielectric unions.

E. All high points in the chilled water piping systems where air may tend to accumulate shall be provided with 1/4" gate valves for venting.

E. All equipment shall be provided with isolation valves except where piping and valve arrangement for equipment is such that the same can be isolated without additional isolation valves.

G. Piping Accessories

1. Thermometers (Temperature Sensors): Thermometers shall be provided at chilled water inlet and outlet of each air handling unit. Thermometers shall be installed complete with thermometers wells.

2. Thermometer Wells: All inlets and outlets of each fan-coil unit.

3. Pressure Gage Cocks: Gage cocks shall be provided at inlet and outlet of each air-handling unit and each fan-coil unit.

H. All drain piping shall be pitched, preferably at 1/4" per foot, 1/8" per foot minimum in the direction of flow, adequate cleanouts shall be provided in changes of direction to facilitate rodding.

3.03 DUCTWORK

A. Low pressure galvanized steel air conditioning ducts shall be fabricated and erected in accordance with the SMACNA HVAC Metal Duct Standards. Beading and cross breaking are both acceptable. Longitudinal seams shall either be the Pittsburgh lock or ACME locked grooved seam. Button punch snap lock may be used with 1/2" pocket depth for gauge 26 material, 1/2" or 5/8" for gauge 24 and 5/8" for heavier material. Round elbows with standard elbows may be used in lieu of rectangular vaned elbow.

B. All square elbows in all ductwork shall be provided with double thickness turning vanes. All branch take-offs shall be provided with manual volume dampers with locking quadrant.

C. Duct dimensions shown are net inside dimensions.

3.04 INSULATION

A. All air conditioning ducts shall be provided with external duct wrap insulation.

B. Chilled Water Lines, Condensate Lines, and valves shall be insulated. Piping shall not be insulated at joints until tested, approved, and painted. Self-sealing adhesive strips shall be pressed in place only with nylon tools to be provided for that specific purpose.

C. Chilled water lines and condensate water lines shall be insulated with foamglass insulation.

3.05 INSTALLATION OF REGISTERS AND DIFFUSERS

A. Install and connect all registers and diffusers, in the locations shown, securely anchoring each item in place and sealing with rubber gaskets to prevent leakage.

3.06 WATER SIDE BALANCING AND TESTING REQUIREMENTS:

A. Balancing of water side shall be done after balancing of air side is completed.

B. Remove and clean all strainers or clean strainers. Examine water in the system and make sure water has been treated and cleaned. Check and vent all high points in the system. Check operation of control valves.

3.07 TEST REPORTS

A. Completed test report forms and data sheets be submitted in triplicate after testing and balancing is completed. Report form and data sheets shall be as follows:

1. Air Handling Unit Test Report - Similar to the following:

AIR HANDLER TEST REPORT

Project_____Sheet_____of
System_____Floor #_____Zone #
Job #_____Date

Remarks _____

Item	Specified	Field Test 1	Field Test 2	Field Test 3
Outside air cfm				
Total air cfm				
% outside air				
Discharge duct sq. ft.				
Discharge duct fpm				
Return duct sq. ft.				
Return duct fpm				
Return air cfm				
Manufacturer				
Fan size				
Arrangement				
Fan blade				
Fan sheeve				
Motor sheeve				
No. rows coil				
Filters				
Rpm				
Hp				
Bhp				

Volts _____
Phase _____
Cycle _____
Full-load amps _____
No-load amps _____
Heaters: rated amps _____

Suction sp _____
Discharge sp _____
Total sp _____
Ent. DB temperature _____
Ent. WB temperature _____
Lvg. DB temperature _____
Lvg. WB temperature _____
Outside air temperature _____
Gpm circulating H_2O _____
Pressure drop _____
Ent. water temperature _____
Lvg. water temperature _____

Remarks: _____

2. Exhaust Fan Data Sheets - indicating all data on fan nameplate, current characteristics to fan motor, suction and discharge static pressures, total fan cfm, and cfm through each exhaust registers.

3. All other readings required to be recorded under balancing and test requirements.

3.08 CLOSING-IN OF UNINSPECTED WORK

A. General: Do not allow or cause any of the work of this Section to be covered up or enclosed until it has been inspected, tested, and approved by the Architect and by all other authorities having jurisdiction.

B. Uncovering: Should any of the work of this Section be covered up or enclosed before it has been completely inspected, tested, and approved, do all things necessary to uncover all such work. After the work has been completely inspected, tested, and approved, provide all materials and labor necessary and make all repairs necessary to restore the work to its original and proper condition at no additional cost to the Owner.

3.09 COOPERATION WITH OTHER TRADES

A. Do all things necessary to cooperate with other trades in order that all systems in the Work may be installed in the best arrangement. Coordinate as required with all other trades to share space in common areas and to provide the maximum of access to each system.

