

SECTION 08570

ACCESSIBLE AWNING WINDOWS

PART 1 - GENERAL

1.1 SUMMARY

- A. Furnish and install accessible awning windows complete with push out hardware, glazing, weather stripping, insect screens, simulated divided lites, jamb extensions, specified anchors, trim, attachments and related components as shown on Drawings and specified in this Section.
- B. The materials in this section are part of the overall USGBC "Leadership in Energy and Environmental Design" (LEED) prerequisites and credits needed from the Project to obtain LEED certification based on LEED 2009 for Schools requirements. See Section 01352 "LEED Requirements" and this section for more information.**
- C. **Coordination of integration and installation of accessible awning windows into aluminum window wall system.**
 - 1. Accessible awning window units must be fully integrated into window wall framing system(s). Stacked (independent) installations of awning windows units and window wall systems are prohibited.**
- D. **Coordination of integration and installation of exterior metal window guards to accessible awning windows shown in Drawings.**
 - 1. Exterior metal window guards must be fully integrated with accessible awning window units. Window guards must not interfere with proper accessible operation of awning window units, including all operating clearance and forces required by applicable accessibility code.**

1.2 REFERENCES

- A. AAMA - American Architectural Manufacturers Association – *www.aamanet.org*
 - 1. AAMA/WDMA/CSA 101/I.S.2/A440-05 "Standard/Specification for Windows, Doors, and Unit Skylights"
 - 2. AAMA 502-08 "Voluntary Specification for Field Testing of Newly Installed Fenestration Products"
 - 3. AAMA 611-98 "Voluntary Specification for Anodized Architectural Aluminum"
 - 4. AAMA 701/702-04 "Voluntary Specification for Pile Weatherstripping and Replaceable Fenestration Weatherseals"
 - 5. AAMA 800-07 "Voluntary Specifications and Test Methods for Sealants"
 - 6. AAMA 904-01 "Voluntary Specification for Multi-Bar Hinges in Window Applications"
 - 7. AAMA 910-93 "Voluntary 'Life Cycle' Specifications and Test Methods for Architectural Grade Windows and Sliding Glass Doors"

8. AAMA 1503-98 "Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors, and Glazed Wall Sections"
 9. AAMA 2603-02 "Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels"
 10. AAMA 2604-05 "Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels"
 11. AAMA 2605-05 "Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels"
 12. AAMA CW-10-04 "Care and Handling of Architectural Aluminum from Shop to Site"
- B. ANSI – American National Standards Institute – www.ansi.org
1. ANSI A117.1-03 "Accessible and Usable Buildings and Facilities Standards"
 2. ANSI Z97.1-04 "American National Standard for Safety Glazing Materials used in Buildings – Safety Performance Specifications and Methods of Test"
- C. ASTM - American Society for Testing and Materials – www.astm.org
1. ASTM E 90-04 Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
 2. ASTM E 283-04 "Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen"
 3. ASTM E 330-02 "Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights, and Curtain Walls by Uniform Static Air Pressure Difference"
 4. ASTM E 331-00 "Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference"
 5. ASTM E 413-04 Classification for Rating Sound Insulation
 6. ASTM E 547-00 "Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Cyclic Static Air Pressure Difference"
 7. ASTM E 2190-02 "Standard Specification for Insulating Glass Unit Performance and Evaluation"
- D. CCMC – City of Chicago Municipal Code - www.amlegal.com/library/il/chicago.shtml
1. CCMC – Chapter 18-11-1109.13.1 - Operable windows.
 2. CCMC – Chapter 18-13 Energy Conservation Code
- E. CPSC - Product Safety Commission - www.cpsc.gov
1. CPSC 16 CFR 1201 "Consumer Product Safety Commission Safety Standard for Architectural Glazing Materials – codified at Title 16, Part 1201 of the Code of Federal Regulations"
- F. GANA – Glass Association of North America – www.glasswebsite.com
1. GANA - "Glazing Manual" 2008
- G. IGCC – Insulating Glass Certification Council – www.igcc.org
- H. NAAMM - National Association of Architectural Metal Manufacturers - www.naamm.org
1. AMP-500-06 "Metal Finishes Manual"

- I. NFRC - National Fenestration Rating Council - *www.nfrc.org*
 - 1. NFRC -100-04 "Procedures for Determining Fenestration Product U-factors"
 - 2. NFRC- 300- 04 "Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems"
- J. PEI – Porcelain Enamel Institute - *www.porcelainenamel.com*
 - 1. PEI - "Porcelain Enamel for Architects, Designers & Construction Specifiers," 2008
- K. SGCC – Safety Glazing Certification Council – *www.sgcc.org*
- L. WDMA – Window and Door Manufacturer’s Association - *www.wdma.com*
 - 1. WDMA I.S.4-07A "Water-Repellent Preservative Non-Pressure Treatment for Millwork"

1.3 SYSTEM DESCRIPTION

- A. AAMA product designation: AW-PG65-AP
- B. Windows: manufacturer’s standard awning windows with a minimum frame depth of 2-¼ inches with operable sash installed by the manufacturer into frame; equal leg frame; interior and exterior finishes applied by the window manufacturer; frames and vents assembled by the window manufacturer.
- C. Configuration: Match size, shape, proportions and patterns of adjacent windows.
 - a. Project out/awning; overlap vent sash in window configurations indicated on drawings.
 - b. In projects where adjacent windows configuration consists of single hung or double hung sashes: provide a single vent in lower lite and fixed lite in upper frame. Meeting rail dimensions between upper and lower sections to match adjacent window dimensions.
 - c. In projects where adjacent window configuration consists of individual fixed and operable projecting vents: provide single project out awning vent with dimensions matching adjacent operable vents.
- D. Vent glazing: exterior aluminum glazing bead; with thermal glazing bead on interior and exterior perimeter; 1" insulating glass; glazed by the window manufacturer.

1.4 PERFORMANCE REQUIREMENTS

- A. General: Provide accessible awning windows units that meet or exceed performance requirements specified as confirmed by testing manufacturer's windows that are representative of those specified, and that are of tested to size indicated below.
- B. Performance Class & Grade: All window units installed in project are to conform to AW-PG65-AP specifications of AAMA/WDMA/CSA 101/I.S.2/A440 when tests are performed on a 60" x 36" minimum frame size with the test results as specified below.
 - 1. In cases where window units required exceed test size stated above, test largest sized unit required for project for compliance with specified performance requirements below.

- C. Design Requirements: Provide windows that comply with AAMA 910 life cycle test requirements and meet AAMA/WDMA/CSA 101/I.S.2/A440 standards when tests are performed on a window size matching or exceeding size specified above. Window tests are to be by a recognized Independent Testing Laboratory or Agency, in accordance with ASTM E 283 for air infiltration, and with ASTM E 331 and ASTM E 547 for water penetration
 - 1. Air Infiltration: of maximum .1 cfm/square foot at a static air pressure difference of 6.24 psf.
 - 2. Water Penetration: no water penetration shall be permitted at a static air pressure difference of 10 psf.

- D. Structural Performance: Provide windows capable of withstanding the effects of the following loads, based on testing units representative of those indicated for Project that pass AAMA/WDMA/CSA 101/I.S.2/A440 requirements for Uniform Load Structural Test:
 - 1. Design Wind Loads: Provide windows identical to windows that have been successfully tested to resist design pressure, but not less than the following:
 - a. Pressure: 30 psf in any direction.
 - 2. Uniform Deflection: no more than L/175 when tested per ASTM E 330 at a static air pressure difference of 65 psf.
 - 3. Uniform Structural: Unit is to be tested at 1.5 x design wind pressure, both positive and negative at 97.5 psf in accordance with ASTM E 330. There shall be no glass breakage, permanent damage to fasteners, hardware parts or any other damage to make the window inoperable. There shall be no permanent deformation of any main frame or vent member in excess of 2% of its span.

- E. Installation Performance Requirements:
 - 1. Design the attachment of the windows at jambs, head, and sill and reinforce mullions to resist 30 psf load applied in any direction.

- F. Thermal Movement: Provide windows, including anchorage, that allow for thermal movement resulting from the following maximum range in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, 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.

- G. Thermal Performance: Provide windows that comply with energy conservation requirements of CCMC as demonstrated by testing per AAMA 1503.
 - 1. U-Factor: Provide window units having maximum U-factor of 0.45 or better for fixed units and 0.50 or better for operable units as determined in accordance with NFRC 100 by a laboratory accredited by a nationally recognized accreditation organization such as the NRFC and labeled and certified by the manufacturer
 - 2. Condensation Resistance Factor (CRF): Minimum CRF to be 50 or better for frame and 60 or better for glass.

3. Solar Heat Gain Coefficient: Provide window units assembly maximum solar heat gain coefficient (SHGC) for overall glazed area of 0.49 or better for north orientation and 0.39 or better for all other orientations as determined in accordance with NFRC 200 by a laboratory accredited by a nationally recognized accreditation organization such as the National Fenestration Rating Council and shall be labeled and certified by the manufacturer.
 - a. Shading coefficient of the center of glass multiplied by 0.86 shall be an acceptable alternate for determining compliance with the SHGC required for the overall glazed area. Shading coefficient shall be determined using special data file determined in accordance with NFRC 300. Shading coefficient shall be verified and certified by the glass unit manufacturer.
- H. Sound Transmission Class (STC): Provide glazed windows rated for not less than 35 STC when tested for laboratory sound transmission loss according to ASTM E 90 and determined by ASTM E 413.
- I. Accessible Windows: Where accessible glazed openings in accessible rooms or spaces are shown on the Drawings for operation by occupants, provide windows that comply with CCMC accessibility requirements for operable windows .
 1. Window Hardware: Comply with ANSI A117.1 section 309.4 Operation, that need to be pushed, pulled, or lifted to open, provide hardware that requires that no more than 5 lbf of force be used to open or close the operable vent.
 2. Operation. Provide controls and operating mechanisms for Accessible Windows, in compliance with ANSI A117.1-2003 section 309.4 Operation, that are operable with one hand with a force of no more than 5 lbf and do not require tight grasping, pinching, or twisting of the wrist.
 3. Confirm compliance with specified operating force requirements by having operable vent of accessible window tested by a recognized Independent Testing Laboratory or Agency and so labeled and certified by the manufacturer.

1.5 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, fabrication methods, product performance test certifications, dimensions of individual components and profiles, hardware, finishes, and operating instructions for each type of accessible awning window indicated.
- B. LEED Submittals
 1. Product Data for Credit MR 4.1 and Credit MR 4.2: Indicating percentages by weight of postconsumer and pre-consumer recycled content for products having recycled content. Include statement indicating costs for each product having recycled content.
 2. Credit MR5.1: Submit a statement from the product manufacturer stating the distance between the place of manufacturer and the project location.

- C. Shop Drawings: Shop drawings shall be the responsibility of the window manufacturer and prepared by the manufacturer's authorized agent bearing the manufacturer's name. Drawings prepared by others are not acceptable. Include building plans and elevations drawn at a minimum 1/8" scale; window unit elevations at minimum 3/8" scale; details of all components, including required reinforcement, to be drawn full size. Include floor plans, elevations, sections, details, hardware, attachments to other work, operational clearances, installation details, and the following:
1. Mullion details, including reinforcement and stiffeners.
 2. Joinery details.
 3. Expansion provisions.
 4. Flashing and drainage details.
 5. Weather-stripping details.
 6. Thermal-break details.
 7. Glazing details.
 - 8. Exterior window guard attachment details.**
 9. Window cleaning provisions.
- D. Samples for Verification: For the windows and components required, submit samples of size indicated below:
1. Main Framing Member: 12-inch- long, full-size sections of extrusions with factory applied color finish.
 2. Window Corner Fabrication: 12-by-12-inch- long, full-size window corner including full-size sections of extrusions with factory-applied color finish, weather stripping, and glazing.
 3. Operable Window: Full-size unit with factory-applied finish.
 4. Hardware: Full-size units with factory-applied finishes.
 5. Weather Stripping: 12-inch- long sections.
- E. Product Schedule: For new windows using same designations indicated on Drawings.
- F. Qualification Data: For Installer, manufacturer, and testing agency.
- G. Field quality-control test reports.
- H. Product Test Reports: Based on AAMA criteria, submit for evaluation of most recent comprehensive tests performed, but in no case older than four years from date of submittal, by a qualified testing agency for each type, class, grade, and size of window. Test results based on use of downsized test units will not be accepted.
- I. Maintenance Data: For operable window sash, operating hardware, weather stripping and finishes to include in maintenance manuals.
- J. Thermal Performance Certifications: Submit certifications as required under "Performance Requirements" of this section.
- K. Operating Force: provide test results and compliance certification.
- L. Warranty: Special warranty as specified in this Section.

