

SPECIFICATIONS

NEW JERSEY INSTITUTE of TECHNOLOGY
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Newark, New Jersey

NK Project #2144.100

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100% Construction Documents



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SECTION 024119 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

1. Demolition and removal of selected portions of building or structure.
2. Demolition and removal of selected site elements.
3. Salvage of existing items to be reused or recycled.

- B. Related Requirements:

1. Section 011000 "Summary" for restrictions on use of the premises, Owner-occupancy requirements, and phasing requirements.
2. Section 017300 "Execution" for cutting and patching procedures.
3. Section 311000 "Site Preparation" for site clearing and removal of above- and below-grade improvements not part of selective demolition.

1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.
- B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and store.
- C. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.
- D. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.
- E. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

1.4 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.

- B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.
 - 1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.5 INFORMATIONAL SUBMITTALS

- A. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property for dust control and, for noise control. Indicate proposed locations and construction of barriers.
- B. Schedule of Selective Demolition Activities: Indicate the following:
 - 1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's building manager's on-site operations are uninterrupted.
 - 2. Interruption of utility services. Indicate how long utility services will be interrupted.
 - 3. Coordination for shutoff, capping, and continuation of utility services.
 - 4. Use of elevator and stairs.
 - 5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
- C. Predemolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces, that might be misconstrued as damage caused by demolition operations. Comply with Section 013233 "Photographic Documentation." Submit before Work begins.
- D. Warranties: Documentation indicating that existing warranties are still in effect after completion of selective demolition.

1.6 CLOSEOUT SUBMITTALS

- A. Inventory: Submit a list of items that have been removed and salvaged.

1.7 QUALITY ASSURANCE

- A. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

1.8 FIELD CONDITIONS

- A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
- B. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- C. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.

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

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

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

1.9 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials and using approved contractors so as not to void existing warranties. Notify warrantor before proceeding. Existing warranties include the following:

1. Existing Roofing Warranty

B. Notify warrantor on completion of selective demolition, and obtain documentation verifying that existing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

1.10 COORDINATION

A. Arrange selective demolition schedule so as not to interfere with Owner's operations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

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

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

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

B. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.

3.2 PREPARATION

- A. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction.

3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.
- B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.
 - 1. Arrange to shut off utilities with utility companies.
 - 2. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
 - 3. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.
 - a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
 - b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
 - c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
 - d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
 - e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
 - f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
 - g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.

3.4 PROTECTION

- A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 - 1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
 - 2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
 - 3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
 - 4. Cover and protect furniture, furnishings, and equipment that have not been removed.
 - 5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 015000 "Temporary Facilities and Controls."

- B. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
 - 1. Strengthen or add new supports when required during progress of selective demolition.
- C. Remove temporary barricades and protections where hazards no longer exist.

3.5 SELECTIVE DEMOLITION, GENERAL

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
 - 1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
 - 2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
 - 3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 - 4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
 - 5. Maintain fire watch during and for at least 2 hours after flame-cutting operations.
 - 6. Maintain adequate ventilation when using cutting torches.
 - 7. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
 - 8. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
 - 9. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 - 10. Dispose of demolished items and materials promptly. Comply with requirements in Section 017419 "Construction Waste Management and Disposal."
- B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
- C. Removed and Salvaged Items:
 - 1. Clean salvaged items.
 - 2. Pack or crate items after cleaning. Identify contents of containers.
 - 3. Store items in a secure area until delivery to Owner.
 - 4. Transport items to Owner's storage area designated by Owner.
 - 5. Protect items from damage during transport and storage.
- D. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse.
 2. Pack or crate items after cleaning and repairing. Identify contents of containers.
 3. Protect items from damage during transport and storage.
 4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
- E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition..

3.6 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- A. Concrete: Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least 3/4 inch (19 mm) at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.
- B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.
- C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.
- D. Roofing: Remove no more existing roofing than what can be covered in one day by new roofing and so that building interior remains watertight and weathertight. See Section 075200 "Modified Bituminous Membrane Roofing" for new roofing requirements.
1. Remove existing roof membrane, flashings, copings, and roof accessories.
 2. Remove existing roofing system down to substrate.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove demolition waste materials from Project site and recycle or dispose of them according to Section 017419 "Construction Waste Management and Disposal."
1. Do not allow demolished materials to accumulate on-site.
 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
 4. Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."
- B. Burning: Do not burn demolished materials.

3.8 CLEANING

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

END OF SECTION 024119

SECTION 055210 - PIPE AND TUBE RAILINGS

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. Aluminum pipe and tube railings.

- B. Related Sections:

- 1. Division 05 Section "Metal Stairs" for steel tube railings associated with metal stairs.
 - 2. Division 06 Section "Miscellaneous Rough Carpentry" for wood blocking for anchoring railings.
 - 3. Division 09 Section "Non-Structural Metal Framing" for metal backing for anchoring railings.

1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Railings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

- 1. Handrails and Top Rails of Guards:

- a. Uniform load of 50 lbf/ ft. (0.73 kN/m) applied in any direction.
 - b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.

- B. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.4 SUBMITTALS

- A. Product Data: For the following:

- 1. Manufacturer's product lines of mechanically connected railings.
 - 2. Railing brackets.
 - 3. Grout, anchoring cement, and paint products.

- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
- C. Samples for Verification: For each type of exposed finish required.
 - 1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters.
 - 2. Fittings and brackets.
- D. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of railing from single source from single manufacturer.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

1.7 COORDINATION AND SCHEDULING

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- C. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Aluminum Pipe and Tube Railings:
 - a. ATR Technologies, Inc.
 - b. Blum, Julius & Co., Inc.
 - c. Braun, J. G., Company; a division of the Wagner Companies.

- d. CraneVeyor Corp.
- e. Hollaender Manufacturing Company.
- f. Kee Industrial Products, Inc.
- g. Moultrie Manufacturing Company.
- h. Pisor Industries, Inc.
- i. Sterling Dula Architectural Products, Inc.; Div. of Kane Manufacturing.
- j. Superior Aluminum Products, Inc.
- k. Thompson Fabricating, LLC.
- l. Tri Tech, Inc.
- m. Tubular Specialties Manufacturing, Inc.
- n. Tuttle Railing Systems; Div. of Tuttle Aluminum & Bronze, Inc.
- o. Wagner, R & B, Inc.; a division of the Wagner Companies.

2.2 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.

2.3 ALUMINUM

- A. Aluminum, General: Provide alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of alloy and temper designated below for each aluminum form required.
- B. Extruded Structural Pipe: ASTM B 429/B 429M, Alloy 6063-T6.
 - 1. Provide Standard Weight (Schedule 40) pipe, unless otherwise indicated.

2.4 FASTENERS

- A. General: Provide the following:
- B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.
- C. Fasteners for Interconnecting Railing Components:
 - 1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.

2.5 MISCELLANEOUS MATERIALS

- A. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.
- B. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

- C. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.

2.6 FABRICATION

- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
- B. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- D. Form work true to line and level with accurate angles and surfaces.
- E. Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- G. Connections: Fabricate railings with nonwelded connections unless otherwise indicated.
- H. Welded Connections for Aluminum Pipe: Fabricate railings to interconnect members with concealed internal welds that eliminate surface grinding, using manufacturer's standard system of sleeve and socket fittings.
- I. Nonwelded Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
- J. Form changes in direction as follows:
- K. Bend members in jigs to produce uniform curvature for each configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- L. Close exposed ends of railing members with prefabricated end fittings.
- M. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch (6 mm) or less.
- N. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.
 - 1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers, or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.

- O. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.

2.7 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

2.8 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements have been clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION, GENERAL

- A. Fit exposed connections together to form tight, hairline joints.
- B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
 - 1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 - 2. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet (5 mm in 3 m).
- C. Corrosion Protection: Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
- D. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

- A. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of railings.

3.4 ATTACHING RAILINGS

- A. Anchor railing ends at walls with round flanges anchored to wall construction and welded to railing ends or connected to railing ends using nonwelded connections.
- B. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces and connected to railing ends using nonwelded connections.
- C. Attach railings to wall with wall brackets, except where end flanges are used. Provide brackets with 1-1/2-inch (38-mm) clearance from inside face of handrail and finished wall surface. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
 - 1. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt.
 - 2. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
- D. Secure wall brackets and railing end flanges to building construction as follows:
 - 1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
 - 2. For hollow masonry anchorage, use toggle bolts.
 - 3. For steel-framed partitions, use hanger or lag bolts set into fire-retardant-treated wood backing between studs. Coordinate with stud installation to locate backing members.

3.5 ADJUSTING AND CLEANING

- A. Clean aluminum by washing thoroughly with clean water and soap and rinsing with clean water.

3.6 PROTECTION

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

END OF SECTION 055210

SECTION 057300 DECORATIVE METAL RAILINGS WITH PERFORATED INFILL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Component Aluminum Railings
 - 2. Infill panel system for component aluminum railings

1.3 PERFORMANCE REQUIREMENTS

- A. All railings shall be supplied to conform to applicable sections of the following codes:
 - 1. International Building Code
 - 2. ADAAG
- B. Structural Performance: Provide railings capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Handrails:
 - a. Uniform load of 50 lbf/ ft. applied in any direction.
 - b. Concentrated load of 200 lbf applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 - 2. Top Rails of Guards:
 - a. Uniform load of 50 lbf/ ft. applied in any direction.
 - b. Concentrated load of 200 lbf applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 - 3. Infill Area of Guards:
 - a. Horizontal concentrated load of 50 lbf applied to 1 sq. ft. at any point in system, including panels, intermediate rails, balusters, or other elements composing infill area. Load on infill area need not be assumed to act concurrently with loads on top rails.
- C. Thermal Movements: Provide exterior railings that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
- D. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.4 SUBMITTALS

- A. Product Data: For the following:
 - 1. Manufacturer's product lines of mechanically connected railings.

2. Grout, anchoring cement, and paint products.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Samples for Initial Selection: For products involving selection of color, texture, or design.
- D. Mill Certificates: Signed by manufacturers of stainless-steel products certifying that products furnished comply with requirements.
- E. Qualification Data: For professional engineer.
- F. Product Test Reports: Supplier shall submit calculations and test reports for complete system, including railing and infill panels. Calculations and test reports shall be stamped by a licensed PE. Test reports shall be in accordance with ASTM E 935.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of railing through one source from a single manufacturer.
- B. Mock-up Panel: one section of railing system for verification.
 1. Approximate Size: $\frac{1}{4}$ to $\frac{1}{2}$ of full size, using full size components.
 2. Approved mockups may become part of the completed work if undamaged at time of Substantial Completion.
 3. Approval of mockups does not constitute approval of deviations from the Contract Documents unless such deviations are specifically approved by Architect in writing.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication and indicate measurements on Shop Drawings.

1.7 COORDINATION AND SCHEDULING

- A. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to project site in time for installation.
- B. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Railing Product: Subject to compliance with requirements, provide Interna-Rail® aluminum component railing as manufactured and assembled by

Hollaender® Manufacturing or an approved equivalent. Single source manufacturer is required. Welded railing will not be accepted.

2.2 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails, unless otherwise indicated.

2.3 ALUMINUM

- A. Aluminum, General: Provide alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of alloy and temper designated below for each aluminum form required.
- B. Extruded Bars and Tubing: ASTM B 221, Alloy 6063-T5/T52, 6005-T5
Provide 1 ½ in IPS, (1.90 in OD) Standard Weight (Schedule 40) pipe for rails, Schedule 80 for posts, Schedule 10 for pickets, unless otherwise indicated
- C. Extruded Structural Pipe and Round Tubing: ASTM B 429, Alloy 6061-T6.
Provide 1 ½ in IPS, (1.90 in OD) Standard Weight (Schedule 40) pipe for rails, Schedule 80 for posts, unless otherwise indicated
- D. Drawn Seamless Tubing: ASTM B 210, Alloy 6063-T832
- E. Plate and Sheet: ASTM B 209, Alloy 6061-T6
- F. Die and Hand Forgings: ASTM B 247, Alloy 6061-T6
- G. Base Flange Castings: ASTM B 26/B 26M, Alloy Almag 535
- H. Panel Clips and Structural Fasteners: Alloy 6063-T6

2.4 STEEL

- A. Perforated Sheet: ASTM A1008.