3.10 TESTING AND AIR BALANCING

A. General: Balancing shall be performed by Independent TAB agency and Personnel. TAB Firm must be either a member of AABC or certified by the NEBB. Provide all necessary personnel, equipment, and services and perform all tests necessary to demonstrate the integrity of the completed installation to the approval of the Architect and all other authorities having jurisdiction. Make all adjustments necessary to balance the completed system in accordance with the data shown on the Drawings.

B. Air Balancing: Perform in accordance with SMACNA HVAC Systems Testing, Adjusting, and Balancing Manual.

3.11 INSTRUCTING

A. Upon completion of all required testing and balancing, and at a date set by the Architect to coincide with the Owner's acceptance of the completed Work, furnish all necessary personnel and thoroughly indoctrinate and instruct the Owner's maintenance and operation personnel in all aspects of operation and maintenance of the installed systems. Demonstrate the contents of the Operation and Maintenance Manual and ensure that the Owner's personnel are thoroughly familiar with all aspects of operation and maintenance of the installed systems.

END OF SECTION

SECTION 15975

DIRECT DIGITAL CONTROL (DDC) SYSTEM FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. DDC system for monitoring and controlling of HVAC systems.
2. Delivery of selected control devices to equipment and systems manufacturers for factory installation and to HVAC systems installers for field installation.

1.3 DEFINITIONS

A. Algorithm: A logical procedure for solving a recurrent mathematical problem. A prescribed set of well-defined rules or processes for solving a problem in a finite number of steps.

B. Analog: A continuously varying signal value, such as current, flow, pressure, or temperature.

C. BACnet Specific Definitions:

1. BACnet: Building Automation Control Network Protocol, ASHRAE 135. A communications protocol allowing devices to communicate data over and services over a network.
2. BACnet Interoperability Building Blocks (BIBBs): BIBB defines a small portion of BACnet functionality that is needed to perform a particular task. BIBBs are combined to build the BACnet functional requirements for a device.
3. BACnet/IP: Defines and allows using a reserved UDP socket to transmit BACnet messages over IP networks. A BACnet/IP network is a collection of one or more IP subnetworks that share the same BACnet network number.
4. BACnet Testing Laboratories (BTL): Organization responsible for testing products for compliance with ASHRAE 135, operated under direction of BACnet International.
5. PICS (Protocol Implementation Conformance Statement): Written document that identifies the particular options specified by BACnet that are implemented in a device.

D. Binary: Two-state signal where a high signal level represents ON" or "OPEN" condition and a low signal level represents "OFF" or "CLOSED" condition. "Digital" is sometimes used interchangeably with "Binary" to indicate a two-state signal.

E. Controller: Generic term for any standalone, microprocessor-based, digital controller residing on a network, used for local or global control. Three types of controllers are indicated: Network Controller, Programmable Application Controller, and Application-Specific Controller.

F. Control System Integrator: An entity that assists in expansion of existing enterprise system and support of additional operator interfaces to I/O being added to existing enterprise system.

G. COV: Changes of value.

H. DDC System Provider: Authorized representative of, and trained by, DDC system manufacturer and responsible for execution of DDC system Work indicated.

I. Distributed Control: Processing of system data is decentralized and control decisions are made at subsystem level. System operational programs and information are provided to remote subsystems and status is reported back. On loss of communication, subsystems shall be capable of operating in a standalone mode using the last best available data.

J. DOCSIS: Data-Over Cable Service Interface Specifications.

K. E/P: Voltage to pneumatic.

L. Gateway: Bidirectional protocol translator that connects control systems that use different communication protocols.

M. HLC: Heavy load conditions.

N. I/O: System through which information is received and transmitted. I/O refers to analog input (AI), binary input (BI), analog output (AO) and binary output (BO). Analog signals are continuous and represent control influences such as flow, level, moisture, pressure, and temperature. Binary signals convert electronic signals to digital pulses (values) and generally represent two-position operating and alarm status. "Digital," (DI and (DO), is sometimes used interchangeably with "Binary," (BI) and (BO), respectively.

O. I/P: Current to pneumatic.

P. LAN: Local area network.

Q. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control, signaling power-limited circuits.

R. Modbus TCP/IP: An open protocol for exchange of process data.

S. MS/TP: Master-slave/token-passing, IEE 8802-3. Datalink protocol LAN option that uses twisted-pair wire for low-speed communication.

T. MTBF: Mean time between failures.

U. Network Controller: Digital controller, which supports a family of programmable application controllers and application-specific controllers, that communicates on peer-to-peer network for transmission of global data.

V. TCP/IP: Transport control protocol/Internet protocol incorporated into Microsoft Windows.

W. USB: Universal Serial Bus.

X. User Datagram Protocol (UDP): This protocol assumes that the IP is used as the underlying protocol. If needed, insert list of conference participants not mentioned in Section 013100 "Project Management and Coordination."