1.6 QUALITY ASSURANCE

- A. The Drawings and Specifications herein indicate types, sizes, profiles, connections, dimensional and operational requirements for accessible awning windows of the specific manufacturer's products as specified.
- B. Accessible awning windows having equal performance characteristics by other manufacturers may be considered, provided that deviations do not change the design concept or intended performance as determined by the Architect.
- C. Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of required windows. Aesthetic effects, such as simulated divided lites, are shown on Drawings by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to each 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 without PBCC approval. If modifications are proposed, submit comprehensive explanatory data to the PBCC for review.
 - 2. For replacement window projects use CPS archive information provided by the PBCC as basis for applied muntin and mullion design of simulated divided lites for shop drawings.
- D. Manufacturer Qualifications: A manufacturer capable of fabricating windows that meet or exceed performance requirements indicated and of documenting this performance by inclusion in lists and by labels, test reports, calculations and verifiable history of manufacturing specified windows for a minimum of ten (10) years.
- E. Installer Qualifications: Installer to be certified by window manufacturer for installation of window units required.
 - 1. Engineering Responsibility: Preparation of data for windows, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project by a state of Illinois licensed engineer.
 - 2. Provide skilled craftspeople who have demonstrated a verifiable successful history of installing specified windows for a minimum of five (5) years.
- F. In addition to above comply with the following:
 - 1. The Manufacturer shall visit the site before fabrication and examine existing window openings and frames into which the new replacement windows are to be installed. If any discrepancies, or conditions, are discovered that are detrimental to the proper and timely completion of the work, the Manufacturer is to notify the Architect in writing.
 - 2. Check actual window openings by accurate field measurement before fabrication. The replacement window tolerance of 1/2" less than the actual window opening dimensions will apply for all manufactured units. Units supplied plus or minus 1/4" in excess of the tolerance standards will be deemed out of compliance and will be replaced by the Manufacturer. Show recorded measurements on final shop drawings.
- G. Source Limitations: Obtain windows through one source from a single manufacturer.
- H. Mockups: Build mockups as directed by the Board to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Build mockup for type(s) of window(s) indicated, in location(s) shown on Drawings.
 - 2. Mock up a minimum of three (3) accessible awning windows of each type, or three (3%) percent of each type of accessible awning window product; whichever is greater.

- I. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to windows including, but not limited to, the following:
 - 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. Review and discuss the finishes of windows that are required to be coordinated with the finishing of other adjacent work for color and finish matching.
 - 3. Review, discuss, and coordinate the interrelationship of windows with other exterior wall components. Include provisions for structural anchorage, glazing, flashing, weeping, sealants, and protection of finishes.
 - 4. Review and discuss the sequence of work required to construct a watertight and weathertight exterior building envelope.
 - 5. Inspect and discuss the condition of substrate and other preparatory work performed by other trades.
- J. Fenestration Standard: For minimum standards of performance, definitions, materials, components, accessories, and fabrication requirements conform to AAMA/WDMA/CSA 101/I.S.2/A440. In case of conflicts, comply with more stringent requirements.
- K. Furnish a valid AAMA "Authorization for Product Certification" indicating that the windows for the project conform to AAMA/WDMA/CSA 101/I.S.2/A440.
- L. Furnish visible, permanent IGCC certification labels indicating conformance to ASTM E 2190 on insulating glass units.
- M. Provide glazing to match adjacent window wall.
- N. Glazing Standard: Comply with published recommendations of glass manufacturers and with GANA's "Glazing Manual" unless more stringent requirements are indicated on Drawings.

1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify window openings 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 opening dimensions and proceed with fabricating without field measurements. Coordinate wall construction to ensure that actual opening dimensions correspond to established dimensions.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Protect windows from damage during handling and construction operations before, during and after installation.
- B. Store windows under cover, setting upright.
- C. Do not stack windows flat.
- D. Do not lay building materials and/or equipment on windows

1.9 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace windows that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
 - a. Failure to meet performance requirements.
 - b. Structural failures including excessive deflection, water leakage, air infiltration, or condensation.
 - c. Deterioration of metals, other materials, and metal finishes beyond normal weathering.
 - d. Faulty operation of operable vents and hardware.
 - e. Failure of insulating glass.
 2. Warranty Period:
 - a. Windows: Ten (10) years from date of Preliminary Acceptance of the Project, as applicable.
 - b. Metal Finish: Ten (10) years from date of Preliminary Acceptance of window installation.
 - c. Hardware: Ten (10) years from date of Preliminary Acceptance of window installation.
 - d. Glazing: Ten (10) years from date of Preliminary Acceptance of window installation.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

- A. Description: Subject to compliance with the requirements, provide factory assembled accessible awning windows from:
1. **Traco**
 2. **Graham**
- B. Accessible awning windows having equal performance characteristics by other manufacturers may be considered, provided that deviations do not change the design concept or intended performance as determined by the Architect. The burden of proof for equality of other awning windows is on the proposer.

2.2 MATERIALS

- A. Aluminum Extrusions: extruded by the window manufacturer from commercial quality 6063-T5 alloy; free from defects impairing strength and durability.
- B. Wood: Clear Poplar for painted finishes; all wood to be free of finger joints.
 - 1. Kiln dried to moisture content no greater than twelve (12) percent at the time of fabrication.
 - 2. Water repellent preservative treated in accordance with WDMA I.S.4.
- C. Weather-stripping: Provide full-perimeter weather stripping for each operable ventilator. Installed weather stripping to be UV stable, flexible in low temperatures, and resistant to compression set; conforming to AAMA 701/702.
- D. Hardware: Provide ANSI A117.1 compliant operator and hinge hardware in manufacturer's standard finish complete with stainless steel limit stop for 6" opening restriction and release key for custodial access to clean and maintain operable vent.
- E. Screens General: Design windows and hardware to accommodate screens in a tight-fitting, removable arrangement, with a minimum of exposed fasteners and latches.
 - 1. Security Screens: Where indicated on Drawings, provide reinforcement to aluminum framing to accommodate loads and fasteners for attachment of metal window guard framing on exterior face of window. For requirements see Section 08661 Exterior Metal Window Guards.
 - 2. Insect Screens: Fabricate insect screens to fully integrate with window frame. Locate screens on inside of window and provide for each operable ventilator where shown on Drawings.
 - a. Provide insect screens on operating sash and ventilators in administrative offices, teachers' lounges, food preparation areas, and lunchrooms and where indicated on Drawings.
 - b. Aluminum Insect Screen Frames: Manufacturer's standard aluminum alloy complying with SMA 1004. Fabricate frames with mitered or coped joints, concealed fasteners and removable PVC spline/anchor concealing edge of frame.
 - 1) Extruded-Aluminum or Aluminum Tubular Framing Sections and Cross Braces: Not less than 0.040-inch wall thickness.
 - 2) Finish: Match aluminum window members.
 - c. Aluminum Wire Fabric: 18-by-16 mesh of 0.011-inch- diameter, coated aluminum wire.
 - 1) Wire-Fabric Finish: Charcoal gray.
- F. **Exterior Metal Window Guards: Design windows and hardware to accommodate guards in a tight-fitting, fully operable arrangement, with a minimum of exposed fasteners and latches.**
 - 1. **Perforated Metal Panel: Screen infill shall be minimum 18 gauge stainless steel perforated metal panel with 5/32" diameter holes on 3/16" centers, staggered pattern; and with an open area of 63% of total panel area. Paint perforated panels after punching process is complete.**
 - 2. **Frames and hardware: Comply with all requirements as specified in Section 08661 "Exterior Metal Window Guards".**

G. GLAZING

1. Glazing types and locations as indicated on drawings.
2. Glass Type "G1": Not Used
3. Glass Type "G2": 1/4" thick clear tempered glass (Safety Rated, UL 10C).
4. Glass Type "G3": 5/16" thick Firelite Plus (Premium) Ceramic Fire-Rated Safety Glazing (Fire + Safety Rated). For B-Label openings include Pemco Doorlite Set with Pemco FG3000 Fireglaze (Compound) for setting panels in frames.
 - a. Other manufacturer's products will be considered subject to meeting the performance criteria specified herein.
5. Glass Type "G4": 1-inch thick Insulated Exterior Glass Assembly: Unit shall consist of a 1/4" thick clear low-E outboard lite with PPG Solarban 60 on the #2 surface, 1/2" gas cavity and a 1/4" thick clear inboard lite. Other manufacturer's products will be considered subject to meeting the performance criteria specified herein. Unit shall have the following performance characteristics:
 - a. Visible Light Transmittance: 71% minimum
 - b. Solar Energy Transmittance: 33% maximum
 - c. Ultraviolet Transmittance: 19% maximum
 - d. Visible Light Reflectance – Exterior: 11%
 - e. Visible Light Reflectance – Interior: 13%
 - f. Solar Energy Reflectance: 29%
 - g. U-Value (Winter Nighttime): 0.30 Btu/(hr x sq.ft. x °F) maximum
 - h. U-Value (Summer Daytime): 0.28 Btu/(hr x sq.ft. x °F) maximum
 - i. Shading Coefficient: 0.44
 - j. Relative Heat Gain: 91 Btu/hr x sq.ft.
 - k. Solar Heat Gain Coefficient: 0.38 maximum.
6. Glass Type "G4-S": 1-inch thick Insulated Spandrel Exterior Glass Assembly: Unit shall consist of a 1/4" thick clear outboard lite with PPG Solarban 60, a 1/2" thick gas cavity and a 1/4" thick clear inboard lite with ceramic frit on the #4 surface. Provide 70% coverage silicone spandrel coating on the #4 surface. Other manufacturer's products will be considered subject to meeting the performance criteria specified herein.
 - a. Provide Spandrel Glazing where shown on the Drawings with ICD Opaci-Coat 300 silicone spandrel coating.
 - b. Color: 3-0586 Medium Gray
 - c. Unit shall have the following performance characteristics:
 - 1) Visible Light Transmittance: 27% minimum
 - 2) Visible Light Reflectance – Exterior: 17%
 - 3) Visible Light Reflectance – Interior: 26%
 - 4) U-Value (Winter Nighttime): 0.48 Btu/(hr x sq.ft. x °F) maximum
 - 5) U-Value (Summer Daytime): 0.50 Btu/(hr x sq.ft. x °F) maximum
 - 6) Shading Coefficient: 0.43
 - 7) Solar Heat Gain Coefficient: 0.38 maximum.

7. Glass Type "G4-L": 1-inch Thick Insulated Laminated Exterior Glass Assembly: Unit shall consist of 1/4-inch thick clear low-E tempered outboard lite with PPG Solarban 60 on the #2 surface, 1/2" gas cavity, 1/8" clear lite, a 0.060 clear PVB interlayer, and a 1/8" clear lite. Other manufacturer's products will be considered subject to meeting the performance criteria specified herein.
 - a. Visible Light Transmittance: 71% minimum
 - b. Solar Energy Transmittance: 32% maximum
 - c. Ultra-Violet Transmittance: < 1% maximum
 - d. Visible Light Reflectance – Exterior: 11%
 - e. Visible Light Reflectance – Interior: 12%
 - f. Solar Energy Reflectance: 29%
 - g. U-Value (Winter Nighttime): 0.29 Btu/(hr x sq.ft. x °F) maximum
 - h. U-Value (Summer Daytime): 0.28 Btu/(hr x sq.ft. x °F) maximum
 - i. Shading Coefficient: 0.43
 - j. Relative Heat Gain: 91 Btu/hr x sq. ft.
 - k. Solar Heat Gain Coefficient: 0.38 maximum.