2.5 FASTENERS

- A. General: Provide the following:
 - 1. Aluminum Railings: Type 304 stainless-steel fasteners
- B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.
- C. Structural Fasteners for Interconnecting Railing Components:
 - 1. Rails shall be attached to posts by means of tee fittings equipped with anodized aluminum, tubular rivet nut and stainless steel socket head cap screw. All structural fasteners such as tee fittings shall be machined from 6063-T6 aluminum alloy. The fitting shall be internally connected to the rail by means of an internal dual tang that is expanded with a stainless steel, internal /external, reverse knurl, cup point socket head

set screw. This combination shall prevent any loosening of the system due to changes in temperature or vibration. Systems using pop rivets or adhesives will not be accepted.

- D. Fasten infill panels to rails and posts with Hollaender model 145 panel clips, machined from 6063-T6 aluminum alloy. Secure the infill panels in the panel clips with reverse-knurl cup-point set screws. Fasten panel clips to rails and posts with ¼ - 20 sheet metal screws.
- E. Anchors: Provide concrete adhesive anchors where indicated or necessary.

2.6 INFILL FOR RAILINGS

- A. Panel:
 - 1. Perforated Steel Sheet: of gage necessary to withstand loads indicated, minimum
 - 2. Pattern: 1/2" dia. holes spaced at 11/16" o.c.
 - 3. Frame: Aluminum U-channel, minimum 11 ga, thick, x 1 inch, corners welded and ground smooth. To assure minimum maintenance and maximum corrosion protection, bottom channel of frame shall be open, in order to evacuate all water.
 - 4. Coating
 - a. Entire panel shall then be powder coated with Silver powder coat, or equivalent powder coat color of architect's choice. Powder to be TGIC Polyester, minimum AAMA 2604.
 - 5. Panels to be attached to railing using Hollaender model 145 panel retainers and ¼ - 20 screws, with appropriate slot width for panel thickness, and set screw for final tightening of panel within retainer slot. Panel retainer to be constructed of 6061 - T6 aluminum alloy.

2.7 HANDRAIL FOR ADA RAMPS OR STAIRWAYS (AS REQUIRED)

- 1. Ramps that have a drop off of 30 inches or more on the side require guardrail, per above spec. Ramps with a rise greater than 6 inches shall have handrails on both sides.
- 2. Stairways shall have handrails on both sides.
- 3. Handrail will be attached to the guardrail sections using Hollaender model 85 adjustable brackets.
- 4. Handrail will be installed at a height of 34 - 38 inches above ramp surface or stair tread nosings.
- 5. Handrail will be anodized aluminum 6063 Sch 40, 1 ½ in IPS nominal (1.90 in. OD) and shall have a continuous surface. Where necessary, lengths of the handrail will be spliced using Hollaender Model 70ES-8 internal locking splices.
- 6. Handrails shall return to a wall, guard or walking surface. If returning to the guard, Hollaender model 185 post return swivel shall be used to connect the end of the handrail to the guardrail post.

2.8 MISCELLANEOUS MATERIALS

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

2.9 FABRICATION

- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.

- B. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- D. Form work true to line and level with accurate angles and surfaces.
- E. Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- G. Connections: Fabricate railings with non-welded connections, unless otherwise indicated. Welding will not be accepted.
- H. Non-welded Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
 - 1. Fittings to be of the internal double tang type activated by a reverse knurl cup point set screw. Reverse knurl is required to ensure that screw does not come loose under vibration. Plain cup point screws will not be accepted. Fittings to be fastened to pipe by means of a 5/16 in. tubular rivet nut and socket head cap screw.
- I. Form changes in direction as follows:
 - 1. By flush bends or by inserting prefabricated flush-elbow fittings.
- J. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- K. Close exposed ends of railing members with prefabricated end fittings.
- L. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.
- M. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work, unless otherwise indicated. Flanges to be sand cast from aluminum alloy 535 with anodized finish and fastened directly to the post by means of two reverse knurl cup point set screws.
- N. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.
- O. Provide railing toe plates when adjacent to or above and open to stair system, floor or grade below and in accordance with the following:
 - 1. Size; 4-inch high extruded section.
 - 2. Clearance of Toe Plate Bottom Above Top of Walking Surface: 1/8 inch minimum and 1/4 inch maximum. Notch flanges as required at railing posts and post base plates.

3. Attach to each rail post with clamps which will allow for temperature expansion and contraction between posts.
4. Provide expansion joints in toeboard at railing expansion joints.
5. Provide pre-manufactured corners for field installation.

2.10 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

2.11 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- B. Unless indicated otherwise, provide aluminum with the following finish:
 1. Anodized Finish: AA-M10C22A41 (Architectural class, .7 mil thickness or greater)

2.12 STEEL FINISHES

- A. Perforated Sheet Metal Infill Panel:
 1. Primer/Corrosion Protection – PPG Powercron 8000 or approved equal, applied in four-step process.
 2. Finish: Powder coat
 - a. Color: as selected by Architect from manufacturer's full line.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements have been clearly marked for installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION, GENERAL

- A. Fit exposed connections together to form tight, hairline joints.
- B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 2. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
 3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.
- C. Corrosion Protection: Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint, or provide protective gaskets.
- D. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

- A. Non-welded Connections: Use mechanical joints for permanently connecting railing components. Use wood blocks and padding to prevent damage to railing members and fittings.
- B. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches beyond joint on either side, fasten internal sleeve securely to 1 side, and locate joint within 6 inches of post.

3.4 ANCHORING RAILING ENDS

- A. Anchor railing ends to concrete and masonry with round flanges connected to railing ends and anchored to wall construction with anchors and bolts.
- B. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces and connected to railing ends using non-welded connections.

3.5 ATTACHING HANDRAILS TO WALLS

- A. Attach handrails to wall with wall brackets. Provide brackets with 1-1/2-inch clearance from inside face of handrail and finished wall surface.
- B. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
- C. Secure wall brackets to building construction as indicated, or if not indicated, as follows:
1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
 2. For hollow masonry anchorage, use toggle bolts.
 3. Provide blocking between studs in stud wall construction.

3.6 ADJUSTING AND CLEANING

- A. Clean aluminum and stainless steel by washing thoroughly with clean water and soap and rinsing with clean water.

3.7 PROTECTION

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.
- B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION - 057300 DECORATIVE METAL RAILINGS

SECTION 084413 - GLAZED ALUMINUM CURTAIN WALLS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes glazed aluminum curtain walls as follows:
 - 1. Structurally glazed aluminum curtain wall; stick built.
 - 2. Matching sills, closures, stools, trim and copings.
 - 3. Aluminum doors and frames.
 - 4. 2 sided glass parapets
 - 5. Curtain wall mullion extension
 - 6. Aluminum Break metal horizontal bands
- B. Related Sections include the following:
 - 1. Division 7 Section "Fire-Resistive Joint Systems" for perimeter fire-containment systems (safing insulation) and insulation field installed with glazed aluminum curtain wall systems.
 - 2. Division 7 Section "Joint Sealants" for installation of joint sealants installed with curtain wall systems and for sealants to the extent not specified in this Section.
 - 3. Division 8 Section "Glazing" for glass and glazing material requirements.

1.2 SYSTEMS DESCRIPTION

- A. Air Infiltration: Shall be no more than 0.02 cubic feet/minute/square at 6.24 pounds/square foot when tested in accordance with ASTM E283.
- B. Water infiltration: No penetration when tested at rate of 5 gallons/hour/square foot and 30 pounds/square foot pressure for 15 minutes when tested in accordance with ASTM E331.
- C. Uniform load deflection: In accordance with ASTM E330, a static air pressure difference of 30 pounds/square foot applied in the positive and negative directions. Maximum deflection of L/175.
- D. Uniform load structural: In accordance with ASTM E330, a minimum static air pressure difference of 45 pounds/square foot shall be applied in the positive and negative directions.
- E. Interstory movement/seismic tests: Tested in accordance with AAMA 501:
 - 1. Resists air and water penetration at 19 mm movement and 15 pounds per square foot pressure.
 - 2. Resists air and water penetration at 36 mm movement and 12.5 pounds per square foot pressure.
 - 3. No glazing fall-out tested at 54 mm movement.
- F. Glazing impact test with 110.2 pounds force from 48 inches at center and at corner of glass: No fall-out or breakage.

1.3 PERFORMANCE REQUIREMENTS

- A. General: Provide glazed aluminum curtain wall systems that comply with performance requirements specified herein as determined by engineering calculations and testing manufacturers' standard assemblies similar to those indicated for this Project, by a qualified testing and inspecting agency.
- B. General: Provide glazed aluminum curtain wall systems, including anchorage, capable of withstanding, without structural failure, the effects of the following:
1. Structural loads.
 - a. Wind Loads: Per the NJIBC, but in no event less than the following values:
 - 1) Basic wind speed equal to 100 mph; Ground Roughness Exposure C; Importance Factor = 1.0.
 - 2) For typical walls: Uniform pressure of 22 lbf/sq. ft., acting inward and 24 lbf/sq. ft. outward.
 - 3) For walls located within corner zones: Uniform pressure of 22 lbf/sq. ft., acting inward and 30 lbf/sq. ft. outward.
 - 4) For typical parapets: Uniform pressure of 49 lbf/sq. ft., acting inward and 39 lbf/sq. ft. outward.
 - 5) For parapets located within corner zones: Uniform pressure of 73 lbf/sq. ft., acting inward and 45 lbf/sq. ft. outward.
 - 6) For typical ceiling/soffit/overhang: Uniform pressure of 44 lbf/sq. ft., acting upward.
 - 7) For ceiling/soffit/overhang located within corner zones: Uniform pressure of 69 lbf/sq. ft., acting upward.
 - b. Seismic Loads: The effects of earthquake motions calculated according to requirements of the NJIBC or ASCE 7, "Minimum Design Loads for Buildings and Other Structures," Section 9, "Earthquake Loads," whichever are more stringent.
 - 1) Maximum Considered Earthquake Spectral response acceleration at short periods $S_s = 0.40$.
 - 2) Maximum Considered Earthquake Spectral response acceleration at one second $S_1 = 0.095$.
 - 3) Seismic Use Group 1.
 - 4) Importance Factor $I = 1.0$.
 - 5) Site Class A.
 - 6) Seismic Design Category B.
 - c. Dead Loads: Self-weight of wall system and attached components.
 - d. Periodic Maintenance Loads: Equal to the weight of a 300 pound (136 kg) vertical load applied anywhere onto ledges or other horizontal surfaces.
 2. Deflection of Framing Members:
 - a. Deflection Normal to Wall Plane: Limited to 1/240 of clear span or 3/4 inch(19 mm), whichever is smaller.
 - b. Deflection Parallel to Glazing Plane: Limited to amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and which reduces edge clearance between framing members and glazing or other fixed components to less than 1/8 inch(3.2 mm).
 - c. Cantilever Deflection: Where framing members overhang an anchor point, limited to 2 times the length of cantilevered member, divided by 175. Where two cantilevers meet end to end at a splice, utilize the shorter dimension of the two for this calculation.
 3. Movements of supporting structure indicated on Drawings including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
 - a. Vertical Deflection: Provide wall systems that accommodate design deflection of building structure without structural failure, failure to comply with water penetration requirements, failure to comply with air infiltration requirements, or other damage.