1.4 SUBMITTALS

A. Product Data: For each type of product include the following:

1. Construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Operating characteristics, electrical characteristics, and furnished accessories indicating process operating range, accuracy over range, control signal over range, default control signal with loss of power, calibration data specific to each unique application, electrical power requirements, and limitations of ambient operating environment, including temperature and humidity.
3. Product description with complete technical data, performance curves, and product specification sheets.
4. Installation, operation and maintenance instructions including factors effecting performance.
5. Bill of materials of indicating quantity, manufacturer, and extended model number for each unique product.

    a. DDC controllers.
    b. Enclosures.
    c. Accessories.
    d. Instruments.
    e. Control dampers and actuators.
    f. Control valves and actuators.

6. When manufacturer's product datasheets apply to a product series rather than a specific product model, clearly indicate and highlight only applicable information.
7. Each submitted piece of product literature shall clearly cross reference specification and drawings that submittal is to cover.

PART 2 - PRODUCTS

2.1 DDC SYSTEM DESCRIPTION

A. Microprocessor-based monitoring and control including analog/digital conversion and program logic. A control loop or subsystem in which digital and analog information is received and processed by a microprocessor, and digital control signals are generated based on control algorithms and transmitted to field devices to achieve a set of predefined conditions.

1. DDC system shall consist of a peer-to-peer network of distributed DDC controllers, operator interfaces, and software.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. DDC System Speed:

1. Response Time of Connected I/O:

a. AI point values connected to DDC system shall be updated at least every five or two seconds for use by DDC controllers. Points used globally shall also comply with this requirement.
b. BI point values connected to DDC system shall be updated at least every five seconds for use by DDC controllers. Points used globally shall also comply with this requirement.
c. AO points connected to DDC system shall begin to respond to controller output commands within two second(s). Global commands shall also comply with this requirement.
d. BO point values connected to DDC system shall respond to controller output commands within two second(s). Global commands shall also comply with this requirement.

2. Display of Connected I/O:

a. Analog point COV connected to DDC system shall be updated and displayed at least every 10seconds for use by operator.
b. Binary point COV connected to DDC system shall be updated and displayed at least every 10seconds for use by operator.
c. Alarms of analog and digital points connected to DDC system shall be displayed within 30seconds of activation or change of state.
d. Graphic display refresh shall update within eight seconds.
e. Point change of values and alarms displayed from workstation to workstation when multiple operators are viewing from multiple workstations shall not exceed graphic refresh rate indicated.

D. Input Point Displayed Accuracy: Input point displayed values shall meet following end-to-end overall system accuracy, including errors associated with meter, sensor, transmitter, lead wire or cable, and analog to digital conversion.

1. Flow:

a. Air: Within 5percent of design flow rate.
b. Water: Within 5percent of design flow rate.

2. Moisture (Relative Humidity):

a. Air: Within 5 percent RH.
b. Space: Within 5 percent RH.
c. Outdoor: Within 5 percent RH.

3. Level: Within 5percent of reading.
4. Pressure:

a. Air, Ducts and Equipment: 0.5 percent of instrument range
b. Space: Within 0.25 percent of instrument range.

c. Water: Within 0.5 percent of instrument range.

5. Temperature, Dry Bulb:

a. Air: Within 1 deg F (0.5 deg C)
b. Space: Within 1 deg F (0.5 deg C)
c. Chilled Water: Within 1 deg F (0.5 deg C)

6. Temperature, Wet Bulb:

a. Air: Within 1 deg F (0.5 deg C)
b. Space: Within 1 deg F (0.5 deg C)
c. Outdoor: Within 2 deg F (1 deg C)

2.2 SYSTEM ARCHITECTURE

A. System architecture shall consist of no more than two or three levels of LANs.

1. Level one LAN shall connect network controllers and operator workstations.
2. Level one or Level two LAN shall connect programmable application controllers to other programmable application controllers, and to network controllers.

B. DDC system shall consist of dedicated and separated LANs that are not shared with other building systems and tenant data and communication networks.

C. System architecture shall perform modifications without having to remove and replace existing network equipment.

D. Number of LANs and associated communication shall be transparent to operator. All I/O points residing on any LAN shall be capable of global sharing between all system LANs.

E. System design shall eliminate dependence on any single device for system alarm reporting and control execution. Each controller shall operate independently by performing its' own control, alarm management and historical data collection.

2.3 NETWORKS

A. Acceptable networks for connecting operator workstations and network controllers include the following:

1. ATA 878.1, ARCNET.
2. IP.
3. IEEE 8802-3, Ethernet.

B. Acceptable networks for connecting programmable application controllers include the following:

1. ATA 878.1, ARCNET.
2. IP.
3. IEEE 8802-3, Ethernet.

C. Acceptable networks for connecting application-specific controllers include the following:

1. ATA 878.1, ARCNET.
2. EIA-485A.
3. IP.
4. IEEE 8802-3, Ethernet.

2.4 NETWORK COMMUNICATION PROTOCOL

A. Network communication protocol(s) used throughout entire DDC system shall be open to public and available to other companies for use in making future modifications to DDC system.