2.3 FABRICATION

A. Window Unit Fabrication:

1. Aluminum Fabrication:
 - a. Vent and Frame: all members to be tubular; 45 degree reinforced mitered corners; crimped to extruded aluminum corner keys.
 - b. Frame and vent joints: factory sealed by window manufacturer with sealant conforming to AAMA 800.
2. Wood Fabrication: Vent and Frame:
 - a. Wood Surfaces: Wood shall be smooth and free of surface defects.
 - b. Corner Joinery: Vent and Frame connected with mortise and tenon joints; glued and stapled.
3. Composite Vent and Frame Construction: Fabricate window units with a continuous butyl tape or closed cell foam thermal/moisture barrier, located between exterior aluminum and interior wood. Fasten aluminum to wood with stainless steel ring-shanked nails at 6 inch on center spacing around perimeter of frame and sash.
4. Water control: pressure equalization compression gasket on vent interior to resist wind driven rain.
5. Weep holes: Provide exterior weep slots/holes in each sill of sufficient size to allow water drainage to exterior by gravity, but prevent ingress by insects
6. Emboss universal symbol of accessibility (1" diameter) on all operable window frames that comply with ADAAG with a contrasting color.
7. Provide 1-1/2" x 1-1/2" universal symbol of accessibility interior sign on bottom rail of operable window frames that comply with ADAAG. See section 10433 "Interior Signage".

B. Insulating Glass Units:

1. Preglaze window units at the factory using glazing method tested with unit as required and in conformance to ASTM E 2190; with visible, permanent IGCC certification label for window grade and performance requirements specified.
2. Provide 1" insulating glass units composed of two (2) sheets of minimum 3/16" thick glass (ASTM C 1048, Type I, Quality 3) permanently and hermetically sealed together at edges with manufacturer's spacer system and sealant to provide a dehydrated air space with -80 degree F dew point, passing IGCC Test CBA.
 - a. Provide tempered glass both sides.
 - b. Provide soft coat low E coating on #2 surface of exterior lite of units meeting "performance requirements" of this Specification and Drawing notes.
 - c. Airspace fill: Argon gas.
 - d. Glazing Spacer color: black

C. Finish on Aluminum Extrusions:

1. Comply with NAAMM's "Metal Finishes Manual" for recommendations for applying and designating finishes. Apply on clean extrusions free from serious surface blemishes; on exposed surfaces visible when installed product's operating vents are closed.
2. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering or shrink wrapping before shipping.
3. 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.
4. Class I, Clear Anodic AA-M12C22A41 Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker complying with AAMA 611.

D. Miscellaneous Metal Finishes:

1. Concealed Steel Items: Galvanized in accordance with ANSI/ASTM A386 to 2.0 oz/sq. ft. or primed with iron oxide paint.
2. Apply one coat of bituminous paint to concealed aluminum and steel surfaces in contact with cementitious or dissimilar materials.

E. Installation Accessories

1. Material: extruded aluminum; nominal .078" wall for panning and .062" wall for trim; with exposed surfaces finished to match window color and finish performance; install with concealed fasteners and required weatherseals. Detail installation for unrestricted expansion and contraction.
2. Exterior: preset panning; two-piece mullion cover; (two-piece head and jamb receptor with thermal break); (subsill with thermal break and end dams sealed by the window manufacturer); (sill cover); (slip-on expanders).
3. Interior: continuous clip two-piece snap trim.

PART 3 – EXECUTION

3.1 PREPARATION – GENERAL

- A. Comply with all applicable laws, rules and regulations.
- B. Inspect openings before beginning installation work. Verify that rough or masonry opening is correct and the sill is level.
- C. Assure that each window opening conforms to dimensions and tolerances taken at the time of site visit.
- D. Perform operations as necessary to prepare openings for proper installation and operation of new construction units. Verify openings are in accordance with shop drawings and Architects Drawings. Prepared openings to be in tolerance, plumb, level, and provided with secure anchoring. Window installation shall not begin until all conditions are satisfactory. Failure to do so does not relieve the Contractor from the need to furnish any and all materials, which may be required, in accordance with the specifications, without any additional costs to the Board.

3.2 PREPARATION

- A. Perform operations as necessary to prepare openings for proper installation and operation of new construction units. Verify openings are in accordance with shop drawings and Architects Drawings. Prepared openings to be in tolerance, plumb, level, and provided with secure anchoring.
- B. New Construction: Verify wall openings and adjoining air and vapor seal materials are clean, dry and ready to receive work of this Section. Verify that rough opening and masonry openings are correct and the sill plate is level.
- C. Provide and apply sealant compound, meeting AAMA 808.3, at all joints and intersections and at all other opening perimeters. Wipe off excess material and leave all exposed surfaces and joints clean and smooth. Coordinate installation with wall flashings and other components of the work.

3.3 INSTALLATION

- A. Remove new windows and accessories from crating and packaging material. Verify that all parts and accessories are included.
- B. Install in accordance with manufacturer's approved shop drawings, specifications and recommendations for installation of window units, hardware, operators and other components of work.

- C. Provide required support and securely fasten and set windows plumb, square, and level without twist or bow of frames or sash. Maintain dimensional tolerances, aligning with adjacent work. Anchor securely in place. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action. In no case shall attachment to structure or to components of the window system be through or affect the thermal barriers of the window units.
- D. Coordinate attachment and seal of air and vapor barrier materials. Install under sill and sill brake metal flashing.
- E. Pack fibrous insulation in shim spaces at perimeter to maintain continuity of thermal barrier. Wedge fiberglass insulation between frames of new windows and construction to remain, or between frames and new receptor as applicable. Compress fiberglass to no less than 50 percent of original thickness.
- F. Set sill members and other members in bed of compound, joint fillers, or gaskets per manufacturer recommendations to provide weatertight construction. Seal units per sealant manufacturer's recommendations at all other opening perimeters. Wipe off excess material and leave all exposed surfaces and joints clean and smooth.
- G. Anchor windows on all four sides with anchor clips
 1. Do not allow anchor clips to bridge thermal breaks
 2. Use separate clips for each side of thermal breaks.
 3. Make connections to allow for thermal and other movements.
 4. Do not allow building load to bear on windows.
 5. Use manufacturer's standard clips at all corners and at intermediate points not over 16" on center.
 6. Anchor clips are to be fully covered by panning or trim.
- H. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials by complying with the requirements specified in the window reference standard. Where incompatible metals join together, coat the abutting surfaces with asphaltic paint and use epoxy coated connectors.
- I. Pre-fit, pre-punch, etc., all materials so that the unit when assembled shall fit the openings and will not require any cutting, ripping or fitting on the job site other than trimming of the exterior panning to fit into the masonry opening and cutting interior trim to length by the installing crews.
- J. All voids between new window frames and adjoining construction shall be packed solid with fiberglass batt insulation before installation of interior trim or panning.
- K. Interior and exterior surfaces shall have proper contact for caulking back up. The caulking shall be in full contact with window members and exterior and interior walls providing a continuous air and water tight bead around perimeter of windows as shown on Drawings.
- L. It shall be the responsibility of the installation Contractor to repair any exterior and interior surfaces to the satisfaction of the Board approved representative damaged as a result of the installation procedures involved with the materials and products of this section.

3.4 FIELD TESTING

- A. Field Tests: Contractor shall perform and pay for onsite tests of selected newly installed windows or window system components. Test newly installed accessible awning window products as directed by the Board's Authorized Representative for air leakage and water penetration resistance.
1. All new accessible awning window products shall be field tested in accordance with AAMA 502 by an AAMA accredited laboratory as selected by the Board's Authorized Representative and engaged by the responsible Contractor. Independent testing laboratory engaged to perform tests will meet all requirements of AAMA 204.
 2. Costs for all tests, both original and retests shall be paid for by the responsible Contractor. All unsuccessful tests, both original and retest, shall be paid for by the responsible Contractor.
 3. All testing work in accordance to AAMA 502 of newly installed accessible awning window products shall commence at initial window installation and shall be completed prior to issuance of a certificate of Preliminary Acceptance for accessible awning window work; and in no case more than six months after the date of Preliminary Acceptance of the installation. Any field testing required six months beyond the date of Final Acceptance of the accessible awning window installation, will be done in accordance with AAMA 511.
 4. Testing Quantity: Erect test chambers for each window product type identified on plans. Test three (3) accessible awning window products of each type, or three (3%) percent of each type of accessible awning window products installations; whichever is greater, for air infiltration and water penetration as specified in accordance to AAMA 502 after the accessible awning window products have been completely installed.
 5. Test Parameters:
 - a. Air infiltration field tests shall be conducted at the same uniform static test pressure as the laboratory test unit. The Maximum allowable rate of air leakage shall not exceed 1.5 times the laboratory test unit for hardware and glazing types consistent with the laboratory test unit. The field test air leakage rate shall not exceed 1.5 times the maximum allowable laboratory performance specified in the testing criteria listed in Section 1.4.D & E above for any configuration.
 - b. Water penetration field tests shall be conducted at a static test pressure of 4/5 of the laboratory test performance values for hardware and glazing types consistent with the laboratory test unit. The field test water test pressure shall not be less than 4/5 of the minimum allowable laboratory performance specified in the testing criteria listed in Section 1.4.F above for any configuration.
 6. All work on accessible window products that fail the field tests shall be re-executed until the installation passes the field testing. Modify methods of installation of subsequent work to incorporate required corrections identified by the testing process.

3.5 ADJUSTING AND CLEANING

- A. Adjust operating vent and hardware to provide tight fit at contact points and at weatherstripping, for smooth operation and weathertight closure.
- B. Clean aluminum surfaces promptly after installation of windows, exercising care to avoid damage to protective coatings and finishes. Remove excess glazing and sealant compounds, dirt, and other substances. Lubricate hardware and moving parts.
- C. Clean glass promptly after installation of windows. Remove glazing and sealant compound, dirt and other substances.

- D. Remove from site all removed materials, debris, packaging, banding and all other surplus materials and equipment. All materials removed from site become property of the Contractor who shall promptly remove same and legally dispose of at no additional cost to the Board.

3.6 PROTECTION

- A. Initiate all protection and other precautions required to ensure that window units will be without damage or deterioration (other than normal weathering) at time of acceptance.
- B. Submit to Architect written recommendations for maintenance and protection of windows following Substantial Completion of window installation work.

END OF SECTION

SECTION 08661

EXTERIOR FIXED METAL WINDOW GUARDS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes: Window guards on windows where noted and shown on the drawings that comply with performance requirements specified as determined by testing manufacturer's standard assemblies representing those indicated for this Project.

1.2 SYSTEM DESCRIPTIONS AND OPERATION

- A. Metal window guards shall be designed to furnish physical deterrence against forcible entry through windows and to allow operation of windows as indicated.
- B. Window guard assemblies shall consist of, but are not limited to, a permanently fixed main frame with perforated sheet metal guard panel (operable by cam lock for maintenance purposes), concealment plates, scribes, hardware, and anchors.
- C. Window guard assemblies shall be accessible and easily operated for maintenance purposes, including window cleaning and general maintenance.
- D. Window guards over 5' wide or 8' high shall be fabricated in two sections.
- E. **Window guards shall be designed to be attached to the frames of operable (moving) lites of the aluminum windows.**
- F. **Coordination of integration and installation of exterior metal window guards to accessible awning windows where shown in Drawings.**
 - 1. **Exterior metal window guards must be fully integrated with accessible awning window units. Window guards must not interfere with proper accessible operation of awning window units, including all operating clearances and forces required by applicable accessibility codes.**

1.3 QUALITY ASSURANCE

- A. Acceptable Manufacturers:
 - 1. Items provided in the section shall be manufactured and fabricated by firms with 3 years experience in type of work specified.
 - 2. Field Support: The manufacturer shall furnish site support including installation support for installation crews.
 - 3. Manufacturers must coordinate with window manufacturers, window wall manufacturers, and other adjacent trades for sizes, alignment and anchoring.
- B. AAMA Certification: Units shall comply with AAMA CFR-200.935, "Security Screen-Heavy" and SMA 6001-2002 for impact, forced entry resistance and sag.

- C. Qualifications of Installers: Use skilled workers, experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work.
- D. Single Source Responsibility: Furnish metal window guards produced by a single manufacturer.