- Joints designed to accommodate building deflection by means of allowing glass to slip within a glazing pocket are not acceptable.
- 1) Design Deflection: 1/2 inch inter-story differential movement.
- b. Story Drift: Provide wall systems that accommodate design displacement of adjacent stories indicated without structural failure, failure to comply with water penetration requirements, failure to comply with air infiltration requirements, or other damage.
 - 1) Design Displacement: H/400 when subjected to the full design wind load.
 - 2) Design Displacement: H/400 when subjected to the full design seismic load.
4. Structural failure includes the following:
 - a. Deflection exceeding specified limits.
 - b. Thermal stresses transferred to building structure.
 - c. Framing members transferring stresses, including those caused by thermal and structural movements, to glazing.
 - d. Glazing-to-glazing contact.
 - e. Glass breakage, other than that confirmed to be a result of direct impact or seismic event.
 - f. Glass falling out.
 - g. Damage to metal components of system, including permanent deformation, except in a seismic event.
 - h. Noise or vibration created by wind and thermal and structural movements.
 - i. Loosening or weakening of fasteners, attachments, and other components.
 - j. Sealant failure.
- C. Thermal Movements: Provide glazed aluminum curtain wall systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss. Components used within the system shall withstand noiselessly thermal movements without any buckling, distortion, cracking, failure of glass, and failure of joint seals or undue stress on the finished surfaces, materials, or fixing assemblies.
1. Temperature Design Parameters: Analyze the parameters below and design to accommodate each of the possible maximum movement combinations (temperature ranges).
 - a. Low exterior ambient temperature of -10 deg F(-23 deg C)
 - b. High exterior surface temperature of 180 deg F(65 deg C) for dark colors and 150 deg F (100 deg C) for light colors.
 - c. Low interior ambient temperature of 55 deg F(13 deg C)
- D. Air Infiltration: Provide aluminum curtain wall with maximum air leakage when tested according to ASTM E 283 as follows:
1. Fixed windows: 0.06 cfm/sq. ft. (0.03 L/s per sq. m) of window area at a minimum static-air-pressure differential of 6.24 lbf/sq. ft. (300 Pa).
 2. Operable windows: 0.06 cfm/sq. ft. (0.03 L/s per sq. m) of window area at a minimum static-air-pressure differential of 1.57 lbf/sq. ft. (75 Pa).
- E. Water Penetration: Provide glazed aluminum curtain wall systems that do not evidence uncontrolled water penetration when subjected to the tests specified herein. Water penetration, in this Specification, is defined as the appearance of uncontrolled water on the indoor face of any part of the work. "Controlled" water or condensation is that which is demonstrably drained harmlessly to the exterior of the work by means of a suitable weep system without endangering or wetting adjacent surfaces or insulation, not visible in the final construction, and designed to minimize streaking of the exterior. This definition takes precedence over any definition in standards referenced in these Specifications.
1. ASTM E-331: at a positive pressure differential of 12 lbf/sq. ft. with no uncontrolled water penetration. (Before first water tests are conducted, the test specimen shall be subjected

- to a positive and negative pressure differential equal to 50% of the full positive and negative design load for a period of ten (10) seconds.)
2. AAMA Standard 501.1: at a positive dynamic pressure differential of 12 lbf/sq. ft. with no uncontrolled water penetration.
- F. Dimensional Tolerances: Provide glazed aluminum curtain wall systems that accommodate dimensional construction tolerances of building frame and other adjacent construction.
- G. Condensation Resistance: Provide glazed aluminum curtain wall systems that are free of excessive condensation on the indoor face of the work, both where the heating and ventilation system is functioning or is out of operation under the following winter conditions:
1. Indoor ambient winter temperature of 72 degrees F(22 deg C); and a relative humidity of 35%.
 2. "Excessive condensation" is defined as water, ice or frost on more than 5% of any surface other than an exterior surface of any module or component of the wall, or the accumulation of uncontrolled flow of water and condensation visible in the final construction.
- H. Thermal Performance: Provide glazed aluminum curtain wall system that, as a part of the overall building envelope, complies with the requirements of the NJUCC.
- I. Life-Cycle Testing: Test according to AAMA 910 and comply with AAMA/NWWDA 101/I.S.2.

1.4 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of product indicated.
- B. Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication and assembly of glazed aluminum curtain wall systems. Clearly indicate materials, methods, and coordination with other trades.
- C. Thermal Modeling: Computer generated thermal modeling demonstrating compliance with specified performance requirements.
- D. Product Test Reports: as specified under "Laboratory Mock-Up Test Reports."
- E. Calculations: Submit calculations proving glazed aluminum curtain wall systems performance and compliance with specified loads signed and sealed by a licensed Professional Engineer registered in the State of New Jersey. For members subject to thermal movement, prepare thermal calculations to indicate the amount of anticipated movement when subjected to the maximum temperature design range. Include copies of shop drawings indicating the location and configuration for each member, connection, anchor, etc.; labeling the magnitude and direction for each load that is imposed onto the primary building structure. For members subject to thermal movement identify the amount required and indicate how the movement is accounted for in the detailing.
- F. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
- G. Fabrication Sample: Of each vertical-to-horizontal intersection of systems, made from 12-inch(300-mm) lengths of full-size components and showing details of the following:
1. Joinery.
 2. Anchorage.
 3. Expansion provisions.

4. Glazing.
5. Flashing and drainage.
6. Hardware: Full-size units with factory-applied finish.
7. Weather Stripping: 12-inch- (300-mm-) long sections.

- H. Welding certificates.
- I. Qualification Data: For Installer and testing agency.
- J. Preconstruction Testing Program: Developed specifically for Project.
- K. Preconstruction Test Reports: For glazed aluminum curtain wall systems.
- L. Field quality-control test reports.
- M. Warranties: Special warranties/guarantees specified in this Section.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Capable of assuming engineering responsibility and performing Work of this Section and who is acceptable to manufacturer.
 1. Curtain Wall Engineering Responsibility: Engage a qualified Specialty Structural Engineer, licensed to practice in the State of New Jersey, to prepare design calculations, Shop Drawings, and other structural data.
 - a. Specialty structural engineer shall demonstrate experience in the design of similar glazed aluminum curtain wall systems.
 - b. Shop Drawings, Project-specific preconstruction-testing program development, and comprehensive engineering analysis by a qualified professional engineer.
- B. Testing Agency Qualifications: An independent agency qualified according to ASTM E 699 for testing indicated.
- C. Product Options: Information on Drawings and in Specifications establishes requirements for systems' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.
 1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.
- D. Preconstruction Testing Service: Engage a qualified independent testing agency to test glazed aluminum curtain wall systems for compliance with specified requirements for performance and test methods. Provide test specimens and assemblies representative of proposed materials and construction.
 1. Select sizes and configurations of assemblies to adequately demonstrate capability of glazed aluminum curtain wall systems to comply with performance requirements and according to AAMA 501 recommendations.
- E. Welding: Qualify procedures and personnel according to AWS D1.2, "Structural Welding Code-Aluminum."
- F. Visual Mockups: Build mockups to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockup of typical wall area as shown on Drawings.
2. **Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.**
3. **Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing**
4. **Testing shall be performed on mockups according to requirements in "Field Quality Control" Article.**

- G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to glazed aluminum curtain wall systems including, but not limited to, the following:
1. Review structural load limitations.
 2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 3. Review required testing, inspecting, and certifying procedures.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of structural supports for glazed aluminum curtain wall systems by field measurements before fabrication and indicate measurements on Shop Drawings.
1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating glazed aluminum curtain wall systems without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.7 WARRANTY/GUARANTEE

- A. Unless stated otherwise in these specifications, guarantee shall state that the work is in accord with drawings and specifications, as amended by any changes thereto authorized by the Architect, free from defects in materials and workmanship and weathertight for a period of five (5) years (twenty (20) years for finish) from the date of acceptance of the work by the Owner. Contractor shall agree to repair or replace defective materials and workmanship to "like new condition", including such exploratory work, required to determine the cause, during the guarantee period, at no additional cost to the Owner. The Contractor shall include with his proposal, copy(s) of proposed warranty(s).
- B. Guarantee glass against breakage due to defects in glass materials, fabrication of insulating units, and/or installation for a period of five (5) years after acceptance of the work by the Owner. Contractor shall include with his proposal drawings copy of proposed warranty(s).
1. Refer to Division 8 "Glazing" section for additional warranty requirements.
- C. In addition to Contractor's guarantee, the paint finish manufacturer shall guarantee the finish for a period of twenty (20) year against defects, including full labor and material costs. Contractor shall include with his proposal, copy of warranty from proposed paint finish manufacturer. Warranty does not include normal weathering.
- D. In addition to Contractor's guarantee, the silicone sealants shall carry a twenty (20) year warranty from the sealant manufacturer against adhesive or cohesive failure and staining in a form acceptable to the Owner. Warranty shall cover full labor and material replacements. Contractor shall include with his proposal, copy of proposed warranty.

- E. The Contractor shall be responsible for damage to the building and furnishings occasioned by defective materials or workmanship or damage as part of repairs to the wall.
- F. The guarantee, the enforcement or lack of enforcement thereof, shall not deprive the Owner of other actions, rights or remedies available to him. Guarantee shall be in form approved by the Owner. Guarantee does not cover damage resulting from vandalism or acts of nature exceeding specified performance criteria.
- G. Defective materials and workmanship is hereby defined to include, but not be limited to, evidence of:
 - 1. Penetration of uncontrolled water into the building.
 - 2. Air infiltration exceeding specified limits.
 - 3. Structural failure of components resulting from forces within specified limits.
 - 4. Noise or vibration caused by thermal movements.
 - 5. Cracking, crazing, flaking, discoloration of coatings on glass.
 - 6. Glass breakage.
 - 7. Secondary glass damage and/or damage due to falling components of the work of this Contract.
 - 8. Discoloration, fading, chalking, excessive non-uniformity, pitting, cracking, peeling, corrosion, or crazing of finish.
 - 9. Failure of touch-up finish to match factory finish.
 - 10. Adhesive or cohesive failure of sealants.
 - 11. Crazing on surface of sealant.
 - 12. Non-structural sealant hardening beyond Shore A durometer 50 or softening below 20.
 - 13. Failure to fulfill other specified performance requirements.
 - 14. Failure of operating parts to function normally.
- H. The terms below used in conjunction with finish Guarantee are defined as follows:
 - 1. "Excessive fading": means a change in appearance that is perceptible and objectionable as determined by the Architect when viewed visually in comparison with the original color range standards.
 - 2. "Excessive non-uniformity": means non-uniform fading during the period of the guarantee to the extent that adjacent parts have a color difference greater than the original acceptable color range.
 - 3. "Will not pit or otherwise corrode": means there shall be no pitting or other type of corrosion of finish discernible from a distance of ten (10) feet, resulting from the natural elements in the atmosphere at the project site.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: The design for glazed aluminum curtain wall systems is based on 1600 System 2. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
 - 1. EFCO Corporation.
 - 2. Kawneer
 - 3. Vistawall Architectural Products.
 - 4. Wausau Window and Wall Systems.

2.2 FRAMING SYSTEMS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - 1. Sheet and Plate: ASTM B 209 (ASTM B 209M).
 - 2. Extruded Bars, Rods, Shapes, and Tubes: ASTM B 221 (ASTM B 221M).
 - 3. Extruded Structural Pipe and Tubes: ASTM B 429.
 - 4. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.
- B. Steel Reinforcement: With manufacturer's standard corrosion-resistant primer complying with SSPC-PS Guide No. 12.00 applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.
 - 1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
 - 2. Cold-Rolled Sheet and Strip: ASTM A 611.
 - 3. Hot-Rolled Sheet and Strip: ASTM A 570/A 570M.
- C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
- D. Fasteners and Accessories: Stainless steel fasteners and accessories.
 - 1. Where fasteners are subject to loosening or turn out from thermal and structural movements, wind loads, or vibration, use approved self-locking devices.
 - 2. Reinforce members as required to receive fastener threads.
 - 3. Use exposed fasteners (where approved) with countersunk Phillips screw heads.
 - 4. Finish exposed portions to match framing system.
 - 5. At movement joints, use slip-joint linings, spacers, and sleeves of material and type recommended by manufacturer.
- E. Anchors: Three-way adjustable anchors that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.
 - 1. Concrete Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.
- F. Concealed Flashing: Dead-soft, 0.018-inch-(0.457-mm-) thick stainless steel, ASTM A 240/A 240M of type recommended by manufacturer.
- G. Framing Gaskets: Of neoprene, EPDM, or silicone, of configuration as recommended by manufacturer for joint type.
- H. Glazing gaskets and vapor barriers: EPDM elastomeric extrusions of profiles specifically designed for framing system and capable of being removed and replaced.
- I. Framing Sealants: As recommended by manufacturer for joint type.
- J. Thermal insulation: High density plastic "Isolator" thermally breaking pressure plate from mullion.

2.3 COMPONENTS

- A. Vertical and horizontal mullion profiles:
 - 1. Profile: Extruded aluminum rectangle box with flanges to receive pressure plate and glazing gaskets.