B. ASHRAE 135 Protocol:

1. ASHRAE 135 communication protocol shall be sole and native protocol used throughout entire DDC system.
2. DDC system shall not require use of gateways except to integrate HVAC equipment and other building systems and equipment, not required to use ASHRAE 135 communication protocol.
3. If used, gateways shall connect to DDC system using ASHRAE 135 communication protocol and Project object properties and read/write services indicated by interoperability schedule.
4. Operator workstations, controllers and other network devices shall be tested and listed by BACnet Testing Laboratories.

C. Industry Standard Protocols:

1. DDC system shall use industry standard protocols for network communication with DDC system requirements indicated:

    a. ASHRAE 135.

2. Portions of DDC system networks using ASHRAE 135 communication protocol shall be an open implementation of network devices complying with ASHRAE 135. Network devices shall be tested and listed by BACnet Testing Laboratories.
3. Retain "ASHRAE 135 Gateways" Article below for DDC systems using ASHRAE 135 protocol.

2.5 NETWORK CONTROLLERS

A. General Network Controller Requirements:

1. Include adequate number of controllers to achieve performance indicated.
2. System shall consist of one or more independent, standalone, microprocessor-based network controllers to manage global strategies indicated.
3. Controller shall have enough memory to support its operating system, database, and programming requirements.
4. Data shall be shared between networked controllers and other network devices.
5. Operating system of controller shall manage input and output communication signals to allow distributed controllers to share real and virtual object information and allow for central monitoring and alarms.
6. Controllers that perform scheduling shall have a real-time clock.

7. Controller shall continually check status of its processor and memory circuits. If an abnormal operation is detected, controller shall assume a predetermined failure mode and generate an alarm notification.
8. Controllers shall be fully programmable.

B. Communication:

1. Network controllers shall communicate with other devices on DDC system Level one network.
2. Network controller also shall perform routing if connected to a network of programmable application and application-specific controllers.

C. Serviceability:

1. Controller shall be equipped with diagnostic LEDs or other form of local visual indication of power, communication, and processor.
2. Wiring and cable connections shall be made to field-removable, modular terminal strips or to a termination card connected by a ribbon cable.

2.6 ENCLOSURES

A. General Enclosure Requirements:

1. House each controller and associated control accessories in a single enclosure. Enclosure shall serve as central tie-in point for control devices such as switches, transmitters, transducers, power supplies and transformers.
2. Include enclosure door with key locking mechanism. Key locks alike for all enclosures and include one pair of keys per enclosure.
3. Equip doors of enclosures housing controllers and components with analog or digital displays with windows to allow visual observation of displays without opening enclosure door.

2.7 RELAYS

A. General-Purpose Relays:
1. Relays shall be heavy duty and rated for at least 10 A at 250-V ac and 60 Hz.
2. Relays shall be either double pole double throw (DPDT) or three-pole double throw, depending on the control application.
3. Use a plug-in-style relay with an eight-pin octal plug for DPDT relays and an 11-pin octal plug for three-pole double-throw relays.
4. Construct the contacts of either silver cadmium oxide or gold.
5. Enclose the relay in a clear transparent polycarbonate dust-tight cover.
6. Relays shall have LED indication and a manual reset and push-to-test button.
7. Performance:

a. Mechanical Life: At least 10 million cycles.
b. Electrical Life: At least 100,000 cycles at rated load.
c. Pickup Time: 15 ms or less.
d. Dropout Time: 10 ms or less.
e. Pull-in Voltage: 85 percent of rated voltage.
f. Dropout Voltage: 50 percent of nominal rated voltage.

g. Power Consumption: 2 VA.
h. Ambient Operating Temperatures: Minus 40 to 115 deg F (Minus 40 to 46 deg C).

8. Equip relays with coil transient suppression to limit transients to non-damaging levels.
9. Plug each relay into an industry-standard, 35-mm DIN rail socket. Plug all relays located in control panels into sockets that are mounted on a DIN rail.
10. Relay socket shall have screw terminals. Mold into the socket the coincident screw terminal numbers and associated octal pin numbers.

B. Current Sensing Relay:
1. Monitors ac current.
2. Independent adjustable controls for pickup and dropout current.
3. Energized when supply voltage is present and current is above pickup setting.
4. De-energizes when monitored current is below dropout current.
5. Dropout current is adjustable from 50 to 95 percent of pickup current.
6. Include a current transformer, if required for application.
7. House current sensing relay and current transformer in its own enclosure. Use NEMA 250, Type 12 enclosure for indoors and NEMA 250, Type 4 for outdoors.