1.4 SUBMITTALS

- A. Product Data:
 - 1. Materials list of all parts and components of metal window guard.
 - 2. Construction details and fabrication methods.
 - 3. Profiles and dimensions of individual components.
 - 4. Data on hardware, accessories, and finishes.
 - 5. Recommendations for maintaining and cleaning exterior surfaces.
 - 6. Manufacturer's recommended installation procedures, specifications and other data required to demonstrate compliance with the specified requirements.
- B. The manufacturer's submitted installation procedures approved by the Architect will be used for the actual installation procedures used on the work.
- C. Window guard submittals shall be coordinated and submitted with the aluminum window and aluminum window wall submittals so that they can be reviewed together. Refer to other sections for requirements for window and window wall submittals.
- D. Shop Drawings: Submit complete shop drawings for metal window guards. Include information not fully detailed in manufacturer's standard product data, including details of surrounding construction locations, sills, and the following:
 - 1. Fabrication and installation of metal window guards.
 - 2. Layout and installation details, including anchors.
 - 3. Elevations at 1/4 inch = 1 foot scale.
 - 4. Typical unit elevations at 3/4 inch = 1 foot scale.
 - 5. Full-size section details of typical members, including reinforcement, stiffeners and anchoring devices.
- E. Samples
 - 1. Samples for Initial Color Selection: Submit samples of each specified finish on 10-inch long sections of members. Where finishes involve normal color variations, include sample sets showing the full range of variations; include sample sets showing the full range of variations expected.
 - 2. Perforated Metal Panel Sample: 8" x 8", of perforated metal guard panel, finished as specified.
 - 3. Full Scale Sample: If requested, furnish an assembled, operational, full-scale sample including all required items to demonstrate operation of system. Sample shall be approximately 18" x 30" showing fabrication techniques and workmanship, including all required hardware and accessories.

F. Manufacturer Certifications

1. AAMA Certification: Submit certification stating that units comply with AAMA CFR-200.935, "Security Screen-Heavy" and SMA 6001-2002 for impact, forced entry resistance and sag test reports from a qualified testing agency.
 - a. Test Requirements: Comply with test criteria of SMA 6001-2002.
 - 1) Impact Test: An impact of 100 ft. lbs of force causing a deflection of not more than 3" as specified for heaving rating.
 - 2) Sag Test: 90 lbs of weight applied for 5 minutes with permanent sag of not more than 0.063" as specified for heaving rating.
 - 3) Force Entry Test: Three loads of force: A: 150 lbs, B: 300 lbs, C: 50 lbs applied to the screen as specified for heaving rating.
2. Testing: Submit copy of test report(s) signed by an Independent Laboratory. Test reports more than four years old will not be accepted.

1.5 PRODUCT HANDLING

- A. Protection: Use all means necessary to protect materials of this Section before, during, and after installation and to protect installed work and materials of all other trades.
- B. Replacements: In the event of damage, immediately make all repairs and replacements necessary to approval of the Architect and at no additional cost to the Owner.
- C. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturers recommendations.

1.6 EXISTING CONDITIONS

- A. Existing Measurements: Check actual existing window openings by accurate field measurement before fabrication. Coordinate fabrication schedule with construction progress to avoid delay of the work.
- B. Coordinate and obtain from the field all dimensions needed for fabrication and installation of new window guards. Include field dimensions on shop drawings. Obtain dimensions and details for the operation of the new windows, blocking of the windows and adjacent framing, critical set backs, anchors, and all information needed to install the window guards.
- C. Notify the Architect in writing of any discrepancies or conditions, which are detrimental to proper and timely completion of the work. Proceeding with the erection of the work means acceptance of the existing conditions.

1.7 WARRANTY

- A. Special Warranty: Submit a written warranty signed by window guard manufacturer agreeing to repair or replace window guard components that fail in materials or workmanship within the specified warranty period. Failures include, but are not limited to, the following:
 1. Structural failures including excessive deflection.
 2. Faulty operation of window guard and hardware.
 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

- B. Warranty Period for The Window Guard Unit: 5 years after date of Preliminary Acceptance.
- C. Warranty Period for Metal Finishes: 5 years after date of Preliminary Acceptance.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers: Subject to compliance with requirements, furnish metal window guards manufactured by one of the following:
 - 1. Accurate Screening Media, Inc.
 - 2. Avant-Guards
 - 3. Exeter Architectural Products
 - 4. Kane Manufacturing Corporation.
 - 5. Air Tec
 - 6. Harmony Products Inc.

2.2 MATERIALS

- A. Extruded Aluminum: ASTM B-221, 6063-T6 alloy and temper having a minimum ultimate tensile strength of not less than 35,000-psi and a yield strength of not less than 31,000 psi.
- B. Steel Sheet, Galvannealed: ASTM A-653 (commercial quality), Coating Designation G 90, mill phosphatized, stretcher leveled.
- C. Steel Sheet, Aluminum-Zinc Coated: Commercial-quality, cold-rolled, stretcher-leveled, carbon-steel sheet, complying with the following requirements:
 - 1. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792, Class AZ-50 coating, Grade 40.
- D. Stainless-Steel Sheet: ASTM A-167, Type 304, stretcher leveled with the following mill finish suitable for application of specified paint finish:
 - 1. Polished requiring no polishing after fabrication to produce the SSINA No. 4 polished finish.
- E. Fasteners and Anchors: Fasteners and anchors and all other materials, required for a complete and operable installation, shall be non-magnetic 300 series stainless steel.
 - 1. Furnish concealed fasteners except where exposed fasteners are unavoidable.
 - 2. Where exposed in finished surfaces, use Torx tamper resistant fasteners.
- F. Steel Scribing Angle: shall be formed from 0.062 thick 1-1/4" by 1" galvannealed steel angles and shall be at head and jambs.
- G. Concealment Plates: shall be formed from 0.090" thick galvannealed steel plate of sufficient size and fastened to mainframe to conceal fasteners anchoring perforated metal panel to subframe and to conceal locking bolts.
- H. Horizontal Stiffener: The horizontal stiffener shall be located and centered at each window-meeting rail.

- I. Screen infill shall be perforated metal panel shall be minimum 18 gauge stainless steel with 5/32" diameter holes on 3/16" centers, staggered pattern and with an open area of 63% of total panel area. Paint perforated panels after punching process is complete.
- J. Locking Mechanism: Provide key operated maintenance multi-point mechanism that activates a cast metal bolt at the sill and a two directional metal lock and keeper.
- K. Hardware: Each screen shall be furnished with two or more concealed 13 gauge, minimum steel hinges with minimum 1/4" inch diameter hardened, loose stainless steel pins and integral compression guards or stainless steel pivots with minimum 1/4" diameter hardened stainless steel pins. Each screen shall have all necessary installation hardware, including fastening screws. Each screen shall come fully assembled and tested from the factory.
- L. Custodial Locks: At fixed windows and transoms, furnish a custodial-keyed locking device to allow the window to be cleaned from the exterior. For openings having a vertical dimension less than 3 feet, furnish one locking device at the mid point of the screen frame jamb. In vertical openings exceeding 3 feet furnish one lock for every 3 feet of vertical height. Locate locks on the frame jambs at quarter points.
- M. Limit Device: An adjustable arm made of galvanized steel shall be provided and located at the head, to limit the screen from swinging open past 100 degrees. Field adjustment shall be possible to accommodate existing conditions.
- N. Furnish all other materials, not specifically described but required for a complete and operable installation of the window guards.

2.3 FABRICATION

- A. Fabricate and assemble window guards at the manufacturer's shop to the fullest extent possible and before applying finishes, including, but not limited to, welding, cutting, drilling, and fitting of joints. Furnish mortising, drilling, tapping, and reinforcement required for hardware at fabrication plant prior to application of finishes.
- B. Welding: Use electrodes and methods recommended by manufacturer of material being welded, and in accordance with applicable AWS standards. Use only methods, which prevent distortion and discoloration of exposed faces. Grind weld areas smooth. Restore finish of component parts after welding and grinding.
- C. Dissimilar Materials: Separate dissimilar materials with a heavy coating of epoxy paint or other suitable permanent separation as required to prevent galvanic action.
- D. Window guards shall be side hinged or pivoted. Window guards shall be fabricated so hinges shall not carry the weight of the operable guard panel when the panel is in the closed position. Panels shall be supported on frame with plastic supports to support panel and facilitate smooth opening of the operable panel.
- E. Removal of hinge pins shall not allow access from the exterior.
- F. All hinge and latch mechanisms and fasteners shall be concealed and inaccessible from the exterior.

- G. Fasten perforated metal window guard panel to subframe using screws, spaced 4" on center maximum and concealed with a continuous angle fastened with Torx tamper resistant screws.
- H. Anchoring mechanisms shall be adjustable to accommodate variations in window openings. Adjustability range shall be 3" vertically and 3" horizontally.
- I. Vertical juncture of a pair of adjoining window guards shall occur at the centerline of the window mullions behind and shall be capped and sealed continuously at head.
- J. Weeps: Furnish weeps to drain water entering the window guards to the exterior.
- K. Fasteners used to anchor metal window guards to adjacent construction shall be installed in the plane of the wall so that during forcible entry attempts, the fasteners are stressed in shear.

2.4 FINISH

- A. Steel Finish Preparation: Prepare steel surfaces for painting as recommended by coating manufacture.
- B. Aluminum Preparation: Prepare aluminum in accordance with coating manufacturer's recommendations.
- C. Stainless Steel Preparation: Prepare stainless in accordance with coating manufacturer's recommendations.
- D. Furnish shop applied paint system after assembly consisting of Tnemec Series 161 Epoxy - Polyamide primer and Tnemec Series 74 high-build acrylic polyurethane enamel finish applied in accordance with paint system manufacturer's recommendations, minimum 3.5 mil dry.
 - 1. At the option of the manufacturer, Furnish shop electrostatically applied polyester powder coated finish. Powder coating finish shall meet or exceed AAMA 603.8.
- E. Colors: Furnish custom colors to match aluminum window framing at each window on the concealment angles and frame assembly. Balance of assembly and perforated stainless steel panel shall be matte black.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Verify that openings fit allowable tolerances are plumb, level, provide a solid anchoring surface and comply with approved shop drawings.
- B. Plumb and align faces in a single plane and erect guards square and true and adequately anchored. After completion of installation, screens shall be in proper working condition.

3.2 INSTALLATION

- A. Exterior guards shall cover those portions of windows indicated on the drawings. Guards shall be secured to substrate with anchors equally spaced and 1' - 6" on center maximum.

- B. Exterior guard installation shall be coordinated so as to not void the aluminum window manufacturer's warranty the aluminum panel manufacturer's warranty, or affect performance requirements of the windows, window walls and metal panels. Installation details and sequencing must be coordinated between all adjacent trades.
- C. Shim and allow for movement resulting from changes in thermal conditions. Furnish separators and isolators to prevent freeze-up of moving joints.
- D. Install in accordance with approved shop drawings, manufacturer's instructions, and specifications. Plumb and align faces in a single plane and erect screens square and true, adequately anchored. After completion of installation, screens shall be adjusted to insure proper operation.

3.3 DEMONSTRATION

- A. After installation and final inspection, test and demonstrate maintenance operation.

3.4 CLEANING

- A. Clean work of this section upon completion. Remove debris resulting from work of this section.

END OF SECTION

SECTION 08910 ALUMINUM WINDOW WALL

PART 1 - GENERAL

1.1 SUMMARY

Section Includes: Aluminum window wall as indicated and as specified.