2. Face width: 2 1/2 inches.
 3. Depth: As specified by manufacturer to meet structural requirements.
- B. Structural reinforcement: Insert profiles fixed inside mullion and/or transom profiles to meet structural requirement.
1. Aluminum inset profile.
 2. Steel insert profile.
- C. Glass and glazing: Shall be "dry – set", secured to framing without adhesives.
1. Glazing: Refer to Section 08800 "Glazing".
 2. Insulating glass spacer: Shall be extruded aluminum dessicant filled u-channel spacer to accept glazing clip.
 - a. Corner construction: verticals are notched (20.8 mm)[13/16 inch] to accept angle anchors.
 - b. Adhesives: Primary seal: Butyl. Secondary seal: Silicone-based load-bearing adhesive.
 - c. Glazing clip: Mechanically fastens glazing to curtain wall profiles via glazing spacer.
- D. Door frames: Fabricate tubular and channel frame assemblies, as indicated, with welded or mechanical joints in accordance with manufacturers' standards; reinforce as necessary to support required loads.
1. Provide 10 inch high bottom rail to comply with accessibility code.

2.4 GLAZING SYSTEMS

- A. Glazing: As specified in Division 8 Section "Glazing."

2.5 DOORS

- A. Frames and Door Panels: Fabricated from aluminum extrusions complying with AAMA/WDMA/CSA 101/I.S.2/A440.
1. Thermally Improved Construction: Fabricate frames and door panels with an integral, concealed, low-conductance thermal barrier located between exterior and interior surfaces in a manner that eliminates direct metal-to-metal contact.
- B. Threshold: Provide extruded-aluminum threshold of thickness, dimensions, and profile indicated; designed to comply with performance requirements indicated and to drain to the exterior; with manufacturer's standard finish.
1. Low-Profile Threshold: ADA-ABA compliant.

2.6 ACCESSORIES

- A. Pressure plate: Secures glazing to framing members using A2 stainless steel screws.
1. PVC-U extrusion.
- B. Cover Cap:
1. Aluminum extrusion: As selected from manufacturer's full range.
 2. Finish: Natural Anodized Finish.
 3. Attachment: Snap-on.

- C. Isolator: Standard 13/16 inch [21 mm] high density pvc extrusion continuously fitted into mullions and transoms.
 - 1. High density pvc extrusion with 4 applied high density foam “legs” that eliminate convection within the glazing cavity.
- D. Glazing Deflector block: Inserted into mullion profile for vapor pressure equalization at least every 26 feet [8 m].
- E. Gaskets: EPDM extrusions specific to specified system:
 - 1. Glazing rebate gaskets: Internal sealing, and as glazing gasket for straight curtain wall. Mullion 1/2 inch [13 mm] thick.
 - 2. Glazing gasket: External sealing for vertical curtain walls with pressure plates.
 - 3. Gasket corners: One-piece molded gasket corners for internally sealing, and as glazing gasket for straight curtain wall designs.
 - 4. Molded gasket intersections: External sealing of cruciform joints in combination with glazing gaskets.
 - 5. Deflector block gasket: silicone extrusion creating a ventilated channel above glazing deflector block.
 - 6. U-shaped joint seal: silicone extrusion external seal [13/16 inches][20 mm] wide.
- F. Glazing support: plastic supports for transferring load to profiles. Used in conjunction with glazing bridge.
 - 1. Standard: maximum weight [115 pounds per foot][1.85 kN].
 - 2. Increased load: maximum weight [764 pounds per foot][3.40 kN].
 - 3. Large loads: maximum weight [1348 pounds per foot][6.00 kN].
- G. Connector profiles: connection of transom to mullion:
 - 1. T-cleats: As recommended by manufacturer.
- H. Anchorage: Connections to building structure.
 - 1. Fold-out:
 - 2. Bolted.
 - 3. Clip-in.

2.7 ACCESSORY MATERIALS

- A. Insulating Materials: Specified in Division 7 Section "Building Insulation."
- B. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil(0.762-mm) thickness per coat.

2.8 FABRICATION

- A. Field verify dimensions prior to fabricating components for aluminum framed glazed assembly.
- B. Fabricate framing to designs indicated on drawings and to meet performance requirements specified.
- C. Mullion - transom fabrication: Fabricate in accordance with manufacturers fabrication manual:
 - 1. Shall have “notched” and “overlapping” transoms creating up to three drainage levels.
 - 2. Glazing gaskets shall be in one plane, using molded one-piece corners.
 - 3. Molded “cruciform” gaskets shall be inserted into “isolator” profiles to seal intersections.

- D. Provide for thermal expansion and contraction.
 - E. Thermal Break: Plastic "isolator" profile shall be inserted into mullion and transom profiles and shall accommodate for shear forces.
 - F. Drainage and ventilation: Framing system shall be fully ventilated, drained, and pressure equalized.
 - 1. Condensation shall be drained downward from higher transom levels to lower mullion levels to the exterior in a controlled manor via "drainage channels" and deflector blocks.
 - 2. Condensation shall be drained out beyond the pressure plates at least every 26 feet [8m] and top and bottom of framing system via self-locating "deflector blocks" at intersections.
 - 3. System shall be fully ventilated to equalize air pressure through use of "deflector blocks" and openings in transoms, gaskets, and pressure plates.
 - 4.
 - 5.
 - G. Glazing: Dry set factory glazing as specified in section 08800 "Glazing".
 - H. Fabricate aluminum shapes before finishing.
 - I. Fabricate components that, when assembled, have the following characteristics:
 - 1. Sharp profiles, straight and free of defects or deformations.
 - 2. Accurately fitted joints with ends coped or mitered.
 - 3. Internal guttering systems or other means to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.
 - 4. Physical and thermal isolation of glazing from framing members.
 - 5. Accommodations for thermal and mechanical movements of glazing and framing to prevent glazing-to-glazing contact and to maintain required glazing edge clearances.
 - 6. Provisions for reglazing from exterior.
 - J. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
 - K. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.
 - L. Mortise hardware reinforcement for doors and frames shall be stainless steel plates or tubes, minimum thickness of 7 gage or 3/16".
 - M. Conceal fasteners wherever possible.
 - N. Provide compression weatherstripping against fixed stops; at other edges, provide sliding weatherstripping retained in adjustable strip mortised into door edge.
- 2.9 ALUMINUM FINISHES
- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
 - B. Preparation: Prior to finishing, ensure exposed aluminum surfaces are free of scratches and other serious blemishes.
 - C. Factory applied aluminum finishes:

1. Class I, Natural Anodized Finish: AA- M10C12C22A41, non-specular as fabricated mechanical finish, chemical etch, medium matte, 0.7 (0.018 mm) mil min. thick anodic coating.
 2. Interior Finish Option: At Contractor's option, furnish PPP "Duracron" finish conforming to AAMA 2603, on interior only exposed metal surfaces. This alternative finish may not be used on surfaces that are a substrate for structural silicone glazing.
- D. Fasteners and concealed items: Non-corrosive type of finish.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General:
1. Comply with manufacturer's written instructions.
 2. Do not install damaged components.
 3. Fit joints to produce hairline joints free of burrs and distortion.
 4. Rigidly secure nonmovement joints.
 5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
 6. Weld components in concealed locations to minimize distortion or discoloration of finish. Protect glazing surfaces from welding.
 7. Seal joints watertight, unless otherwise indicated.
- B. Metal Protection:
1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape or installing nonconductive spacers as recommended by manufacturer for this purpose.
 2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint, or two (2) coats of zinc rich primer in differing colors.
- C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.
- D. Install components plumb and true in alignment with established lines and grades.
- E. Install glazing as specified Division 8 Section "Glazing."
- F. Install sealants as specified in Division 7 Section "Joint Sealants."
- G. Install doors plumb, level, square, true to line, and without warp or rack.
- H. Anchor frames securely in place.

- I. Set thresholds in bed of mastic and backseal.
- J. Install exterior doors to be weathertight in closed position.
- K. Install insulation and perimeter fire-containment systems (safing insulation) as specified in Division 7 Section "Fire-Resistive Joint Systems."
- L. Erection Tolerances: Install glazed aluminum curtain wall systems to comply with the following maximum tolerances:
 - 1. Plumb: 1/8 inch in 10 feet(3 mm in 3 m); 1/4 inch in 40 feet(6 mm in 12 m).
 - 2. Level: 1/8 inch in 20 feet(3 mm in 6 m); 1/4 inch in 40 feet(6 mm in 12 m).
 - 3. Alignment:
 - a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch(13 mm) wide, limit offset from true alignment to 1/32 inch(0.8 mm).
 - b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch(13 to 25 mm) wide, limit offset from true alignment to 1/16 inch(1.6 mm).
 - c. Where surfaces are separated by reveal or protruding element of 1 inch(25 mm) wide or greater, limit offset from true alignment to 1/8 inch(3.2 mm).
 - d. Limit offsets within glazing rabbet to 1/32 inch(0.8 mm).
 - 4. Location: Limit variation from plane to 1/8 inch in 12 feet(3 mm in 3.7 m); 1/2 inch(12.7 mm) over total length.
- M. Repair minor damages to finish in accordance with manufacturer's instructions and as approved by Architect.
- N. Remove and replace damaged components that cannot be successfully repaired as determined by Architect.

3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Testing Services: Testing and inspecting of representative areas to determine compliance of installed system with specified requirements shall take place as follows and in successive stages as indicated on Drawings. Do not proceed with installation of the next area until test results for previously completed areas show compliance with requirements.
 - 1. Water Spray Test: After the installation of minimum area of 15-feet-(23-m-) by-2-story glazed aluminum curtain wall system has been completed but before installation of interior finishes has begun, a 2-bay area of system designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.
- C. Repair or remove work where test results and inspections indicate that it does not comply with specified requirements.
- D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.4 ADJUSTING AND CLEANING

- A. Remove excess sealant by moderate use of mineral spirits or other solvent acceptable to sealant manufacturer.

- B. Exercise care in removing mortar, cementitious materials, and sand from glass and frames. Do not wipe surfaces in order to avoid scratching.
- C. Wash exposed surfaces with solution of mild detergent applied with soft cloth. Take care to remove dirt from corners. Wipe surfaces clean.
- D. Adjust doors, hinges, and locksets for smooth operation without binding.
- E. Clean doors promptly after installation in accordance with manufacturer's instructions. Do not use harsh cleaning materials or methods that would damage finish.

3.5 PROTECTION

- A. Protect installed doors to ensure that, except for normal weathering, doors will be without damage or deterioration at time of final completion.

END OF SECTION 084413

SECTION 087100 – DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes:
 - 1. Mechanical (and electrified) door hardware for the following:
 - a. Swinging doors.
 - 2. Field verification, preparation and modification of existing doors and frames to receive new door hardware.
 - 3. Lead-lining door hardware items required for radiation protection at door openings.
- B. Exclusions: Hardware for the following is not provided under the scope of this section, unless specifically listed in the hardware sets:
 - 1. Windows
 - 2. Cabinets (casework), including locks in cabinets
 - 3. Signage
 - 4. Toilet accessories
 - 5. Overhead doors
- C. Related Sections:
 - 1. Division 01 Section "Alternates" for alternates affecting the work of this section.
 - 2. Division 07 Section "Joint Sealants" for sealant requirements applicable to threshold installation under the work of this section.
 - 3. Division 09 Sections for touchup finishing or refinishing of existing openings modified by the work of this section.

1.3 REFERENCES

- A. Applicable state and local building codes and standards.
- B. Fire/Life Safety
 - 1. NFPA - National Fire Protection Association
 - a. NFPA 70 – National Electric Code
 - b. NFPA 80 - Standard for Fire Doors and Fire Windows

- c. NFPA 101 - Life Safety Code
 - d. NFPA 105 - Smoke and Draft Control Door Assemblies
- 2. State and/or City Fire Safety Code
- C. UL - Underwriters Laboratories
 - 1. UL 10B - Fire Test of Door Assemblies
 - 2. UL 10C - Positive Pressure Test of Fire Door Assemblies
 - 3. UL 1784 - Air Leakage Tests of Door Assemblies
 - 4. UL 305 - Panic Hardware
- D. Accessibility
 - 1. ADA - Americans with Disabilities Act.
 - 2. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
- E. DHI - Door and Hardware Institute
 - 1. Sequence and Format for the Hardware Schedule
 - 2. Recommended Locations for Builders Hardware
- F. ANSI - American National Standards Institute
 - 1. ANSI/BHMA A156.1 - A156.29, and ANSI A156.31 - Standards for Hardware and Specialties

1.4 SUBMITTALS

- A. General:
 - 1. Submit the following in accordance with Conditions of Contract and Division 01 requirements.
 - 2. Advise Architect within the submittal package of incompatibility or issues which may detrimentally affect the work of this section.
 - 3. Prior to Forwarding Submittal: Comply with procedures for verifying existing door and frame compatibility for new hardware, as specified in PART 3, "EXAMINATION" article, herein.
- B. Action Submittals:
 - 1. Product Data: Product data including manufacturers' technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
 - 2. Riser and Wiring Diagrams: After final approval of the hardware schedule, submit details of electrified door hardware, indicating the following:
 - a. Wiring Diagrams: For power, signal, and control wiring and including the following:
 - 1) Details of interface of electrified door hardware and building safety and security systems.
 - 2) Schematic diagram of systems that interface with electrified door hardware.
 - 3) Point-to-point wiring.
 - 4) Risers.