C. Combination On-Off Status Sensor and On-Off Relay:

1. Description:

a. On-off control and status indication in a single device.
b. LED status indication of activated relay and current trigger.
c. Closed-Open-Auto override switch located on the load side of the relay.

2. Performance:

a. Ambient Temperature: Minus 30 to 140 deg F (Minus 34 to 60 deg C).
b. Voltage Rating: Single-phase loads rated for 300-V ac. Three-phase loads rated for 600-V ac.

3. Status Indication:

a. Current Sensor: Integral sensing for single-phase loads up to 20 A and external solid or split sensing ring for three-phase loads up to 150 A.
b. Current Sensor Range: As required by application.
c. Current Set Point: Adjustable
d. Current Sensor Output:

1) Solid-state, single-pole double-throw contact rated for 30-V ac and dc and for 0.4 A.
2) Solid-state, single-pole double-throw contact rated for 120-V ac and 1.0 A.
3) Analog, zero- to 5- or 10-V dc.
4) Analog, 4 to 20 mA, loop powered.

4. Relay: Single-pole double-throw, continuous-duty coil; rated for 10-million mechanical cycles.
5. Enclosure: NEMA 250, Type 1 enclosure.

2.8 ELECTRICAL POWER DEVICES

A. Transformers:

1. Transformer shall be sized for the total connected load, plus an additional 25 percent of connected load.
2. Transformer shall be at least 40VA.
3. Transformer shall have both primary and secondary fuses.

2.9 CONTROL WIRE AND CABLE

A. LAN and Communication Cable: Comply with DDC system manufacturer requirements for network being installed.

1. Cable shall be plenum rated.
2. Cable shall comply with NFPA 70.
3. Cable shall have a unique color that is different from other cables used on Project.

PART 3 - EXECUTION

3.1 EXAMINATION

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

1. Verify compatibility with and suitability of substrates.

B. Examine roughing-in for products to verify actual locations of connections before installation.

1. Examine roughing-in for instruments installed in piping to verify actual locations of connections before installation.
2. Examine roughing-in for instruments installed in duct systems to verify actual locations of connections before installation.

C. Examine walls, floors, roofs, and ceilings for suitable conditions where product will be installed.

D. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

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

F. DDC SYSTEM INTERFACE WITH OTHER SYSTEMS AND EQUIPMENT

G. Communication Interface to Equipment with Integral Controls:

1. DDC system shall have communication interface with equipment having integral controls and having a communication interface for remote monitoring or control.

2. Retain "Communication Interface to Other Building Systems" Paragraph below to require DDC system to interface with systems through a communication link.

3.2 DDC SYSTEM INTERFACE WITH EXISTING SYSTEMS

A. Interface with Existing Systems:

1. DDC systems shall interface existing systems to achieve integration.
2. Monitoring and Control of DDC System by Existing Control System:

    a. DDC system performance requirements shall be satisfied when monitoring and controlling DDC system by existing control system.
    b. Operator of existing system shall be able to upload, download, monitor, trend, control and program every input and output point in DDC system from existing control system using existing control system software and operator workstations.
    c. Remote monitoring and control from existing control system shall not require operators of existing control system to learn new software.
    d. Interface of DDC system into existing control system shall be transparent to operators of existing control system and allow operators to program, monitor, and control DDC system from any operator workstation connected to existing control system.

3. Integration of Existing Control System into DDC System:

    a. Existing control system performance requirements shall be satisfied when monitoring and controlling existing control system through DDC system.
    b. Operator shall be able to upload, download, monitor, alarm, report, trend, control and program every input and output point in existing system from DDC system using operator workstations and software provided. The combined systems shall share one database.
    c. Interface of existing control system I/O points into DDC system shall be transparent to operators. All operational capabilities shall be identical regardless of whether I/O already exists or I/O is being installed.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install products to satisfy more stringent of all requirements indicated.

B. Install products level, plumb, parallel, and perpendicular with building construction.

C. Support products, tubing, piping wiring and raceways. Brace products to prevent lateral movement and sway or a break in attachment when subjected to a force.

D. If codes and referenced standards are more stringent than requirements indicated, comply with requirements in codes and referenced standards.

E. Fabricate openings and install sleeves in ceilings, floors, roof, and walls required by installation of products. Before proceeding with drilling, punching, and cutting, check for concealed work to avoid damage. Patch, flash, grout, seal, and refinish openings to match adjacent condition.

F. Firestop penetrations made in fire-rated assemblies. Seal penetrations made in acoustically rated assemblies. Fastening Hardware:

1. Stills on wrenches, pliers, and other tools that damage surfaces of rods, nuts, and other parts are prohibited for work of assembling and tightening fasteners.
2. Tighten bolts and nuts firmly and uniformly. Do not overstress threads by excessive force or by oversized wrenches.
3. Lubricate threads of bolts, nuts and screws with graphite and oil before assembly.