1.2 SUBMITTALS

- A. Product Data: Submit copies of manufacturer's data, recommendations and standard details, including fabrication, finishing, hardware, accessories and other components of the Work.
- B. Shop Drawings: Submit Shop Drawings for the fabrication and installation and associated components of the Work signed and sealed by a licensed State of Illinois Structural Engineer. Attesting that the system conforms to "Quality Assurance" requirements of the specification. Include wall elevations at 1/2" scale, and half-size detail sections of every typical composite member. Show anchors, joint system, expansion provisions and other components not included in manufacturer's standard data. Include glazing details.
- C. Calculations: Submit structural calculations for the Aluminum Window Wall system/components signed and sealed by a licensed State of Illinois Structural Engineer.
- D. Samples: Submit a set of two (2) samples of required aluminum finish, showing extremes of color and appearance, on minimum 4" long extrusions of the alloys to be used for the Work.
 - 1. The right is reserved to require samples of typical fabricated sections, showing joints, exposed fastenings (if any), quality of workmanship, hardware and accessory items, before fabrication of the Work proceeds.
- E. Certification: Submit written certifications, signed by window wall manufacturer, attesting that system conforms to each of the "Quality Assurance" requirements of this Specification where the manufacturer's standard system has been tested in accordance with specified tests and meets performance requirements specified. Where such testing has not been accomplished, perform required tests through a recognized testing laboratory or agency and provide certified test results.
- F. Field Test Results of Mock-Up: Submit test results of air leakage test and water leakage test of mock-up in accordance with specified standards, including retesting if initial results are not satisfactory.
- G. LEED Submittal:
 - 1. LEED Credit EQ 4: Submit manufacturers' product data proving that adhesives and sealants used inside the weatherproofing system meets the testing and product requirements of the California Department of Health Services *Standard Practice for the Testing of Volatile Organic Emissions from Various sources Using Small Scale Environmental Chambers*, including 2004 addenda

1.3 QUALITY ASSURANCE

- A. Standards: Comply with the requirements and recommendations in applicable specifications and standards by NAAMM, AAMA and AA, including the terminology definitions, and specifically including the "Entrance Manual" by NAAMM, except to the extent more stringent requirements are indicated. Conform to 16 CFR 1201.
- B. Manufacturer: Provide systems by manufacturers regularly engaged in providing systems of the type required for a minimum of three (3) years and conforming to profiles and dimensions shown and this specification.
- C. Installer: Regularly engaged in installation of the types of Work required and acceptable to the system manufacturer.
- D. Wind Loading: Fabricate exterior units to withstand the wind pressure loading of 25 lbs. per sq. ft. on the gross area of the system, acting inward and also acting outward except 30 lbs. per sq. ft. at corners when tested in accordance with ASTM E 330.
- E. Deflections and Thermal Movements: Design work and internally reinforce component members to withstand wind pressures, building deflections, construction shrinkage, thermal movements and erection tolerances, within the following deflection limitations and temperature variations without causing buckling, stresses on glass, failure of joint seals, undue stress on structural elements, damaging loads on fasteners, reduction of performance or other detrimental effects. Fabricate, assemble and erect the work to maintain these limitations.
 - 1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6 inches (4.1 m), and to 1/240 of clear span plus 1/4 inch (6.35 mm), for spans greater than 13 feet 6 inches (4.1 m) or an amount that restricts edge deflection of individual glazing lites to 3/4 inch (19 mm), whichever is less.
 - 2. Deflection Parallel to Glazing Plane: Limited to amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and which reduces edge clearance between framing members and glazing or other fixed components to less than 1/8 inch (3.2 mm).
 - 3. Cantilever Deflection: Where framing members overhang an anchor point, limited to 2 times the length of cantilevered member, divided by 175.
 - 4. Thermal expansion and contraction movement capability, resulting from not less than an ambient temperature range of 120°F, which may cause a window wall material temperature range of 180°F.
 - 5. Building deflection of L/360.
- F. Story Drift: Provide glazed aluminum curtain-wall systems that accommodate design displacement of adjacent stories indicated.
 - 1. Design Displacement: H/400.
- G. Structural steel elements supporting window wall component have been designed in accordance with AAMA TIR-A11 "maximum allowable deflection of framing systems for building cladding components at design wind load."
- H. Water and Air Leakage: Design, fabricate, assemble and erect work and system of sealed joints with other work, to be permanently free of significant leakage of both water and air. Significant leakage is defined as follows, based on a differential test pressure amounting to 20% of

specified strength performance pressure required, testing a complete module of window wall work.

1. Air Infiltration (Framing): More than 0.06 cu. ft. per minute per sq. ft. (projected area of module), determined by ASTM E 283 at an inward test pressure of 6.24 PSF.
 2. Air Infiltration (Doors): Provide doors with an air infiltration rate of not more than 0.50 CFM for single doors and 1.0 for pairs of doors when tested in accordance with ASTM E 283 at an inward test pressure differential of 1.567 PSF.
 3. Water Penetration: Provide framing systems with no water penetration (excluding operable door edges) as defined in the test method when tested in accordance with ASTM E 331 at an inward test pressure differential of 8 lbf. per sq. ft.
- I. Condensation Requirements: Provide thermal-break construction which provides a condensation resistance factor (CRF) of at least 55 per the requirements of AAMA 1503.
- J. Glass Statistical Factor (Safety Factor): Glass thicknesses when shown on the Drawings are for convenience of detailing only and are to be confirmed by the Contractor and/or glass manufacturer. All glass for the size openings shown will be provided in thicknesses such that the probability of breakage at the "Design Wind Pressure" will not exceed 8 lights per 1000 lights (S.F. 2.5
- K. Thermal Performance: Provide window wall system and doors having maximum U-factor of 0.57 for fixed units and 0.67 for operable units as determined in accordance with NFRC 100 by a laboratory accredited by a nationally recognized accreditation organization such as the National Fenestration Rating Council and labeled and certified by the manufacturer; and assembly maximum solar heat gain coefficient (SHGC) of 0.49 for north orientation and 0.39 for all other orientations for overall glazed area as determined in accordance with NFRC 200 by a laboratory accredited by a nationally recognized accreditation organization such as the National Fenestration Rating Council and shall be labeled and certified by the manufacturer. Shading coefficient of the center of glass multiplied by 0.86 shall be an acceptable alternate for determining compliance with the SHGC required for the overall glazed area. Shading coefficient shall be determined using special data file determined in accordance with NFRC 300. Shading coefficient shall be verified and certified by the glass unit manufacturer. U-Factors from 8.1 of ASHRAE IESHA Standard 90.1-1999 shall be an acceptable alternate for determining compliance with the U-factor criteria. Where credit is being taken for a low-emissivity coating, the emissivity of the coating shall be determined in accordance with NFRC 301. Emissivity shall be verified and certified by the window wall manufacturer.
- L. Perimeter Fire-resistive Joint System: For joints between edges of fire -resistive rated floor assemblies and window wall system, provide a system of type and rating below as determined by NFPA 285 and UL 2079.
1. UL-listed Perimeter Fire Containment system: Integrity rating equal or exceeding the fire-resistive rating of the floor or floor/ceiling assembly forming one side of the joint having the required joint width and movement classification and an L number rating.
- M. **Job Mock-Up: Prior to their installation of the work, contribute to the project mock-up shown in the Construction Drawings and as specified in Section 01410 "Preconstruction Project Mock-up". Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects, attachment and performance and set quality standards for fabrication and installation.**

PART 2 - PRODUCTS

2.1 MANUFACTURES

- A. **Description: Subject to compliance with the requirements, provide factory assembled accessible awning windows from:**
1. **Graham**
 2. **Traco**
 3. **Other manufacturer's products will be considered subject to compliance with project requirements.**

2.2 MATERIALS AND ACCESSORIES

- A. Aluminum Extrusions: Provide alloy and temper as recommended by manufacturer for strength, corrosion resistance, application of required finish and control of color, but not less than 22,000 psi ultimate tensile strength. Provide main extrusions of not less than 0.125" wall thickness.
- B. Fasteners: Aluminum, nonmagnetic stainless steel or other non-corrosive metal fasteners guaranteed by the manufacturer to be compatible with the doors, frames, stops, hardware, anchors and other items being fastened. For exposed fasteners (if any), provide Phillips flat-head screws with finish matching the item fastened.
1. Do not use exposed fasteners except where unavoidable for the assembly of units, and unavoidable for the application of hardware. Provide only concealed screws in glazing stops.
- C. Steel Reinforcement and Brackets: Manufacturer's standard formed or fabricated steel units, of shapes, plates or bars; with 2.0 oz. hot-dip zinc coating complying with ASTM A 123, applied after fabrication to brackets and rust inhibitive paint applied to reinforcing elements.
- D. Concealed Flashing: Dead soft stainless steel, minimum 26 gauge.
- E. Inserts: For required anchorage into concrete or masonry work, furnish inserts of cast iron, malleable iron or 12 gauge steel hot-dip galvanized after fabrication.
- F. Expansion Anchor Devices: Lead-shield or toothed-steel, drilled-in, expansion bolt anchors.
- G. Bituminous Coatings: Cold-applied asphalt mastic complying with SSPC-PAINT 12, compounded for 30-mil thickness per coat.
- H. Sealants and Gaskets: Provide sealants and gaskets in the fabrication, assembly and installation of the Work, which are recommended by the manufacturer to remain permanently elastic, non-shrinking, non-migrating and weatherproof for the life of the building.
1. LEED Requirement: Provide adhesives and sealants used inside the weatherproofing system meet the testing and product requirements of the California Department of Health Services *Standard Practice for the Testing of Volatile Organic emissions from Various Sources Using Small Scale Environmental Chambers*. Including 2004 addenda.
- I. Glazing Gaskets: For glazing glass, and for gaskets which are factory-installed in a "captive" assembly of glazing stops, provide manufacturer's standard stripping of molded neoprene.

J. Glazing:

1. Include a minimum 15% pre-consumer recycled glass in the prime glass (before coating). Tempered Glass: ASTM C 1048, Condition A (uncoated surfaces), Type I (transparent glass, flat), Class 1. (clear), quality q3 (glazing select), kind FT (fully tempered); free of visible tong marks.
2. Spandrel Glass: ASTM C 1048, Condition B (spandrel glass, one surface ceramic coated), Type I (transparent glass, flat), Class 1. (clear), quality q3 (glazing select), with ceramic coating applied to second surface free of pin holes, kind HS (heat strengthened) or kind FT (fully tempered).
3. Laminated Glass: Two pieces of 1/8" tempered glass as specified with inner layer of 1/8" clear polycarbonate laminated with polyurethane to allow for differential movement such as Guardvue by Viracon or equal.
4. Insulating Glass Units: Preassembled units consisting of organically sealed panes of glass enclosing a hermetically sealed dehydrated air space complying with ASTM E 774, Performance Classification "A", manufacturer's ten (10) year warranty against failure of hermetic seal of air space.
5. Refer to drawings for composition of various glazing applications and minimum performance requirements.

2.2 HARDWARE

- A. Except as indicated otherwise herein, refer to Section "Door Hardware" of these Specifications for the furnishing of hardware items. Hardware templates will be furnished to the manufacturer for the fabrication of door and frames to receive hardware. Receive the hardware and coordinate with the hardware requirements of this Section. Report discrepancies (in writing) to the Contractor.
- B. Cut, reinforce, drill and tap frames and doors as required to receive hardware, except do not drill and tap for surface-mounted items until the time of installation at the Project Site. Comply with hardware manufacturer's instructions and template requirements. Use concealed fasteners wherever possible.
- C. Install all hardware, except surface-mounted hardware, at the fabrication plant. Remove only as required for final finishing operations, and for delivery and installation of the Work at the Project Site.
- D. Projected Sash: Provide the following operating equipment and hardware:
 1. Hinges: 4-bar friction hinges with adjustable friction slide shoe (2 per vent).
 2. Sash Lock: Cam action sweep lock handle and keeper.
 - a. Provide two locks on units over 3'-6" wide.
 3. Operators For Out-Swing Units: AAMA 90.1, Concealed gear type rotary operator located on the jamb at the sill, complying with ASTM E 405, method A, when subjected to the operating moments and closing techniques indicated in AAMA 101/I.S.2.

2.3 ACCESSORIES

- A. Insect Screens: Provide insect screen units for each operable exterior sash or vent. Locate screen units on either the inside or outside of the sash, depending upon window type and location shown. Where possible, design window units and hardware to accommodate screens in a tight-fitting removable arrangement, with a minimum of exposed fasteners and latches, and without the necessity of wickets for hardware access. Where wickets are necessary, provide

either sliding or hinged type, framed and trimmed for durability during handling, and for a tight fit.

1. Fabricate screen frames of extruded or formed aluminum tubular-shaped members of 0.040" minimum wall thickness, with mitered or coped joints and concealed mechanical fasteners. Provide removable PVC spline-anchor concealing the edge of the screen frame. Finish frames to match window units.
- B. Pole Operators: Provide one pole operator and pole hanger for every room of the project that has operable aluminum windows more than 6'-0" above the floor. Fabricate pole of tubular anodized aluminum with a rubber cap at the lower end and standard push-pull hook at the top to match the hardware design. Provide sufficient length for window operation without reaching more than 5'-0" above the floor.