3. Samples for Verification: If requested by the Architect, submit production sample or sample installations as requested of each type of exposed hardware unit in the finish indicated, and tagged with a full description for coordination with the schedule.
 - a. Samples will be returned to the supplier in like-new condition. Units that are acceptable to the Architect may, after final check of operations, be incorporated into the Work, within limitations of key coordination requirements.
4. Door Hardware Schedule: Submit schedule with hardware sets in vertical format as illustrated by the Sequence of Format for the Hardware Schedule as published by the Door and Hardware Institute. Indicate complete designations of each item required for each door or opening, Include the following information:
 - a. Door Index; include door number, heading number, and Architects hardware set number.
 - b. Opening Lock Function Spreadsheet; list locking device and function for each opening.
 - c. Type, style, function, size, and finish of each hardware item.
 - d. Name and manufacturer of each item.
 - e. Fastenings and other pertinent information.
 - f. Location of each hardware set cross-referenced to indications on Drawings.
 - g. Explanation of all abbreviations, symbols, and codes contained in schedule.
 - h. Mounting locations for hardware.
 - i. Door and frame sizes and materials.
 - j. Name and phone number for the local manufacturer's representative for each product.
 - k. Operational Description of openings with any electrified hardware (locks, exits, electromagnetic locks, electric strikes, automatic operators, door position switches, magnetic holders or closer/holder units, and/or access control components). Operational description should include how the door will operate on egress, ingress, and fire/smoke alarm connection.
 - 1) Submittal Sequence: Submit door hardware schedule concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate the fabrication of other work that is critical in Project construction schedule.

Key Schedule:

- l. After a keying meeting between representatives of the Owner, Architect, hardware supplier—provide a keying schedule listing the levels of keying as well as an explanation of the key system's function, the key symbols used and the door numbers controlled.
- m. Utilize ANSI A156.28 "Recommended Practices for Keying Systems" as a guideline for nomenclature, definitions, and approach for selecting the optimal keying system.
- n. Provide 3 copies of keying schedule for review prepared and detailed in accordance with referenced DHI publication. Include schematic keying diagram and index each key to unique door designations.
- o. Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions.
- p. Provide one complete bitting list of key cuts and one key system schematic illustrating system usage and expansion.

- 1) Forward bitting list, key cuts and key system schematic directly to Owner, by means as directed by Owner.
 - q. Prepare key schedule by or under supervision of supplier, detailing Owner's final keying instructions for locks.
5. Templates: After final approval of the hardware schedule, provide templates for doors, frames and other work specified to be factory prepared for the installation of door hardware.
- C. Informational Submittals:
1. Qualification Data: For Supplier, Installer and Architectural Hardware Consultant.
 2. Product Certificates for electrified door hardware, signed by the manufacturer:
 - a. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.
 3. Certificates of Compliance:
 - a. Upon request of Architect or Authority Having Jurisdiction certificates of compliance for fire-rated hardware and installation instructions shall be made available.
 4. Product Test Reports: For compliance with accessibility requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for door hardware on doors located in accessible routes.
 5. Warranty: Special warranty specified in this Section.
- D. Closeout Submittals:
1. Operations and Maintenance Data : Provide in accordance with Division 01 and include the following:
 - a. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
 - b. Catalog pages for each product.
 - c. Name, address, and phone number of local representative for each manufacturer.
 - d. Parts list for each product.
 - e. Copy of final approved hardware schedule, edited to reflect conditions as-installed.
 - f. Copy of final keying schedule.
 - g. As-installed wiring diagrams for each opening connected to power, both low voltage and 110 volts.
 - h. Copy of warranties including appropriate reference numbers for manufacturers to identify the project.

1.5 QUALITY ASSURANCE

- A. Product Substitutions: For the purpose of performing the work of this section, comply with product requirements stated in Division 01 and as specified herein.
1. Where a specific manufacturer's product is named and accompanied by the words "No Substitute," including make or model number or other designation, provide the product

exactly as specified. (Note: Certain products have been selected for their unique characteristics and particular project suitability.)

- B. Supplier Qualifications and Responsibilities: A recognized architectural hardware supplier that has a record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this Project and that provides a certified Architectural Hardware Consultant (AHC) available to the Owner, Architect, and Contractor, at reasonable times during the course of the Work for consultation.
1. Warehousing Facilities: In Project's vicinity.
 2. Scheduling Responsibility: Preparation of door hardware and keying schedules.
 3. Engineering Responsibility: Preparation of data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
 4. Coordination Responsibility: Coordinate installation of the electronic security hardware with the Architect and electrical engineers and provide installation and technical data to the Architect and other related subcontractors.
 - a. Upon completion of electronic security hardware installation, inspect and verify that all components are working properly.
- C. Installer Qualifications: Qualified tradesmen, skilled in the application of commercial grade hardware that has a record of successful in-service performance for installing door hardware similar in quantity, type, and quality to that indicated for this Project.
- D. Architectural Hardware Consultant Qualifications: A person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and who can meet the following qualification requirements:
1. For door hardware, DHI-certified, Architectural Hardware Consultant (AHC).
 2. Can provide installation and technical data to the Architect and other related subcontractors.
 3. Can inspect and verify components are in working order upon completion of installation.
 4. Capable of producing wiring diagrams.
 5. Capable of coordinating installation of the electrified hardware with the Architect and electrical engineers.
- E. Single Source Responsibility: Obtain each type of door hardware from a single manufacturer.
1. Provide electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated.
 2. Manufacturers that perform electrical modifications and that are listed by a testing and inspecting agency acceptable to authorities having jurisdiction are acceptable.
- F. Fire-Rated Door Openings: Provide door hardware for fire-rated openings that complies with NFPA 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and are identical to products tested by Underwriters Laboratories, Intertek Testing Services, or other testing and inspecting organizations acceptable to the authorities having jurisdiction for use on types and sizes of doors indicated, based on testing at positive pressure and according to NFPA 252 or UL 10C and in compliance with requirements of fire-rated door and door frame labels.

- G. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
1. Air Leakage Rate: Maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at the tested pressure differential of 0.3-inch wg (75 Pa) of water.
- H. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.
- I. Means of Egress Doors: Latches do not require more than 15 lbf (67 N) to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.
- J. Accessibility Requirements: For door hardware on doors in an accessible route, comply with governing accessibility regulations cited in "REFERENCES" article, herein.
1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf (22.2 N).
 2. Comply with the following maximum opening-force requirements:
 - a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf (22.2 N) applied perpendicular to door.
 - b. Sliding or Folding Doors: 5 lbf (22.2 N) applied parallel to door at latch.
 - c. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
 3. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch (13 mm) high [and] [3/4 inch (19 mm) high for exterior sliding doors].
 4. Adjust door closer sweep periods so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches (75 mm) from the latch, measured to the leading edge of the door.
- K. Keying Conference: Conduct conference at Project site to comply with requirements in Division 01.
1. Attendees: Owner, Contractor, Architect, Installer, Supplier's Architectural Hardware Consultant.
 2. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including, but not limited to, the following:
 - a. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
 - b. Preliminary key system schematic diagram.
 - c. Requirements for key control system.
 - d. Requirements for access control.
 - e. Address for delivery of keys.
- L. Pre-installation Conference: Conduct conference at Project site.
1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 2. Inspect and discuss preparatory work performed by other trades.
 3. Review required testing, inspecting, and certifying procedures.
- M. Coordination Conferences:

1. Installation Coordination Conference: Prior to hardware installation, schedule and hold a meeting for the purpose of reviewing any questions or concerns related to the proper installation and adjustment of door hardware.
 - a. Attendees: doors hardware supplier, door hardware installer, Contractor.
 - b. After the meeting, provide letter of compliance to the Architect, indicating when the meeting was held and who was in attendance.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site.
- B. Tag each item or package separately with identification coordinated with the final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.
 1. Each article of hardware shall be individually packaged in manufacturer's original packaging.
- C. Project Conditions:
 1. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.
 2. Provide secure lock-up for door hardware delivered to the Project, but not yet installed. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.
- D. Protection and Damage:
 1. Promptly replace products damaged during shipping with exactly the same products.
 2. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during the course of the Work.
 3. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent.
- E. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.
- F. Deliver keys (and permanent cores) to Owner by registered mail or overnight package service.

1.7 COORDINATION

- A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete. Concrete, reinforcement, and formwork requirements are specified in Division 03.
- B. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

- C. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.
- D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.
- E. Existing Openings: Where hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operation.
- F. Direct shipments not permitted, unless approved by the Contractor.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Years from date of Substantial Completion, for durations indicated.
 - a. Closers:
 - 1) Mechanical: 10 years.
 - 2) Electrified: 2 years.
 - b. Exit Devices:
 - 1) Mechanical: 3 years.
 - 2) Electrified: 1 year.
 - c. Locksets:
 - 1) Mechanical: 3 years.
 - 2) Electrified: 1 year.
 - d. Continuous Hinges: Lifetime warranty
 - e. Key Blanks: Lifetime
 - 2. Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.

1.9 MAINTENANCE

- A. Maintenance Tools:
 - 1. Furnish One (1) complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. The Awarding Authority has determined that certain products will be selected for their unique characteristics and particular project suitability to insure continuity of existing and future performance and maintenance standards. After investigating available product offerings the Awarding Authority has elected to prepare proprietary specifications. These products are specified with the notation: "No Substitute."
- B. Approval of manufacturers other than those listed shall be in accordance with QUALITY ASSURANCE article, herein.

Item	Scheduled Manufacturer
Hinges	Ives (IVE)
Continuous	Ives (IVE)
Locksets & Deadlocks	Schlage (SCH)
Cylinders	Schlage (SCH)
Door Closers	LCN (LCN)
Overhead Stops	Glynn Johnson (GLY)
Door Trim	Ives (IVE)
Stops & Holders	Ives (IVE)
Silencers	Ives (IVE)
Weather Seals	Zero (ZER)
Key Cabinets	Telkee (TEL)

- C. Hand of Door: Drawings show direction of slide, swing, or hand of each door leaf. Furnish each item of hardware for proper installation and operation of door movement as shown.
- D. Where the hardware specified is not adaptable to the finished shape or size of the members requiring hardware, furnish suitable types having the same operation and quality as the type specified, subject to the Architect's approval.

2.2 MATERIALS

- A. Fasteners
 - 1. Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation.
 - 2. Furnish screws for installation with each hardware item. Finish exposed (exposed under any condition) screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work as closely as possible including "prepared for paint" surfaces to receive painted finish.
 - 3. Provide concealed fasteners for hardware units that are exposed when door is closed except to the extent that no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work unless their use is the only means of reinforcing the work adequately to fasten the hardware securely. Review door specification and advise Architect if thru-bolts are required.
 - 4. Hardware shall be installed with the fasteners provided by the hardware manufacturer.

- B. Modification and Preparation of Existing Doors: Provide necessary fillers, Dutchmen, reinforcements, and fasteners, compatible with existing materials, as required for mounting new opening hardware and to cover existing door and frame preparations.
 - 1. When possible, use materials which match materials of adjacent modified areas.
 - 2. When modifying existing fire-rated openings, provide materials permitted by NFPA 80 as required to maintain fire-rating.
- C. Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation.
 - 1. Where fasteners are exposed to view: Finish to match adjacent door hardware material.