G. If product locations are not indicated, install products in locations that are accessible and that will permit service and maintenance from floor, equipment platforms, or catwalks without removal of permanently installed furniture and equipment.

H. Corrosive Environments:

1. Avoid or limit use of materials in corrosive airstreams and environments, including, but not limited to, the following:

    a. Laboratory exhaust-air streams.
    b. Process exhaust-air streams.

2. When conduit is in contact with a corrosive airstream and environment, use Type 316 stainless-steel conduit and fittings or conduit and fittings that are coated with a corrosive-resistant coating that is suitable for environment. Comply with requirements for installation of raceways and boxes specified in Section 260533 "Raceways and Boxes for Electrical Systems."
3. Where instruments are located in a corrosive airstream and are not corrosive resistant from manufacturer, field install products in NEMA 250, Type 4X enclosure constructed of Type 316L stainless steel.

3.4 CONTROLLER INSTALLATION

A. Install controllers in enclosures to comply with indicated requirements.

B. Connect controllers to field power supply.

C. Install controller with latest version of applicable software and configure to execute requirements indicated.

D. Test and adjust controllers to verify operation of connected I/O to achieve performance indicated requirements while executing sequences of operation.

E. Installation of Network Controllers:

1. Quantity and location of network controllers shall be determined by DDC system manufacturer to satisfy requirements indicated.
2. Install controllers in a protected location that is easily accessible by operators.

3.5 ELECTRIC POWER CONNECTIONS

A. Connect electrical power to DDC system products requiring electrical power connections.

B. Design of electrical power to products not indicated with electric power is delegated to DDC system provider and installing trade. Work shall comply with NFPA 70 and other requirements indicated.

3.6 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and installations, including connections.

B. Testing:

1. Perform preinstallation, in-progress, and final tests, supplemented by additional tests, as necessary.
2. Preinstallation Cable Verification: Verify integrity and serviceability for new cable lengths before installation. This assurance may be provided by using vendor verification documents, testing, or other methods. As a minimum, furnish evidence of verification for cable attenuation and bandwidth parameters.
3. In-Progress Testing: Perform standard tests for correct pair identification and termination during installation to ensure proper installation and cable placement. Perform tests in addition to those specified if there is any reason to question condition of material furnished and installed. Testing accomplished is to be documented by agency conducting tests. Submit test results for Project record.
4. Final Testing: Perform final test of installed system to demonstrate acceptability as installed. Testing shall be performed according to a test plan supplied by DDC system manufacturer. Defective Work or material shall be corrected and retested. As a minimum, final testing for cable system, including spare cable, shall verify conformance of attenuation, length, and bandwidth parameters with performance indicated.
5. Test Equipment: Use a fiber-optic time domain reflectometer for testing of length and optical connectivity.

3.7 DDC SYSTEM I/O CHECKOUT PROCEDURES

A. Check installed products before continuity tests, leak tests and calibration.

B. Check instruments for proper location and accessibility.

C. Check instruments for proper installation on direction of flow, elevation, orientation, insertion depth, or other applicable considerations that will impact performance.

D. Check instrument tubing for proper isolation, fittings, slope, dirt legs, drains, material and support.

E. Control Damper Checkout:

1. Verify that control dampers are installed correctly for flow direction.
2. Verify that proper blade alignment, either parallel or opposed, has been provided.
3. Verify that damper frame attachment is properly secured and sealed.
4. Verify that damper actuator and linkage attachment is secure.
5. Verify that actuator wiring is complete, enclosed and connected to correct power source.

6. Verify that damper blade travel is unobstructed.

F. Control Valve Checkout:
1. Verify that control valves are installed correctly for flow direction.
2. Verify that valve body attachment is properly secured and sealed.
3. Verify that valve actuator and linkage attachment is secure.
4. Verify that actuator wiring is complete, enclosed and connected to correct power source.
5. Verify that valve ball, disc or plug travel is unobstructed.
6. After piping systems have been tested and put into service, but before insulating and balancing, inspect each valve for leaks. Adjust or replace packing to stop leaks. Replace the valve if leaks persist.

G. Instrument Checkout:

1. Verify that instrument is correctly installed for location, orientation, direction and operating clearances.
2. Verify that attachment is properly secured and sealed.
3. Verify that conduit connections are properly secured and sealed.
4. Verify that wiring is properly labeled with unique identification, correct type and size and is securely attached to proper terminals.
5. Inspect instrument tag against approved submittal.
6. For instruments with tubing connections, verify that tubing attachment is secure and isolation valves have been provided.
7. For flow instruments, verify that recommended upstream and downstream distances have been maintained.
8. For temperature instruments:

    a. Verify sensing element type and proper material.
    b. Verify length and insertion.

END OF SECTION

SECTION 16110
RACEWAYS AND BOXES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Metal conduits and fittings.
2. Boxes, enclosures, and cabinets.