2.4 FABRICATION

- A. Coordination of Fabrication: Wherever possible, check the actual openings in the construction work by accurate field measurement before fabrication, and show recorded measurements on final Shop Drawings.
- B. Prefabrication: Provide each door as a "packaged entrance" unit. Complete the fabrication, assembly, finishing, application of hardware and all other Work, before shipment to the Project Site, to the greatest extent possible. Disassemble only to the extent necessary for shipment and installation.
- C. Basic Fabrication:
1. Complete the cutting, fitting, forming, drilling and grinding of all metal at the shop to the extent possible. Remove arrises from cut edges and ease edges and corners to a radius of approximately 1/64".
 2. Conceal fasteners, wherever possible, except as otherwise shown.
 3. Maintain continuity of line and accurate relation of planes and angles. Provide secure attachment and support at mechanical joints, with hairline fit of contacting members.
 4. Internally reinforce the Work as necessary for performance requirements, and for support to the structure. Separate dissimilar metals with bituminous paint or preformed separators which will prevent corrosion. Separate metal surfaces at moving joints with nonmetallic separators to prevent "freeze-up" of joints.
- D. Weather Stripping: Where exterior door stiles or head rails do not close against fixed stops equipped with compression weather stripping, provide sliding weather stripping, retained in an adjustable strip in a mortise centered in the edge of the door. Provide heavy-duty, hollow, compression weather stripping in the bottom-rail, adjustable for contact with the threshold.
- E. Stile-and-Rail Type Aluminum Doors:
1. Provide tubular frame members, fabricated with mechanical joints of heavy inserted reinforcing plates and concealed tie-rods or j-bolts, in accordance with manufacturer's standard fabrication methods; or fabricate with structurally welded joints, at manufacturer's option.
 2. Except as otherwise shown or scheduled, provide door units 1-3/4" thick.
 - a. Provide wide stile doors.
- F. Aluminum Framing:
1. Fabricate tubular and channel frame assemblies with either welded or mechanical joints using shear blocks with concealed fasteners wherever possible.

2. Provide non-removable door stops extruded integrally with frame to extent possible.
 - a. Provide compression weather stripping on the door-contact face of door stop for exterior door frames, and on other frames where indicated.
 - b. Where weather stripping is not provided, install neoprene silencers on door stops to prevent metal-to-metal contact between doors and stops.
3. Provide glazing system for frames to receive lights. Design system for replacement of glass, but for non-removal of glass from the exterior.
4. Fabricate frame assemblies for exterior walls with flashing and weeps to drain penetrating moisture to exterior. Provide anchorage and alignment brackets for concealed support of assembly from the building structure. Allow for thermal expansion of exterior units.
5. Provide all elements with thermal breaks to positively eliminate outside to inside metal contact. Provide thermal break materials certified to comply with Performance Requirements of the unit in each case (window or window wall).
 - a. Interior framing need not be thermal break construction.

G. Fabrication of Supporting Steel Elements:

1. Fabricate in accordance with AISC - Manual of Standard Practice.
2. Certify welders in accordance with requirements of AWS.
3. Fabricate and assemble in the shop to the greatest extent possible. Shear, slane cut and chip accurately and carefully.
4. Degrease, hand tool clean and apply one coat of rust-inhibitive metal primer to all elements after fabrication.

2.3 ALUMINUM FINISHES

- A. Prepare the surfaces for finishing in accordance with recommendations of the aluminum producer and the finisher or processor.
- B. Finish all components of each assembly simultaneously so as to attain complete uniformity of color. Adjust and control the direction of mechanical finishes (as specified) to achieve the best overall visual effect in the Work, as determined in consultation with the Architect.
- C. Sequence the finishing and processing of materials in a predetermined bay-bay-bay plan, which will minimize color and texture differences between adjacent components.
- D. Color and Texture Tolerance:
 1. The right is reserved to reject the Work because of color or texture variations, which are visually objectionable, but only where the variation exceeds the range of variations established by the manufacturer prior to the Work, by means of range samples which have been accepted by the Architect.
 2. Prepare range samples on extrusions of profiles and shapes of the actual members of the Work. Establish range samples to maintain a total range of 2 degrees on the green reflectance scale.
- E. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes.
- F. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.

- G. Class I, Clear Anodic AA-M12C22A41 Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker complying with AAMA 611.

2.4 GLAZING

- A. Glazing types and locations as indicated on drawings.
- B. Glass Type "G1": Not Used
- C. Glass Type "G2": 1/4" thick clear tempered glass (Safety Rated, UL 10C).
- D. Glass Type "G3": 5/16" thick Firelite Plus (Premium) Ceramic Fire-Rated Safety Glazing (Fire + Safety Rated). For B-Label openings include Pemco Doorlite Set with Pemco FG3000 Fireglaze (Compound) for setting panels in frames.
 - 1. Other manufacturer's products will be considered subject to meeting the performance criteria specified herein.
- E. Glass Type "G4": 1-inch thick Insulated Exterior Glass Assembly: Unit shall consist of a 1/4" thick clear low-E outboard lite with PPG Solarban 60 on the #2 surface, 1/2" gas cavity and a 1/4" thick clear inboard lite. Other manufacturer's products will be considered subject to meeting the performance criteria specified herein. Unit shall have the following performance characteristics:
 - 1. Visible Light Transmittance: 71% minimum
 - 2. Solar Energy Transmittance: 33% maximum
 - 3. Ultraviolet Transmittance: 19% maximum
 - 4. Visible Light Reflectance – Exterior: 11%
 - 5. Visible Light Reflectance – Interior: 13%
 - 6. Solar Energy Reflectance: 29%
 - 7. U-Value (Winter Nighttime): 0.30 Btu/(hr x sq.ft. x °F) maximum
 - 8. U-Value (Summer Daytime): 0.28 Btu/(hr x sq.ft. x °F) maximum
 - 9. Shading Coefficient: 0.44
 - 10. Relative Heat Gain: 91 Btu/hr x sq.ft.
 - 11. Solar Heat Gain Coefficient: 0.38 maximum.
- F. Glass Type "G4-S": 1-inch thick Insulated Spandrel Exterior Glass Assembly: Unit shall consist of a 1/4" thick clear outboard lite with PPG Solarban 60, a 1/2" thick gas cavity and a 1/4" thick clear inboard lite with ceramic frit on the #4 surface. Provide 70% coverage silicone spandrel coating on the #4 surface. Other manufacturer's products will be considered subject to meeting the performance criteria specified herein.
 - 1. Provide Spandrel Glazing where shown on the Drawings with ICD Opaci-Coat 300 silicone spandrel coating.
 - 2. Color: 3-0586 Medium Gray
 - 3. Unit shall have the following performance characteristics:
 - a. Visible Light Transmittance: 27% minimum
 - b. Visible Light Reflectance – Exterior: 17%
 - c. Visible Light Reflectance – Interior: 26%
 - d. U-Value (Winter Nighttime): 0.48 Btu/(hr x sq.ft. x °F) maximum
 - e. U-Value (Summer Daytime): 0.50 Btu/(hr x sq.ft. x °F) maximum
 - f. Shading Coefficient: 0.43
 - g. Solar Heat Gain Coefficient: 0.38 maximum.

- G. Glass Type "G4-L": 1-inch Thick Insulated Laminated Exterior Glass Assembly: Unit shall consist of 1/4-inch thick clear low-E tempered outboard lite with PPG Solarban 60 on the #2 surface, 1/2" gas cavity, 1/8" clear lite, a 0.060 clear PVB interlayer, and a 1/8" clear lite. Other manufacturer's products will be considered subject to meeting the performance criteria specified herein.
1. Visible Light Transmittance: 71% minimum
 2. Solar Energy Transmittance: 32% maximum
 3. Ultra-Violet Transmittance: < 1% maximum
 4. Visible Light Reflectance – Exterior: 11%
 5. Visible Light Reflectance – Interior: 12%
 6. Solar Energy Reflectance: 29%
 7. U-Value (Winter Nighttime): 0.29 Btu/(hr x sq.ft. x °F) maximum
 8. U-Value (Summer Daytime): 0.28 Btu/(hr x sq.ft. x °F) maximum
 9. Shading Coefficient: 0.43
 10. Relative Heat Gain: 91 Btu/hr x sq. ft.
 11. Solar Heat Gain Coefficient: 0.38 maximum.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Do not install component parts which are observed to be defective in any way, including warped, bowed, dented, abraided and broken members, including glass and edge damage. Remove and replace members which have been damaged during installation.\
- B. Deliver base plates for mullion anchorage in time to allow for installation. Provide setting drawings.

3.2 ERECTION TOLERANCES

- A. Limit variations from plumb, and level to the following:
 1. 1/8" maximum deviation.
- B. Limit variations from location (theoretical calculated positions in plan or elevation based on established floor lines and column lines), including variations from plumb and level, to the following:
 1. 3/8" total maximum deviation for any member at any location.
 2. 1/8" maximum change in deviation for any member at any 10' run, any direction.
- C. Limit offsets in the end-to-end and edge-to-edge alignments of adjoining and consecutive members, which form planes, continuous runs and profiles to the following:
 1. 1/16" maximum offset in any flush alignment, including any which are to be 1/2" or less out-of-flush, and including any which are separated 2" or less by a reveal or protrusion in the plane of the wall.
 2. 1/8" maximum offset in alignments which are to be out-of-flush by more than 1/2", or separated by a reveal or protrusion of more than 2" width.
- D. Provide sliding connections at top of mullions to accommodate deflections of L/360 of the floor above.

3.3 ERECTION

- A. Erect steel elements in accordance with AISC - Manual of Standard Practice.
- B. Certify welders in accordance with requirements of AWS.
- C. Do not cut, trim, weld or braze components during erection in any manner which would damage the finish, decrease the strength, or result in a visual imperfection or a failure in performance of the window wall. Return component parts which require alteration to the shop for refabrication, if possible, or for replacement by new parts, if not possible.
- D. Install components level, plumb, true to line and with uniform joints and reveals. Use erection equipment which will not mark or stain finished surfaces, and will not damage the component parts in any way.
- E. Anchor component parts securely in place by bolting, welding or other permanent mechanical attachment system, which will comply with performance requirements and permit movements which are intended or necessary. Install slip-joints wherever necessary to ensure movement as intended or necessary.
- F. Apply bituminous paint of approximately 30-mil dry film thickness, or other suitable permanent separator, on concealed contact surfaces of dissimilar materials, before assembly or installation.
- G. Wire brush and touch-up prime welded and unshop primed steel.
- H. Provide close fitting sleeves at joints to insure alignment and no open joints.
- I. Provide all closures, panels, sill and stool covers and all other accessory items required for a complete installation. Form accessories of minimum .063" aluminum.
- J. Install fire stopping in accordance with requirements to obtain fire rating.

3.4 GLAZING

- A. Protect glass units from edge damage at all times during handling and installation.
- B. Inspect for edge or surface damage and do not install defective units. The glazer is responsible for correct glass size for each opening, within the tolerances and necessary dimensions established.
- C. The glazer must examine the framing or glazing channel surfaces, backing, removable stop design, and the conditions under which the glazing is to be performed, and notify the Construction Manager in writing of any conditions detrimental to the proper and timely completion of the Work. Start of Work will evidence acceptance of conditions.
- D. Do not install glazing sealants under adverse weather conditions, or when temperatures are below or above manufacturer's recommended limitations for installation.
- E. Comply with combined recommendations of glass manufacturer and manufacturer of glazing sealants and other materials used in glazing, except where more stringent requirements are shown or specified, and except where manufacturers' technical representatives direct otherwise.

- F. Comply with "Glazing Manual" and "Glazing Sealing Systems Manual" by Flat Glass Marketing Association, except as shown and specified otherwise, and except as specifically recommended otherwise by the manufacturers of the glass and glazing materials.
- G. Before glazing begins, the Contractor shall conduct a meeting with the glass manufacturer, glazing materials manufacturer, glazer, and Construction Manager to review details of installation.
- H. Glazing Methods:
 - 1. Glaze in exact accordance with requirements necessary to obtain "quality assurance" specified hereinbefore.
 - 2. Immediately upon installation, protect glass from breakage by attachment of crossed streamers to framing held away from glass. Do not apply markers of any type to surface of glass.
 - 3. Remove and replace glass which is broken, chipped, cracked, abraded, or damaged in any other way during the installation period.
 - 4. Maintain glass in a reasonably clean condition during construction, so that it will not be damaged by corrosive action and will not contribute (by wash-off) to the deterioration of glazing materials and other surfaces.