2.3 CONTINUOUS HINGES

- A. Stainless Steel
 - 1. Manufacturers:
 - a. Scheduled Manufacturer: Ives
 - 2. Requirements:
 - a. Provide pin and barrel continuous hinges conforming to ANSI A156.26, Grade 2.
 - b. Provide pin and barrel continuous hinges, where specified in the hardware sets, fabricated from 14 gauge, type 304 stainless steel.
 - c. Provide twin self-lubricated nylon bearings at each hinge knuckle, with .25 inch diameter stainless steel pin.
 - d. Hinges shall be capable of supporting door weights up to 600 pounds, and shall be successfully tested for 1,500,000 cycles.
 - e. Provide pin and barrel continuous hinges with electrified option where specified. Provide with sufficient number and gage of concealed wires to accommodate electric function of specified hardware.
 - f. Install hinges with fasteners supplied by manufacturer. Hole pattern shall be symmetrically patterned.

2.4 HINGES

- A. Provide five-knuckle, ball bearing hinges of type, material, and height as outlined in the following guide for this specification:
 - 1. Manufacturers:
 - a. Scheduled Manufacturer: Ives No Substitution.
- B. Requirements:
 - 1. 1-3/4 inch thick doors, up to and including 36 inches wide:
 - a. Exterior: standard weight, bronze/stainless steel, 4-1/2 inches high
 - b. Interior: standard weight, steel, 4-1/2 inches high
 - 2. 1-3/4 inch thick doors over 36 inches wide:
 - a. Exterior: heavy weight, bronze/stainless steel, 5 inches high
 - b. Interior: heavy weight, steel, 5 inches high
 - 3. 2 inches or thicker doors:
 - a. Exterior: heavy weight, bronze/stainless steel, 5 inches high
 - b. Interior: heavy weight, steel, 5 inches high
 - 4. Provide three hinges per door leaf for doors 90 inches or less in height, and one additional hinge for each 30 inches of additional door height.
 - 5. Where new hinges are specified for existing doors and/or existing frames, the new hinge size must be identical to hinge preparation present in the existing door and/or existing frame.
 - 6. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
 - a. Steel Hinges: Steel pins
 - b. Non-Ferrous Hinges: Stainless steel pins
 - c. Out-Swinging Exterior Doors: Non-removable pins
 - d. Out-Swinging Interior Lockable Doors: Non-removable pins
 - e. Interior Non-lockable Doors: Non-rising pins
 - 7. The width of hinges shall be 4-1/2 inches at 1-3/4 inch thick doors, and 5 inches at 2 inches or thicker doors. Adjust hinge width as required for door, frame, and/or wall conditions to allow proper degree of opening.
 - 8. Provide hinges with electrified option where specified. Provide with sufficient number and gage of concealed wires to accommodate electric function of specified hardware. Locate electric hinge at second hinge from bottom or nearest to the electrified locking component.
 - 9. Provide mortar guard for each electrified hinge specified, unless specified in hollow metal frame specification.
 - 10. Provide spring hinges where specified. Provide two spring hinges and one bearing hinge per door leaf for doors 90 inches or less in height. Provide one additional bearing hinge for each 30 inches of additional door height.

2.5 MORTISE LOCKS

A. Manufacturer:

1. Scheduled Manufacturer: Schlage L9000 Series.

B. Requirements:

1. Provide mortise locks certified as ANSI A156.13, Grade 1 Operational, Grade 1 Security, and manufactured from heavy gauge steel, containing components of steel with a zinc dichromate plating for corrosion resistance. Lock case shall be multi-function and field reversible for handing without opening the case. Cylinders: Refer to "KEYING" article, herein.
2. Provide locks with a standard 2-3/4 inches backset with a full 3/4 inch throw stainless steel mechanical anti-friction latchbolt. Deadbolt shall be a full 1 inch throw, constructed of stainless steel.
3. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
4. Provide electrical options as scheduled. Provide electrified locksets with micro switch (RX) option that monitors the retractor crank, and is actuated when rotation of the inside or outside lever rotates the retractor hub. Provide normally closed contacts or normally open contacts as required by security system.
5. Lever trim shall be solid brass, bronze, or stainless steel, cast or forged in the design specified, with wrought roses and external lever spring cages. Levers shall be thru-bolted to assure proper alignment, and shall have a 2-piece spindle.
 - a. Lever design shall be as specified in hardware sets.
 - b. Lever trim on the secure side of doors serving rooms considered by the authority having jurisdiction to be hazardous shall have a tactile warning.

2.6 EXIT DEVICES

A. Manufacturers:

1. Scheduled Manufacturer: To establish a standard of quality and design desired, the exit device specifications have been based on the products of Von Duprin, Indianapolis, IN. Products of other manufacturers meeting or exceeding the design and performance requirements specified herein will be considered for substitution provided any request for substitution conforms to provisions of Division 01 Section "Product Requirements."

B. Requirements:

1. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1, and UL listed for Panic Exit and/or Fire Exit Hardware. Cylinders: Refer to "KEYING" article, herein.
2. Provide touchpad type exit devices, fabricated of brass, bronze, stainless steel, or aluminum, plated to the standard architectural finishes to match the balance of the door hardware.
3. Exit devices shall incorporate a fluid damper or other device that eliminates noise associated with exit device operation. Touchpad shall extend a minimum of one half of the door width, but not the full length of the exit device rail. End-cap will have two-point attachment to door. Touch-pad shall match exit device finish, and shall be stainless steel for US26, US26D, US28, US32, and US32D finishes; for all other finishes, the touch-pad finish shall be of compatible finish to exit device. Only compression springs will be used in devices, latches, and outside trims or controls.

4. Exit devices to incorporate a deadlatching feature for security and/or for future addition of alarm kits and/or other electrical requirements.
5. Concealed vertical exit devices shall be a cable-actuated concealed vertical latch system available in two-point and less bottom latch (LBL) configurations. Vertical rods are not acceptable.
 - a. Cable shall include color-coded stainless steel with polytetrafluoroethylene (Teflon®) liner and stainless steel core wire. Latches and center slides are color coded to aid in installation. Conduit and core wire ends snap into latch and center slides without the use of tools. Latchbolts and blocking cams shall be manufactured from sintered metal low carbon copper- infiltrated steel, with a molybdenum disulfide coating for low friction and consistent performance.
 - b. Top latchbolt shall have a minimum 0.382 inch and greater than 90 degree engagement with strike to prevent door and frame separation under high static load. Bottom latchbolt, when used, shall have a minimum of 0.44 inch engagement with strike.
 - c. Product cycle life shall exceed 1,000,000 cycles.
 - d. Latch release does not require separate trigger mechanism.
 - e. Top and bottom latch must operate independently of each other. Top latch will fully engage top strike even when bottom latch is compromised.
 - f. Cable and latching system shall have the ability to:
 - 1) Be assembled as a complete assembly and function prior to being installed in the door.
 - 2) Install into the door as a one-piece single assembly
 - 3) Be installed independently of device installation and function on door even prior to device and trim installation.
 - 4) Connect to the exit device at a single attachment point.
 - 5) Adjust bottom latch height from a single point, after the system is installed and connected to exit device, while the door is hanging
 - 6) Alter latch position up and down within two-inches without additional adjustment.
 - 7) Ability to remove the system while door is hanging.
 - 8) Configure latchbolt mounting: double or single tab mount for steel doors, and wood doors, face mount for aluminum doors, eliminating requirement of tabs.
 - 9) Provide adjustable exit device to latch center line adjustment. Ensures double tab mounting option for top latch, regardless of exit device centerline.
6. Provide exit devices with manufacturer's approved strikes.
7. Provide exit devices cut to door width and height. Locate exit devices at a height recommended by the exit device manufacturer, allowable by governing building codes, and approved by the Architect.
8. Mechanism case shall sit flush on the face of all flush doors, or spacers shall be furnished to fill gaps behind devices. Where glass trim or molding projects off the face of the door, provide glass bead kits.
9. Non-fire-rated exit devices shall have cylinder [hex key] dogging.
10. Removable mullions shall be a 2 inches x 3 inches steel tube. Where scheduled, mullion shall be of a type that can be removed by use of a keyed cylinder, which is self-locking when re-installed.
11. Where lever handles are specified as outside trim for exit devices, provide heavy-duty lever trims with forged or cast escutcheon plates. Provide vandal-resistant levers that will travel to a 90-degree down position when more than 35 pounds of torque are applied, and which can easily be re-set.
 - a. Lever style will match the lever style of the locksets.

- b. Lever trim on doors serving rooms considered by the authority having jurisdiction to be hazardous shall have a tactile warning.
- 12. Exit devices for fire rated openings shall be UL labeled fire exit hardware.
- 13. Field drill weep holes per manufacturer's recommendation for exit devices used in full exterior application, highly corrosive areas, and where noted in the hardware sets.
- 14. Provide electrical options as scheduled.

2.7 FINAL CYLINDERS AND KEYING

- A. Coordinate a meeting with the owner to determine the key requirements for the building. Key system to be factor master keyed Everest 29 to match existing key system.
- B. Final Cylinders to have the following;
 - 1. Core to have concealed key control stampings
 - 2. Final core to be installed by the owner's represented.
 - 3. Return all construction cores to the hardware supplier.
 - 4. Final biting list to be delivered to the owner no additional cost to the owner.
- C. Keys shall have the following;
 - 1. Material: Nickel silver; minimum thickness of .092-inch (2.3mm)
 - 2. Keys to be stamped with visual key control.
 - 3. Key bow to have stamped "DO NOT DUPLICATE".
 - 4. Quantity: Furnish in the following quantities.
 - a. Change (Day) Keys: 3 per cylinder/core.
 - b. Final Control Keys: 3.
 - c. Master Keys: 6.

2.8 DOOR CLOSERS

- A. Manufacturers:
 - 1. Scheduled Manufacturer: LCN 4010/4110 Series.
- B. Requirements:
 - 1. Provide door closers certified to ANSI/BHMA A156.4 Grade 1 requirements by a BHMA certified independent testing laboratory. Closers shall be ISO 9000 certified. Units shall be stamped with date of manufacture code.
 - 2. Door closers shall have fully hydraulic, full rack and pinion action with a high strength cast iron cylinder, and shall utilize full complement bearings at shaft. Cylinder body shall be 1-1/2 inch diameter, and double heat-treated pinion shall be 11/16 inch diameter.
 - 3. Provide hydraulic fluid requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F. Fluid shall be fireproof and shall pass the requirements of the UL10C "positive pressure" fire test.
 - 4. Spring power shall be continuously adjustable over the full range of closer sizes, and allow for reduced opening force as required by accessibility codes and standards. Hydraulic regulation shall be by tamper-proof, non-critical valves. Closers shall have separate adjustment for latch speed, general speed, and backcheck.

5. Provide closers with a solid forged steel main arms and factory assembled heavy-duty forged forearms for parallel arm closers.
6. Closers shall not incorporate Pressure Relief Valve (PRV) technology.
7. Closer cylinders, arms, adapter plates, and metal covers shall have a powder coating finish which has been certified to exceed 100 hours salt spray testing as described in ANSI Standard A156.4 and ASTM B117, or shall have special rust inhibitor (SRI).
8. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.
9. Mount closers on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Closers shall not be visible in corridors, lobbies and other public spaces unless approved by Architect.

2.9 PROTECTION PLATES

A. Manufacturers:

1. Scheduled Manufacturer: Ives.

B. Requirements:

1. Provide kick plates, mop plates, and armor plates minimum of 0.050 inch thick as scheduled. Furnish with machine or wood screws, finished to match plates. Sizes of plates shall be as follows:
 - a. Kick Plates – 8 inches high x 2 inches less width of door on single doors, 1 inch less width of door on pairs
 - b. Mop Plates – 8 inches high x 2 inches less width of door on single doors, 1 inch less width of door on pairs

2.10 DOOR STOPS AND HOLDERS

A. Manufacturers:

1. Scheduled Manufacturer: Ives.

Provide door stops for all doors in accordance with the following requirements:

2. Provide wall stops wherever possible. Provide convex type where mortise type locks are used and concave type where cylindrical type locks are used.
3. Where wall stops cannot be used, provide dome type floor stops of the proper height.
4. At any opening where a wall or floor stop cannot be used, a medium duty surface mounted overhead stop shall be used.

2.11 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, AND GASKETING

A. Manufacturers:

1. Scheduled Manufacturer: Zero.

B. Requirements:

1. Provide thresholds, weatherstripping (including door sweeps, seals, astragals) and gasketing systems (including smoke, sound, and light) as specified and per architectural details. Match finish of other items as closely as possible. Size of thresholds shall be as follows:
 - a. Saddle Thresholds – 1/2 inch high x jamb width x door width
 - b. Bumper Seal Thresholds – 1/2 inch high x 5 inches wide x door width
2. Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal strip is easily replaceable and readily available.