1.3 DEFINITIONS

A. ARC: Aluminum rigid conduit.

B. GRC: Galvanized rigid steel conduit.

C. IMC: Intermediate metal conduit.

1.4 ACTION SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

PART 2 - PRODUCTS

2.1 METAL CONDUITS AND FITTINGS

A. Metal Conduit:
1. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. GRC: Comply with ANSI C80.1 and UL 6.
3. ARC: Comply with ANSI C80.5 and UL 6A.
4. IMC: Comply with ANSI C80.6 and UL 1242.
5. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.

a. Comply with NEMA RN 1.
b. Coating Thickness: 0.040 inch (1 mm), minimum.

6. EMT: Comply with ANSI C80.3 and UL 797.
7. FMC: Comply with UL 1; zinc-coated steel or aluminum.
8. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

B. Metal Fittings:
1. Comply with NEMA FB 1 and UL 514B.
2. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
3. Fittings, General: Listed and labeled for type of conduit, location, and use.
4. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 1203 and NFPA 70.
5. Fittings for EMT:

a. Material: Steel or die cast.
b. Type: compression.

6. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
7. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch (1 mm), with overlapping sleeves protecting threaded joints.

C. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 BOXES, ENCLOSURES, AND CABINETS

A. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

B. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

C. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.

D. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb (23 kg). Outlet boxes designed for attachment of luminaires weighing more than 50 lb (23 kg) shall be listed and marked for the maximum allowable weight.

E. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

F. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

G. Device Box Dimensions: 4 inches square by 2-1/8 inches deep (100 mm square by 60 mm deep).

H. Gangable boxes are allowed.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Indoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT.

2. Concealed in Ceilings and Interior Walls and Partitions: EMT.
3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
4. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in institutional and commercial kitchens and damp or wet locations.

B. Minimum Raceway Size: 3/4-inch (21-mm) trade size.

C. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
3. EMT: Use compression, cast-metal fittings. Comply with NEMA FB 2.10.
4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

D. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.

E. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

F. Install surface raceways only where indicated on Drawings.

3.2 INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

B. Do not fasten conduits onto the bottom side of a metal deck roof.

C. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

D. Complete raceway installation before starting conductor installation.

E. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches (300 mm) of changes in direction.

F. Make bends in raceway using large-radius preformed ells. Field bending shall be according to NFPA 70 minimum radii requirements. Use only equipment specifically designed for material and size involved.

G. Conceal conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

H. Support conduit within 12 inches (300 mm)of enclosures to which attached.

I. Stub-ups to Above Recessed Ceilings:

1. Use EMT, IMC, or RMC for raceways.
2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

J. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

K. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.

L. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.

M. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch (35mm) trade size and insulated throat metal bushings on 1-1/2-inch (41-mm) trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

N. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

O. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

P. Cut conduit perpendicular to the length. For conduits 2-inch (53-mm) trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

Q. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

R. Surface Raceways:

1. Install surface raceway with a minimum 2-inch (50-mm)radius control at bend points.
2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches (1200 mm) and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.

S. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a

blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.

T. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where an underground service raceway enters a building or structure.
3. Conduit extending from interior to exterior of building.
4. Conduit extending into pressurized duct and equipment.
5. Conduit extending into pressurized zones that are automatically controlled to maintain different pressure set points.
6. Where otherwise required by NFPA 70.

U. Comply with manufacturer's written instructions for solvent welding RNC and fittings.

V. Expansion-Joint Fittings:

1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F (17 deg C) and that has straight-run length that exceeds 25 feet (7.6 m). Install in each run of aboveground RMC conduit that is located where environmental temperature change may exceed 100 deg F (55 deg C) and that has straight-run length that exceeds 100 feet (30 m).

2. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F (0.06 mm per meter of length of straight run per deg C) of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F (0.0115 mm per meter of length of straight run per deg C) of temperature change for metal conduits.
3. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
4. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

W. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches (1830 mm) of flexible conduit for recessed and semirecessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations subject to severe physical damage.
2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.

X. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.

Y. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.

Z. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

AA. Locate boxes so that cover or plate will not span different building finishes.

BB. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

CC. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

3.3 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies.

3.4 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies.

3.5 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533

SECTION 16120
LOW-VOLTAGE WIRING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Copper building wire rated 600 V or less.
2. Connectors, splices, and terminations rated 600 V and less.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Product Schedule: Indicate type, use, location, and termination locations.

PART 2 - PRODUCTS

2.1 COPPER BUILDING WIRE

A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.

B. Standards:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
2. RoHS compliant.
3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

C. Conductors: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8] for stranded conductors.

D. Conductor Insulation:
1. Type THHN: Comply with UL 83.

2.2 CONNECTORS AND SPLICES

A. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

B. Jacketed Cable Connectors: For steel and aluminum jacketed cables, zinc die-cast with set screws, designed to connect conductors specified in this Section.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Feeders: Copper for feeders smaller than No. 4 AWG; copper or aluminum for feeders No. 4 AWG and larger. Conductors shall be solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

C. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

D. Branch Circuits: Copper. Solid for No. 12 AWG and smaller; stranded for No. 10 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Exposed Branch Circuits, Including in Crawlspaces: Type THHN/THWN-2, single conductors in raceway.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

B. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.