3.5 PERIMETER FIRE CONTAINMENT SYSTEM

- A. Perimeter fire resistive joint by system: Install perimeter fire stopping system in exact accordance with manufacturer requirements.
 - 1. Owner will engage qualified independent inspecting agency to inspect fire-resistive joint systems and prepare inspection reports.
 - 2. Inspecting of completed installation of fire-resistive joint systems shall take place in successive stages as installation of fire-resistive joint system proceeds. Do not proceed with installation of joint systems for the next area until inspecting agency determines completed work shows compliance with requirements.
 - a. Inspecting agency shall state in each report whether inspected fire-resistive joint systems comply with or deviate from requirements.
 - 3. Remove and replace fire-resistive joint systems where inspections indicate that they do not comply with specified requirements.
 - 4. Additional inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
 - 5. Proceed with enclosing fire-resistive joint systems with other construction only after inspection reports are issued and fire-resistive joint systems comply with requirements.

3.6 FIELD TESTING

- A. Field Tests: Contractor shall perform and pay for onsite tests of selected newly installed windows wall system components. Test newly installed window wall products as directed by the Board's Authorized Representative for air leakage and water penetration resistance.
 - 1. All new window wall products shall be field tested in accordance with AAMA 502 by an AAMA accredited laboratory as selected by the Board's Authorized Representative and engaged by the responsible Contractor. Independent testing laboratory engaged to perform tests will meet all requirements of AAMA 204.

2. Costs for all tests, both original and retests shall be paid for by the responsible Contractor. All unsuccessful tests, both original and retest, shall be paid for by the responsible Contractor.
3. All testing work in accordance to AAMA 502 of newly installed window wall products shall commence at initial installation and shall be completed prior to issuance of a certificate of Preliminary Acceptance for window wall work; and in no case more than six months after the date of Preliminary Acceptance of the installation. Any field testing required six months beyond the date of Final Acceptance of the window wall installation will be done in accordance with AAMA 511.
4. Testing Quantity: Erect test chambers for each window product type identified on plans. Test three (3) window wall products of each type, or three (3%) percent of each type of window wall product installations; whichever is greater, for air infiltration and water penetration as specified in accordance to AAMA 502 after the window wall products have been completely installed.
5. Test Parameters:
 - a. Air infiltration field tests shall be conducted at the same uniform static test pressure as the laboratory test unit. The Maximum allowable rate of air leakage shall not exceed 1.5 times the laboratory test unit for glazing types consistent with the laboratory test unit. The field test air leakage rate shall not exceed 1.5 times the maximum allowable laboratory performance specified in the testing criteria listed in Section 1.3 H above for any configuration.
 - b. Water penetration field tests shall be conducted at a static test pressure of 4/5 of the laboratory test performance values for hardware and glazing types consistent with the laboratory test unit. The field test water test pressure shall not be less than 4/5 of the minimum allowable laboratory performance specified in the testing criteria listed in Section 1.3 H above for any configuration.
6. All work on window wall products that fail the field tests shall be re-executed until the installation passes the field testing. Modify methods of installation of subsequent work to incorporate required corrections identified by the testing process.

3.7 PROTECTION AND CLEANING

- A. Protect exposed aluminum work from damage by construction and. Use lacquer coating only if totally removed without damage to finish. Use strippable covering only if totally removed without damage to finish. Remove protection and clean surfaces and glass immediately before acceptance of building.

END OF SECTION

SECTION 14241

HYDRAULIC PASSENGER ELEVATORS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Hydraulic elevators as indicated on drawings and as specified, including hydraulic plunger and cylinder (jack); with other components of the work including fluid storage tank, pump, piping, valves, car enclosures, hoistway entrances, control systems, signal equipment, guide rails, electrical wiring, roping, buffers, and devices for operating, dispatching, safety, security, leveling, alarm, maintenance and similar required performances and capabilities.
- B. Description: Drawings are based upon custom holeless hydraulic elevator systems with specified loading. The elevator supplier/installer (Sub-Contractor) agrees to provide the follows as indicated in the drawings:
 - 1. Shaft dimensions and construction.
 - 2. Pit depth and overrun.
 - 3. Car size and scheduled capacity.
 - 4. Door configuration.
 - 5. Machine location, type and horsepower as noted.
 - 6. Space allocation for elevator and machine room.
 - 7. All specified.

1.2 SUBMITTALS

- A. Product Data: Submit manufacturer's detailed technical product data and installation instructions for each component or product, and include certified test reports on required testing. List and describe features of control system, performances, and operating characteristics.
- B. Shop Drawings: Submit plans, elevations, sections and large-scale details indicating service at each landing, coordination with building structure and relationships with other construction, and details of car enclosures, signal fixtures and hoistway entrances. Include elevating diagrams to show service to each level. Provide plan of pit, hoistway and machine room indicating equipment arrangement, elevation section of hoistway, etc. Provide BTU output for all operating equipment.
- C. Maintenance Manuals: Submit three copies of bound manual for elevator, with operating and maintenance instructions, parts listing, recommended parts inventory listing, purchase source listing for major and critical components, emergency instructions, and similar information.
- D. Wiring Diagrams: Provide diagrams detailing wiring for power, signal and control systems differentiating clearly between manufacturer-installed wiring and field-installed wiring. Indicate maximum and average power demands.

- E. Power Confirmation Sheets: Include motor horsepower, code letter, starting current, full load running current, and demand factor for applicable motors.
- F. Samples: Submit samples of exposed finishes of car enclosures, hoistway entrances, and signal equipment. Provide 4 inches to 6 inches square samples of sheet materials and 6 inches to 8 inches lengths of running trim materials.
- G. Certificates and Permits: Provide Owner with copies of all inspection/acceptance certificates and operating permits as required by governing authorities to allow normal, unrestricted use of elevators.
- H. Keys: Before acceptance of work, furnish two sets of keys for all key switches installed as part of this project, including controller cabinet, fire service, stop switch, service cabinet, inspection, independent service, security lock-off and others if provided.

1.3 QUALITY ASSURANCE

- A. Approved Installers: Companies licensed to provide and maintain elevator systems in Chicago, IL.
- B. Regulatory Requirements:
 - 1. Elevator Code: Except where more stringent requirements are indicated or imposed by governing regulations (which must be complied with), comply with applicable requirements of the "American Standard Safety Code for Elevators, Dumbwaiters, Escalators and Moving Walks" (ANSI A17.1) published by The American Society of Mechanical Engineers, hereinafter referred to as the "Code."
 - 2. Inspectors' Manual, ASME/ANSI A17.2.
 - 3. National Electrical Code, No. ANSI/NFPA 70: Comply with applicable NFPA codes, and specifically with sections relating to electrical work and elevators.
 - 4. Fire Resistance of Entrances: Comply with NFPA No. 80, and provide units bearing Underwriters' Laboratories 'B' labels.
 - 5. Accessibility Requirements: Comply with ADA "Accessibility Guidelines for Buildings and Facilities", Federal Register; and, to the extent more stringent, with Illinois Accessibility Code and City of Chicago Code.
 - 6. Chicago Code: Comply with all requirements, including special emergency operation by Fire Department.
 - 7. Surface Burning Characteristics: Provide cab wall finishes tested in accordance with ASTM E84 by an independent laboratory acceptable to authorities having jurisdiction, complying with the following:
 - a. Flame Spread: Less than 25.
 - b. Smoke Developed: Less than 450.
- C. Preconstruction Conference: Conduct preconstruction conference at the project site in compliance with requirements of Division 1 Section "Project Management and Coordination."

1.4 OPERATION PERFORMANCE

- A. The control system shall provide smooth acceleration and deceleration with 1/4-inch leveling accuracy at all landings, from no load to full rated load in the elevator, under normal or unloading conditions. The self-leveling shall, within its zone, be entirely automatic and independent of the operating device and shall correct for over travel and under travel. The car shall remain at the landing irrespective of load. Clearance between the car sill and hoistway landing sill shall not exceed 1 1/4-inches.
- B. The floor to floor performance time under the above criteria shall be 17.5-seconds, measured from the start of door close at one floor to 3/4 open at the next floor. Performance time is based on 14 feet floor to floor heights with rated speed of 100 FPM and 42 inches, two-speed doors. Performance time shall be adjusted by 0.5-seconds for each foot of travel above or below 14 feet standard. Adjustments shall also be provided for varying speeds or varying door openings arrangements.
- C. The door open time shall be 2.8-seconds for 48-inch and 2.6-seconds for 42-inch, side opening doors. Time is measured from start of door open to fully open.
- D. The door close time shall be 5.4-seconds for 48-inches and 4.7-seconds for 42-inches, side opening doors. Time is measured from start of door close to fully closed.
- E. Door Dwell Time (Hall Calls): The time doors remain open upon answering a hall call shall be based on code requirements with a door delay feature. The door delay is the minimum acceptable time from notification that a car is answering a call (lantern and audible signal) until the doors of the car start to close. Time shall be calculated by the following equation:
- $T=D / (1.5 \text{ ft/s})$
T=Total time in seconds
D=Distance from a point in the lobby 60-inches directly in front of the hall station to the centerline of the door opening.
For cars with in-car lanterns, T begins when the lantern is visible from the vicinity of the hall station and the audible signal is sounded.
- F. Door Dwell Time (Car Calls): The time doors remain open after answering a car call shall be adjustable. Initial setting shall be 4.0-seconds.
- G. The speed of the elevator shall not vary plus or minus 10-percent under loading conditions.
- H. Ride quality requirements shall include a horizontal acceleration measured inside of the cab during all conditions to not exceed 25 mg peak to peak within the 1-10 mHz range.
- I. Limit overall elevator noise emissions to the building to the following maximum A-weighted sound pressure levels in any mode of operation:
1. 55-decibels measured 3-feet from any piece of equipment in the machine room.
 2. 58-decibels measured 5-feet above the cab floor near the center during all sequences of operation, exhaust air blower and annunciators.
 3. 45-decibels measured in the elevator lobby 10-feet from the elevator doors.

1.5 PROJECT CONDITIONS

- A. Temporary Elevator Use: Not permitted.
- B. Coordination: Coordinate installation with other trades and Owner's testing agency to ensure timely, correct installation.

1.6 WARRANTY

- A. The elevators and associated equipment shall be free of defective material, imperfect work and faulty operation not due to ordinary wear and tear or improper use or care, for a period of one-year from final acceptance of elevator work. Defective work shall be repaired or replaced at no additional cost.

1.7 MAINTENANCE

- A. Maintenance Service: Provide full maintenance service by skilled competent employees of the elevator Installer for period of 12 months following date of substantial completion, including monthly preventive maintenance, performed during normal working hours. Include repair/replacement of worn or defective parts or components and lubrication, cleaning and adjusting as required for proper elevator operation in conformance with specified requirements. Include 24-hours/day, 7-days/week emergency callback services. Exclude only repair/replacement due to misuse, abuse, accidents or neglect caused by persons other than Installer's personnel.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Elevators: Subject to compliance with requirements, provide elevator systems by one of the following:
 - 1. Schindler Elevator Corporation
 - 2. ThyssenKrupp Elevator Corporation
- B. Control Valves: Provide valves manufactured by one of the following:
 - 1. EECO
 - 2. Maxton
 - 3. ThyssenKrupp Elevator Corporation
- C. Controller: Provide microprocessor control manufactured by one of the following:
 - 1. KONE, Inc.
 - 2. Motion Control Engineering (MCE)
 - 3. Otis Elevator Company
 - 4. Schindler Elevator Corporation
 - 5. ThyssenKrupp Elevator Corporation

2.2 MATERIALS AND COMPONENTS

- A. Provide manufacturer's standard or custom elevator systems, which will comply with and fulfill the requirements of elevator schedule. Where components are not otherwise indicated, provide standard components, published by manufacturer and as required for a complete system.
- B. Hydraulic Machines and Elevator Equipment: Provide manufacturer's standard single-stage hydraulic plunger-cylinder application, two-stage telescoping hydraulic plunger-cylinder application, or three-stage telescoping hydraulic plunger-cylinder application for each elevator, subject to travel distance restrictions, with electric pump-tank-control system equipment in machine room.
- C. Piping: Provide size, type and weight piping recommended by manufacturer, and provide isolation couplings to prevent sound/ vibration transmissions from power unit.
- D. Car Frame and Platform: Manufacturer's standard welded steel units.