2.12 SILENCERS

A. Manufacturers:

1. Scheduled Manufacturer: Ives.

B. Requirements:

1. Provide "Push-in" type silencers for each hollow metal or wood frame. Provide three for each single frame and two for each pair frame. Omit where gasketing is specified or required by code.

2.13 FINISHES

- A. Finish of all hardware shall be as specified within the hardware sets.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Prior to installation of hardware, examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Existing Door and Frame Compatibility: Field verify existing doors and frames receiving new hardware and existing conditions receiving new openings. Verify that new hardware is compatible with the existing door and frame preparation and existing conditions.
- C. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

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

3.2 PREPARATION

- A. Where on-site modification of doors and frames is required, prepare hardware locations in accordance with the following:
1. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.
 2. Wood Doors: Comply with DHI WDHS.5 "Recommended Hardware Reinforcement Locations for Mineral Core Wood Flush Doors."
 3. Where doors are in rated assemblies, comply with NFPA 80 for restrictions on on-site door hardware preparation.
 4. Where on-site modification of existing doors and frames is required:
 - a. Remove existing hardware being replaced, tag, and store according to contract documents.
 - b. Field modify and prepare existing door and/or frame for new hardware being installed.
 - c. When modifications are exposed to view, use concealed fasteners, when possible.

3.3 INSTALLATION

- A. Mounting Heights: Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.
1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
 2. Custom Steel Doors and Frames: HMMA 831.
 3. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
- B. Install each hardware item in compliance with the manufacturer's instructions and recommendations, using only the fasteners provided by the manufacturer.
- C. Do not install surface mounted items until finishes have been completed on the substrate. Protect all installed hardware during painting.
- D. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
- E. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- F. Operating parts shall move freely and smoothly without binding, sticking, or excessive clearance.
- G. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches (750 mm) of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.

- H. Intermediate Offset Pivots: Where offset pivots are indicated, provide intermediate offset pivots in quantities indicated in door hardware schedule but not fewer than one intermediate offset pivot per door and one additional intermediate offset pivot for every 30 inches (750 mm) of door height greater than 90 inches (2286 mm).
- I. Lock Cylinders: Install construction cores to secure building and areas during construction period.
 - 1. Replace construction cores with permanent cores as indicated in keying section.
 - 2. Coordinate with owner for direction of the installation of permanent.
- J. Lead Protection: Lead wrap hardware penetrating lead-lined doors. Levers and roses to be lead lined. Apply kick and armor plates on lead-lined doors with adhesive as recommended by manufacturer.
- K. Wire (including low voltage): Coordinate with the following work, provided under the scope of Division 26, ELECTRICAL.
 - 1. Conduit, junction boxes and wire pulls.
 - 2. Connections to and from power supplies to electrified hardware.
 - 3. Connections to fire/smoke alarm system and smoke evacuation system.
 - 4. Connection of wire to door position switches and wire runs to central room or area, as directed by Architect.
 - 5. Testing and labeling wires with the Architect's opening number.
- L. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.
- M. Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings or in equipment room, or alternate location as directed by Architect.
 - 1. Configuration: Provide [one power supply for each door opening][least number of power supplies required to adequately serve doors] with electrified door hardware.
- N. Thresholds: Set thresholds scheduled herein, in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."
- O. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they may impede traffic or present a tripping hazard.
- P. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
- Q. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
- R. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

3.4 FIELD QUALITY CONTROL

- A. Architectural Hardware Consultant: Engage a qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports.

1. Architectural Hardware Consultant will inspect door hardware and state in each report whether installed work complies with or deviates from requirements, including whether door hardware is properly installed and adjusted.

3.5 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
 1. Spring Hinges: Adjust to achieve positive latching when door is allowed to close freely from an open position of 30 degrees.
 2. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
 3. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.
- B. Occupancy Adjustment: Approximately three [six] <Insert number> months after date of Substantial Completion, Installer's Architectural Hardware Consultant shall examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors, door hardware, and electrified door hardware.

3.6 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items as necessary to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

3.7 DEMONSTRATION

- A. Provide training for the Owner's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes. Refer to Division 01 Section "Demonstration and Training."

3.8 DOOR HARDWARE SCHEDULE

- A. Provide hardware for each door to comply with requirements of this section and the below-listed scheduled sets.
- B. It is intended that the following schedule includes complete items of door hardware necessary to complete the work. If a discrepancy is found in the scheduled hardware sets, such as a missing item, improper hardware for a frame, door or fire codes, provisions of the above-specifications shall govern.

C. Locksets, exit devices, and other hardware items are referenced in the following hardware sets for series, type and function. Refer to the above-specifications for special features, options, cylinders/keying, and other requirements.

D. Hardware Sets:

Hardware Group No. EG05

Provide each SGL door(s) with the following:

Qty	EA	Description	Catalog Number	Finish	Mfr
1	EA	CONT. HINGE	112HD EPT	628	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	ELEC PANIC HARDWARE	LX-QEL+-98-L-2SI-07-1439-CON	630	VON
2	EA	SFIC RIM HOUSING	80-129	626	SCH
3	EA	SFIC CONST. CORE	80-035		SCH
3	EA	SFIC EVEREST CORE	80-037	626	SCH
1	EA	SURF. AUTO OPERATOR	9542 MS	ANCLR	LCN
2	EA	ACTUATOR, JAMB MOUNT	8310-818 OUTSIDE	630	LCN
1	EA	FLUSH MOUNT BOX	8310-819F OUTSIDE	689	LCN
2	EA	ACTUATOR, WALL MOUNT	8310-855 @ VEST	630	LCN
1	EA	FLUSH MOUNT BOX	8310-867F @ VEST	689	LCN
1	EA	PERIM SEAL	BY ALUM DR MFG	GRY	B/O
1	EA	DOOR SWEEP	8193AA	A	ZER
1	EA	THRESHOLD	546A-MSLA-10	A	ZER
1	EA	DOOR CONTACT	679-05HM	BLK	SCE
1	EA	POWER SUPPLY	PS904 900-4R	LGR	VON
1	EA	WIRE HARNESS	CON-38P		SCH
1	EA	WIRE HARNESS	CON-6P		SCH

OPERATIONAL DESCRIPTION:

1. ALWAYS FREE EGRESS.

End Of Section

SECTION 08800 - GLAZING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
1. Doors.
 2. Glazed curtain walls.
 3. Glazed entrances.
 4. Storefront framing.
- B. Related Sections include the following:
1. Division 8 Section "Hollow Metal Doors and Frames" for borrowed lites.
 2. Division 8 Section "Fire Rated Glass and Framing Systems" for rated vision glass and assemblies.
 3. Division 8 Section "Aluminum Entrances and Storefronts."
 4. Division 8 Section "Glazed Aluminum Curtain Walls" including structural-sealant glazing and performance requirements.
 5. Division 10 Section "Toilet Accessories" for mirrors.

1.2 DEFINITIONS

- A. Manufacturers of Glass Products: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.
- C. Interspace: Space between lites of an insulating-glass unit that contains dehydrated air or a specified gas.
- D. Deterioration of Coated Glass: Defects developed from normal use and not to glass breakage and practices for maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in metallic coating.
- E. Deterioration of Insulating Glass: Failure of hermetic seal under normal use and not to glass breakage and practices for maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

- F. Spontaneous Disintegration of Heat Treated Glass: Developed from normal use due to nickel sulfide inclusions and not resulting from impact or practices for maintaining and cleaning heat treated glass contrary to manufacturer's written instructions.

1.3 PERFORMANCE REQUIREMENTS

- A. General: Refer to Division 8 Sections "Aluminum Entrances and Storefronts," "Aluminum Windows," and "Glazed Aluminum Curtain Walls" for additional performance requirements.
- B. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- C. Glass Design: Glass thickness and type designations indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites in the thickness designations indicated for various size openings, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:
 - 1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:
 - a. Specified Design Wind Loads: Determine design wind loads applicable to Project from basic wind speed indicated in miles per hour (meters per second) at 33 feet (10 m) above grade, according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 6.4.2, "Analytic Procedure," based on mean roof heights above grade.
 - b. Probability of Breakage for Vertical Glazing: 8 lites per 1000 for lites set vertically or not more than 15 degrees off vertical and under wind action.
 - 1) Load Duration: 3 seconds or less.
 - c. Maximum Lateral Deflection: For the following types of glass supported on all 4 edges, provide thickness required that limits center deflection at design wind pressure to 1/50 times the short side length or 1 inch (25 mm), whichever is less.
 - 1) For monolithic-glass lites heat treated to resist wind loads.
 - 2) For insulating glass.
 - d. Minimum Glass Thickness for Exterior Lites: Not less than 6.0 mm.
 - 2. Where glass manufacturer cannot assure adequate structural performance of insulating glass units, based upon combination of inner/outer lite, assume outer lite alone must satisfy structural requirements.
 - 3. Safety Glazing: Provide glass types that comply with safety glazing regulations.
- D. Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- E. Thermal and Optical Performance Properties: Provide glass with performance properties specified based on manufacturer's published test data, as determined according to procedures indicated below:
1. For monolithic-glass lites, properties are based on units with lites 6.0 mm thick.
 2. For insulating-glass units, properties are based on units with lites 6.0 mm thick Insert dimension and a nominal 1/2-inch-(12.7-mm-) wide interspace.
 3. Center-of-Glass Values: Based on using LBL-44789 WINDOW 5.0 computer program for the following methodologies:
 - a. U-Factors: NFRC 100 expressed as Btu/ sq. ft. x h x deg F (W/sq. m x K).
 - b. Solar Heat Gain Coefficient: NFRC 200.
 - c. Solar Optical Properties: NFRC 300.

1.4 SUBMITTALS

- A. Product Data: For each glass product and glazing material indicated.
- B. Samples: For the following products, in the form of 12-inch-(300-mm-) square Samples for glass.
1. Each type of patterned glass.
 2. Coated vision glass.
 3. Ceramic-coated spandrel glass.
 4. Each pattern and color of ceramic-coated vision glass.
 5. Fire-resistive glazing products.
 6. Insulating glass for each designation indicated.
 7. For each color (except black) of exposed glazing sealant indicated.
- C. Glazing Schedule: Use same designations indicated on Drawings for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.
- D. Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.
1. For solar-control low-e-coated glass, provide documentation demonstrating that manufacturer of coated glass is certified by coating manufacturer.
 2. Certification from glass producer/fabricator that glass producer/fabricator has reviewed the glazing details and thicknesses and finds same suitable for the purpose intended in accordance with his published literature and in accordance with these Specifications. This shall include a written analysis of stress due to wind load, environmental conditions, and thermal factors showing a probability of failure of no greater than amount specified at design wind load and local environmental conditions, including altitude relative to location of manufacture, temperature variations, and barometric pressure variations anticipated at the completed building.

3. Certification from glass producer/fabricator and where applicable from gasket and sealant manufacturer and glass coated manufacturers that gaskets, sealants and glass products that contact are chemically and otherwise compatible.
- E. Glass Producer/Fabricator Inspection Reports: Prepared and submitted within three days of specified field inspections.
- F. Calculations: Contractor shall submit along with his proposal, calculations establishing anticipated deflections, calculations as to reduction in glass bite as a consequence of deflection and statement from glass manufacturer that the reduction in glass bite will not result in a reduction of load resistance capacity or an increase in breakage probability.
- G. Qualification Data: For installers.
- H. Preconstruction Adhesion and Compatibility Test Report: From glazing sealant manufacturer indicating glazing sealants were tested for adhesion to glass and glazing channel substrates and for compatibility with glass and other glazing materials.
- I. Product Test Reports: For each of the following types of glazing products:
 1. Tinted float glass.
 2. Coated float glass.
 3. Insulating glass.
 4. Glazing sealants.
 5. Glazing gaskets.
- J. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in glass installations with a record of successful in-service performance; and who employs glass installers for this Project who are certified under the National Glass Association Glazier Certification Program as Level 2 (Senior Glaziers) or Level 3 (Master Glaziers).
- B. Source Limitations for Glass: Obtain the following through one source from a single manufacturer for each glass type: clear float glass, coated float glass, and insulating glass.
- C. Source Limitations for Glazing Accessories: Obtain glazing accessories through one source from a single manufacturer for each product and installation method indicated.
- D. Glass Product Testing: Obtain glass test results for product test reports in "Submittals" Article from a qualified testing agency based on testing glass products.
 1. Glass Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.
- E. Elastomeric Glazing Sealant Product Testing: Obtain sealant test results for product test reports in "Submittals" Article from a qualified testing agency based on testing current sealant formulations within a 36-month period.

1. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated, as documented according to ASTM E 548.
 2. Test elastomeric glazing sealants for compliance with requirements specified by reference to ASTM C 920, and where applicable, to other standard test methods.
- F. Preconstruction Adhesion and Compatibility Testing: Submit to elastomeric glazing sealant manufacturers, for testing indicated below, samples of each glazing material type, tape sealant, gasket, glazing accessory, and glass-framing member that will contact or affect elastomeric glazing sealants:
1. Use ASTM C 1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.
 2. Submit not fewer than eight pieces of each type of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
 3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
 4. For materials failing tests, obtain sealant manufacturer's written instructions for corrective measures, including the use of specially formulated primers.
 5. Testing will not be required if elastomeric glazing sealant manufacturers submit data based on previous testing of current sealant products for adhesion to, and compatibility with, glazing materials matching those submitted.
- G. Glazing for Fire-Rated Door Assemblies: Glazing for assemblies that comply with NFPA 80 and that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 252.
- H. Glazing for Fire-Rated Window Assemblies: Glazing for assemblies that comply with NFPA 80 and that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 257.
- I. Safety Glazing Products: Comply with testing requirements in 16 CFR 1201.
1. Subject to compliance with requirements, obtain safety glazing products permanently marked with certification label of the Safety Glazing Certification Council or another certification agency or manufacturer acceptable to authorities having jurisdiction.
 2. Where glazing units, including Kind FT glass, are specified in Part 2 articles for glazing lites more than 9 sq. ft.(0.84 sq. m) in exposed surface area of one side, provide glazing products that comply with Category II materials, for lites 9 sq. ft.(0.84 sq. m) or less in exposed surface area of one side, provide glazing products that comply with Category I or II materials, except for hazardous locations where Category II materials are required by 16 CFR 1201 and regulations of authorities having jurisdiction.
- J. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
1. IGMA Publication for Insulating Glass: SIGMA TM-3000, "Glazing Guidelines for Sealed Insulating Glass Units."
- K. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the following testing and inspecting agency:

1. Insulating Glass Certification Council.
2. Associated Laboratories, Inc.

- L. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- B. Glass shall be delivered to the site bearing the manufacturer's label, complete with glazing instructions where applicable.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
1. Do not install liquid glazing sealants when ambient and substrate temperature conditions are outside limits permitted by glazing sealant manufacturer or below 40 deg F(4.4 deg C).

1.8 WARRANTY

- A. Refer to Division 8 Section "Aluminum Entrances and Storefronts," "Aluminum Windows," and "Glazed Aluminum Curtain Walls" for additional glass products guarantee/warranty requirements.
- B. Manufacturer's Special Warranty for Coated-Glass and Opacified-Glass Products: Manufacturer's standard form, made out to Owner and signed by coated-glass manufacturer agreeing to replace coated-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
1. Warranty Period: 15 years from date of Final Completion.
- C. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form, made out to Owner and signed by insulating-glass manufacturer agreeing to replace insulating-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
1. Warranty Period: 15 years from date of Final Completion.
- D. Manufacturer's Special Warranty on Heat Treated Glass: Manufacturer's standard form, made out to Owner and signed by heat-treated glass manufacturer agreeing to replace heat-treated glass units that spontaneously disintegrate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
1. Warranty Period: 5 years from date of Final Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
1. Products: Subject to compliance with requirements, provide one of the products specified.
 2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
 3. Basis-of-Design Product: The design for each glazing product is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified.

2.2 GLASS PRODUCTS

- A. Annealed Float Glass: ASTM C 1036, Type I (transparent flat glass), Quality-Q3; of class indicated.
- B. Heat-Treated Float Glass: ASTM C 1048; Type I (transparent flat glass); Quality-Q3; of class, kind, and condition indicated.
1. Fabrication Process: By horizontal (roller-hearth) process to eliminate tong marks with roll-wave distortion parallel to bottom edge of glass as installed, unless otherwise indicated.
 2. Provide Kind HS (heat-strengthened) float glass in place of annealed float glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in Part 1 "Performance Requirements" Article.
 - a. Heat strengthened glass shall be fabricated with the low end of allowable compressive strength for heat strengthened glass to ensure against tempered glass breakage pattern. Glass manufacturer shall provide quality control program and testing records to establish that this criteria has been met.
 3. For uncoated glass, comply with requirements for Condition A.
 4. For coated vision glass, comply with requirements for Condition C (other uncoated glass).
 5. Provide Kind FT (fully tempered) float glass in place of annealed or Kind HS (heat-strengthened) complying with to ANSI Z97.1, float glass where safety glass is indicated.
 - a. Fully tempered glass shall be heat soaked (checked) at glass surface temperatures of not less than 400°F for 4 hours, to convert nickel sulfide inclusions from the alpha phase to the beta phase so that glass will fracture in the test. Heat soak must comply with the European Din standard. Written warranties against nickel sulfide inclusions in lieu of heat soaking will not be accepted.
- C. Ceramic-Coated Vision Glass: Float glass with ceramic enamel applied by silk-screened process and complying with ASTM C 1048, Condition C (other coated glass), Type I (transparent flat glass), Quality-Q3, Specification No. 95-1-31 in GANA Tempering Division's "Engineering Standards Manual," and other requirements specified.

- D. Insulating-Glass Units, General: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, and complying with ASTM E 774 for Class CBA units by the Insulating Glass Certification Council (IGCC) and with requirements specified in this Article and in Part 2 "Insulating-Glass Units" Article.
1. Insulating glass shall comply with:
 - a. E 773 Standard Test Method for Seal Durability of Sealed Insulating Glass Units.
 - b. E 774 Standard Specification for Sealed Insulating Glass Units.
 - c. E 546 Standard Test Method for Frost Point of Sealed Insulating Glass Units.
 - d. E 576 Standard Test Method for Dew/Frost Point of Sealed Insulating Glass Units in Vertical Position.
 2. Provide Kind HS (heat-strengthened) float glass in place of annealed glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in Part 1 "Performance Requirements" Article.
 3. Provide Kind FT (fully tempered) glass lites where safety glass is indicated.
 4. Overall Unit Thickness and Thickness of Each Lite: Dimensions indicated for insulating-glass units are nominal and the overall thicknesses of units are measured perpendicularly from outer surfaces of glass lites at unit's edge.
 5. Sealing System: Dual seal, with primary and secondary sealants as follows:
 - a. Polyisobutylene and silicone.
 - 1) For units that are indicated to be structurally-glazed, provide secondary sealant compatible with structural and weatherseal sealants.
 6. Spacer Specifications: Manufacturer's standard spacer material and construction complying with the following requirements:
 - a. Desiccant: Molecular sieve or silica gel, or blend of both.
 - b. Corner Construction: Manufacturer's standard sealed or bent corner construction.
 - c. Overall Unit Thickness and Thickness of Each Lite: Dimensions indicated in the Insulating-Glass Schedule at the end of Part 2 are nominal and the overall thicknesses of units are measured perpendicularly from outer surfaces of glass lites at unit's edge.

2.3 GLAZING GASKETS

- A. Gaskets/weatherstripping shall be neoprene or EPDM, except where used in contact with a silicone sealant. In contact with silicone sealants, gaskets and spacers shall be preformed heat cured silicone rubber, chemically compatible with the silicone sealant and suitable for the specific purpose intended.
- B. Dense Compression Gaskets: Molded or extruded gaskets of material indicated below, complying with standards referenced with name of elastomer indicated below, and of profile and hardness required to maintain watertight seal:
 1. Neoprene, ASTM C 864, for gaskets not exposed to structural silicone.

2. EPDM, ASTM C 864.
 3. Silicone, ASTM C 1115.
- C. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned gaskets of material indicated below; complying with ASTM C 509, Type II, black; and of profile and hardness required to maintain watertight seal:
1. Neoprene, for gaskets not exposed to structural silicone.
 2. EPDM.
 3. Silicone.
- D. Lock-Strip Gaskets: Neoprene extrusions in size and shape indicated, fabricated into frames with molded corner units and zipper lock-strips, complying with ASTM C 542, black.

2.4 GLAZING SEALANTS

- A. General: Provide products of type indicated, complying with the following requirements:
1. Compatibility: Select glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on Project specific testing and field experience.
 2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
 3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.
- B. Elastomeric Glazing Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
1. Single-Component Neutral-Curing Silicone Glazing Sealants:
 - a. Products:
 - 1) Dow Corning Corporation; 795.
 - 2) GE Silicones; SilPruf LM SCS2700.
 - 3) GE Silicones; SilPruf SCS2000.
 - b. Type and Grade: S (single component) and NS (nonsag).
 - c. Class: 100/50.
 - d. Use Related to Exposure: NT (nontraffic).
 - e. Uses Related to Glazing Substrates: M, G, A, and, as applicable to glazing substrates indicated, O.
 - 1) Use O Glazing Substrates: Coated glass, aluminum coated with a high-performance coating and galvanized steel.
 - f. Applications: exposed weatherseal.

- C. Glazing Sealants for Fire-Resistive Glazing Products: Identical to products used in test assemblies to obtain fire-protection rating.

2.5 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based elastomeric tape with a solids content of 100 percent; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; packaged on rolls with a release paper backing; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
 - 1. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
 - 2. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.
- B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; packaged on rolls with release liner protecting adhesive; and complying with AAMA 800 for the following types:
 - 1. Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.6 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions with a Shore, Type A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.
- G. Perimeter Insulation for Fire-Resistive Glazing: Identical to product used in test assembly to obtain fire-resistance rating.
- H. Film: Fully adhered optical quality PVB film.

2.7 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
- B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites in a manner that produces square edges with slight kerfs at junctions with outdoor and indoor faces.
- C. Grind smooth and polish exposed glass edges and corners.

2.8 MONOLITHIC FLOAT-GLASS UNITS

- A. Uncoated Clear Float-Glass Units: Class 1 (clear) annealed or Kind HS (heat-strengthened) float glass where heat strengthening is required to resist thermal stresses induced by differential shading of individual glass lites and to comply with system performance requirements .
 - 1. Thickness: 6.0 mm.
- B. Uncoated Clear Float-Glass Units MG-2: Kind HS (heat-strengthened) float glass.
 - 1. Thickness: 6.0 mm.
- C. Uncoated Clear Float-Glass Units: Kind FT (fully tempered) float glass.
 - 1. Thickness: 6.0 mm.

2.9 INSULATING-GLASS UNITS

- 1. Match existing Glazing type.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine framing glazing, with Installer present, for compliance with the following:
 - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 - 2. Presence and functioning of weep system.
 - 3. Minimum required face or edge clearances.
 - 4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.
- C. Method of glass installation shall make provision to weep sill glazing rabbets. Insulating glass units shall be installed in such manner as to adequately drain the glazing rabbet in a manner, as approved in writing, by the insulating unit glass manufacturer.
- D. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
- E. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.
- F. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- G. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- H. Provide spacers for glass lites where length plus width is larger than 50 inches(1270 mm) as follows:
 - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
 - 2. Provide 1/8-inch(3-mm) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- I. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- J. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- K. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- L. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until just before each glazing unit is installed.
- F. Apply heel bead of elastomeric sealant.
- G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 GASKET GLAZING (DRY)

- A. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
 - 1. On exterior and interior of units use weather-strip and gasket material that has been fabricated into units with molded or vulcanized corners wherever possible. Where lineal gasket material must be used, miter cut and bond units at corners with sealant recommended by gasket manufacturer.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Sponge gaskets shall be compressed 20% to 35% in the final installed position. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Install gaskets so they protrude past face of glazing stops.
- E. Gaskets/weather-stripping/spacers shall have continuous mechanical engagement to framing members; adhesive attachment is not acceptable.

3.6 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding

into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.7 CLEANING AND PROTECTION

- A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended by glass manufacturer.
- C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.
- D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.
- E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

PART 4 - GLASS TYPE SCHEDULE

- G1 Clear tempered glass, 1/4" thick.
- G4 1" Low E Clear Insulated tempered glass

END OF SECTION 088000