C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

3.4 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches (150 mm) of slack.

3.5 IDENTIFICATION

A. Identify and color-code conductors and cables.

B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies.

3.7 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly.

3.8 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. After installing conductors and cables and before electrical circuitry has been energized, test conductors for compliance with requirements.

2. Perform each of the following visual and electrical tests:

    a. Inspect exposed sections of conductor and cable for physical damage and correct connection according to the single-line diagram.
    b. Test bolted connections for high resistance using one of the following:

        1) A low-resistance ohmmeter.
        2) Calibrated torque wrench.
        3) Thermographic survey.

    c. Inspect compression-applied connectors for correct cable match and indentation.
    d. Inspect for correct identification.
    e. Inspect cable jacket and condition.

f. Insulation-resistance test on each conductor for ground and adjacent conductors. Apply a potential of 500-V dc for 300-V rated cable and 1000-V dc for 600-V rated cable for a one-minute duration.
g. Continuity test on each conductor and cable.
h. Uniform resistance of parallel conductors.

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

C. Prepare test and inspection reports to record the following:

1. Procedures used.
2. Results that comply with requirements.
3. Results that do not comply with requirements, and corrective action taken to achieve compliance with requirements.

END OF SECTION 260519

SECTION 16140
WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Straight-blade convenience, hospital-grade, isolated-ground, and tamper-resistant receptacles.
2. GFCI receptacles.
3. Toggle switches.
4. Wall plates.

1.3 DEFINITIONS

A. Abbreviations of Manufacturers' Names:

1. Cooper: Cooper Wiring Devices; Division of Cooper Industries, Inc.
2. Hubbell: Hubbell Incorporated: Wiring Devices-Kellems.
3. Leviton: Leviton Mfg. Company, Inc.
4. Pass & Seymour: Pass& Seymour/Legrand.

B. GFCI: Ground-fault circuit interrupter.

C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

PART 2 - PRODUCTS

2.1 GENERAL WIRING-DEVICE REQUIREMENTS

A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

C. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:

1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
2. Devices shall comply with the requirements in this Section.

D. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 STRAIGHT-BLADE RECEPTACLES

A. Duplex Convenience Receptacles: 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.

B. Hospital-Grade, Duplex Convenience Receptacles: 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498 Supplement sd, and FS W-C-596.
1. Description: Single-piece, rivetless, nickel-plated, all-brass grounding system. Nickel-plated, brass mounting strap.

2.3 GFCI RECEPTACLES

A. General Description:

1. 125 V, 20 A, straight blade, feed-through type.
2. Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, UL 943 Class A, and FS W-C-596.
3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.

2.4 TOGGLE SWITCHES

A. Comply with NEMA WD 1, UL 20, and FS W-S-896.

B. Switches, 120/277 V, 20 A:

1. Single Pole:

C. Key-Operated Switches: 120/277 V, 20 A.
1. Description: Single pole, with factory-supplied key in lieu of switch handle.

2.5 WALL PLATES

A. Single and combination types shall match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: Smooth, high-impact thermoplastic.
3. Material for Unfinished Spaces: Smooth, high-impact thermoplastic.

2.6 FINISHES

A. Device Color:

1. Wiring Devices Connected to Normal Power System: White unless otherwise indicated or required by NFPA 70 or device listing.

B. Wall Plate Color: For plastic covers, match device color.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:

1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
4. Existing Conductors:

a. Cut back and pigtail, or replace all damaged conductors.
b. Straighten conductors that remain and remove corrosion and foreign matter.
c. Pigtailing existing conductors is permitted, provided the outlet box is large enough.

D. Device Installation:

1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles up, and on horizontally mounted receptacles to the right.
2. Install hospital-grade receptacles in patient-care areas with the ground pin or neutral blade at the top.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

3.2 GFCI RECEPTACLES

A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

3.3 FIELD QUALITY CONTROL

A. Test Instruments: Use instruments that comply with UL 1436.

B. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

C. Perform the following tests and inspections:

1. In healthcare facilities, prepare reports that comply with recommendations in NFPA 99.
2. Test Instruments: Use instruments that comply with UL 1436.
3. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

D. Tests for Convenience Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.

2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are securely mounted.
6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

E. Test straight-blade convenience outlets in patient-care areas for the retention force of the grounding blade according to NFPA 99. Retention force shall be not less than 4 oz. (115 g).

F. Wiring device will be considered defective if it does not pass tests and inspections.

G. Prepare test and inspection reports.

END OF SECTION 16140