2.3 CONTROL SYSTEMS

- A. Single Elevator Control: Provide microprocessor control system with "Simplex Selective Collective" operation.
 - 1. Momentary pressure of car or hall button, other than landing at which car is parked, shall automatically start the car and dispatch the car to the corresponding floor for which that call was registered. If a call is registered at the floor when the car is idle, the doors shall automatically open.
 - 2. When the direction of travel has been established, the car shall answer all calls corresponding to the direction of travel and shall not reverse direction until all car and hall calls, in that direction, have been answered.
 - 3. Calls registered for the opposite direction of car travel shall remain registered and shall be answered after car has completed its calls in the direction of travel.
 - 4. If no car buttons are pressed, and car starts up in response to several down calls, the car shall answer highest down call first and then reverse to collect other down calls.
 - 5. The car shall remain at the arrival floor for an adjustable interval to permit passenger transfer. Doors shall close after a predetermined interval after opening unless closing is interrupted by car door reversal device or door open button in car.
 - 6. Where two entrances are provided at any one landing door operation shall be selective.

2.4 AUXILIARY OPERATIONS/CONTROLS

- A. In addition to primary control system features, provide the following controls or operational features for passenger elevators.
 - 1. Independent Service: Provide controls to remove elevator from normal operation and provide control of the elevator from car buttons only. Close doors by constant pressure on desired destination floor button or door close button. Open doors automatically upon arrival at selected floor. Car shall travel at contract speed and shall not respond to corridor calls.

2. Fire Service Operation: Provide operation and equipment as required by Code. Provide relays, wiring and terminal strips to receive signals from the fire alarm system.
3. Key Lockout: Provide on/off key switch at each hall station to restrict use of push buttons. Key to be removable in either position. Fire Service Operation shall override all security key lockouts.
4. Motor Time Control: If the pump motor should run continuously for 20-seconds longer than period of time necessary to move the elevator (in normal operation) from the bottom floor to the top floor, a time protective device shall return the elevator to the lowest level, park and remove power from the pump motor. All control buttons, except car alarm, shall be inoperative.
5. Low Oil Control: In the event the oil level is insufficient for travel to the top floor, controls shall be provided to return the elevator to the main level and park until sufficient amount of oil is added. All control buttons, except car alarm, shall be inoperative.
6. Oil Viscosity Control: When temperature sensor determines oil is too cold, and there are no calls registered, the car shall go to the bottom landing and, as long as the doors are closed, the pump motor shall run the valve coils energized to circulate and heat the oil to the desired temperature. In the event the temperature sensor fails, a timer shall prevent continuous running of the pump motor.
7. Fan and Light Output Timer: Provide an adjustable timer (Range 1 to 10-minutes), that when activated will turn off the fan and light within the car. The time will start when the car becomes inactive. Fan and light shall automatically turn on when car becomes active.
8. Car Top Operation: Provide as required by Code.
9. Emergency Cab Lighting: Provide car-mounted, battery unit with solid-state charger to operate alarm bell and lighting, as required by Code. Battery to be rechargeable with 5-years minimum life expectancy. Provide test button in service cabinet of car station, which causes illumination of standby lighting bulbs.
10. Emergency Power Operation:
 - a. Standby Power Source: Provide controls to automatically lower the cars nonstop to the lowest landing using DC battery power source installed in machine room in event of failure of normal power. Include solid-state charger and testing means mounted in a common metal container. Provide rechargeable lead acid or nickel cadmium battery with 10-year minimum life expectancy. Provide switch in controller to disconnect unit during maintenance. Provide operating instruction adjacent to switch. Upon failure of normal power, lower elevators to designated level, open doors automatically, hold open until regular door time has expired, then close doors and shut elevator down.

2.5 MACHINE ROOM EQUIPMENT

- A. Arrange equipment in spaces shown in drawings. Provide identifying numbers on pump unit, controller, and disconnect switch.
- B. Pump Unit: Assembled unit consisting of tank, positive-displacement screw type pump, induction motor, master-type control valves combining safety features, holding, direction, bypass, stopping and manual-lowering functions, shut-off valve, oil reservoir with protected-vent opening, oil gage and outlet strainer, drip pan and connections all mounted on isolating pads. Provide thermal unit or comparable means to maintain oil at operating temperature. Enclose with removable sheet steel panels lined with sound-absorbing material.

- C. Tank: Welded and reinforced submersible type with surge control to prevent oil from leaving the tank when elevator descends, protective vent opening and overflow connection.
- D. Pump: Positive displacement pump designed to provide smooth and quiet operation. Pump shall provide 400 PSI maximum working pressure.
- E. Motor: Designed for electrohydraulic requirements. Manufactured for a minimum of 60 starts per hour.
- F. Motor Starter: Solid-state soft starter to control voltage and current utilized to start the hydraulic pump motor.
- G. Control Valves: Valves including main, leveling, safety check, up and down direction, lowering valve including down leveling and manual leveling shall be provided. Control valves shall be magnetic type and designed to open and close gradually to provide smooth control.
- H. Negative Pressure Switch: Provide factory-installed unit at valve.
- I. Muffler: Provide in discharge oil line near pump unit. Design to dampen and absorb pulsation and noise in the flow of hydraulic fluid.
- J. Piping and Oil: Provide piping, connections and oil for the system. Use isolated couplings between the pump unit and oil lines.
- K. Shutoff Valve: Manual valve in line adjacent to pump unit. Provide second valve in pit adjacent to jack unit.
- L. Sleeves: Installer shall coordinate the installation of sleeves at all wall penetrations, fill openings with fiberglass packing and seal both ends with fireproof non-hardening mastic, 1/4-inch thickness.
- M. Controller: Provide microprocessor control.
 - 1. The system shall utilize isolated solid-state input/output interface for the majority of signals. It is understood, where required by code, relay contacts are to be utilized for safety and power control considerations. The use of relays as input or output devices are not acceptable.
 - 2. All controller components shall be designed to provide the required operation as herein specified.
 - 3. All assemblies, power supplies, switches, relays and other items shall be securely mounted on a substantial, self-supporting steel frame of angles or channels and shall be totally enclosed with covers in a cabinet. Equipment shall not be mounted on any of the covers.
 - 4. All controller switches and relays shall be magnet operated with contacts of design and material to insure maximum conductivity; long life and reliable operation without overheating or excessive wear and shall provide a wiping action to prevent sticking due to fusion.
 - 5. Each device on all panels shall be properly identified by name, letter, or standard symbol that shall be neatly stencil painted (or otherwise marked), in an indelible and legible manner, on device or panel. Identification markings shall be coordinated with identical markings used on wiring diagrams. The ampere rating shall be marked adjacent to all fuse holders. All spare conductors shall be neatly formed, laced and identified.

6. System shall provide accurate and reliable car positioning utilizing tape, magnet targets and car top sensors. Systems using hoistway vanes and infrared switches are also acceptable.
7. System memory shall be provided so that data shall not be lost in the event of a power failure or disturbance.
8. Provide extender boards when computing devices are used inside a computer chassis to facilitate access to the printed circuit cards utilized.
9. Use stable capacitor or crystals as the time base for electronic time delay devices.

N. Diagnostic Tools: Provide on-board diagnostics.

2.6 HOISTWAY EQUIPMENT

- A. Guide Rails: Planed steel T-sections, Omega, Round or Hat design, suitable for elevator travel and car weight, with brackets for attachment to building structure. Provide backing to meet Code requirements.
- B. Auxiliary Rails: Where required for roped application, provide lightweight hollow formed sheet steel elevator guide rails shall be furnished to guide the sheave assembly, erected plumb and securely fastened to the building structure.
- C. Buffers: Spring type with pipe struts and braces as required. Mount on continuous channels secured to guide rails.
- D. Cylinder: Constructed of steel pipe of sufficient thickness and suitable for a working pressure of 400 pounds per square inch. Cylinders of multiple section construction shall be connected by means of external couplings. Design head to receive unit type packing and provide means to collect oil at cylinder head and pump to return to oil reservoir.
- E. Plunger: Polished seamless steel tubing or pipe. Provide stop ring electrically welded to the bottom to prevent the plunger from leaving the cylinder. Isolate plunger from car sling.
- F. Scavenger System: Provide a scavenger system that shall automatically return oil to the oil reservoir. Provide a copper tubing scavenger line with in-line strainers to filter for solids before the oil is returned to reservoir. To prevent contamination from water that might accumulate in the pit, a lock out float switch shall be provided to detect high water in the pit and prevent the oil recovery pump from operating. The scavenger system shall be secured to the pit floor to prevent the system from floating or turning upside down in a high water condition.
- G. Normal and Final Terminal Stopping Devices: Provide Code compliant assemblies.
- H. Electrical Wiring and Wiring Connections:
 1. Conductors and Connections: Copper throughout with individual wires coded and connections on identified studs or terminal blocks. Use no splices or similar connections in wiring except at terminal blocks, control cabinets and junction boxes. Provide 10% spare conductors throughout. Provide four pairs of shielded communication wires in addition to those required to connect specified items. Run spare wires from car connection points to individual elevator controllers in the machine room. Tag spares so they can be identified in the machine room.

2. Conduit: Painted or galvanized steel conduit and duct. Conduit size: 1/2-inch minimum. Do not use flexible conduit exceeding 36-inches in length. Flexible heavy-duty service cord may be used between fixed car wiring and car door switches for door protective devices.
 3. Traveling Cables: Flame and moisture-resistant outer cover. Prevent traveling cables from rubbing or chafing against hoistway or elevator equipment within hoistway. Provide minimum 4 extra wires for future added features.
 4. Life Safety: Connect smoke sensors, telephones, jacks and speakers to designated point adjacent to hoistway or in machine room.
- I. Entrance Equipment:
1. Door Hangers: Two-point suspension sheave type with provisions for vertical and lateral adjustment. Tire rollers so that no metal-to-metal contact exists. Sheaves shall be minimum of 2 1/4-inch in diameter with sealed ball or roller bearings.
 2. Door Tracks: Bar or formed, cold drawn steel with smooth hanger contact surface. Provide removable tracks for replacement.
 3. Interlocks: Provide type operable without retiring cam. Paint interlocks flat black.
 4. Closers: Spring, counterweight or spirator type.
- J. Pit Stop Switch: Provide Code compliant assemblies.
- K. Floor Numbers: Stencil paint 4-inches high floor numbers within the hoistway as required by Code.

2.7 HOISTWAY ENTRANCES

- A. Provide manufacturer's standard, hollow metal type sliding door frame hoistway entrances; complete with track systems, hardware, safeties, sills and accessories. Match car enclosure doors for size, number of door panels and door panel movement. Provide frame-section size and profile to coordinate with hoistway wall construction.
- B. Materials and Fabrication: Provide; manufacturer's standard assemblies, but not less than the following:
1. Frames: Formed stainless steel sheet, AISI Type 302/304; with manufacturer's standard No. 4 finish.
 2. Panels: Flush stainless steel construction, AISI type 302/304, with manufacturer's No. 4 finish.
- C. Sills: Extruded nickel silver, with grooved surface, 1/4-inch thickness; mill finish.
- D. Gussets: Weld three 5-inches wide gussets to the sill at each landing. One gusset at door center and one gusset at each end 10 1/2-inches from door frame. Anchor gussets to concrete.
- E. Header: Minimum 3/16-inch thick formed steel designed to support hangers. Header shall be bolted to supporting struts.
- F. Dust Covers: Removable, full length 14-gauge steel. Covers shall be made in sections for convenient access to hangers.

2.8 CAR EQUIPMENT

- A. Loading Classification and Requirements: Passenger elevator shall be designed so the elevator and sill assemblies shall carry a single-piece rolling load equal to 50 percent of the elevator capacity, as defined in ASME A17.1.
- B. Platform: Provide car platform of all steel construction consisting of a welded reinforced steel frame with 12-gauge sheet steel floor welded to the frame and reinforcing members. It shall be equipped with a nickel-silver threshold. Protect the underside of the platform against fire.
- C. Car Frame: Provide car frame fabricated from formed or structural steel members with adequate bracing to support the platform and car enclosure. Isolate the car frame from the platen plate by means of rubber isolation mounts. The buffer striking plate on the underside of the car frame plank members must fully compress the spring buffers mounted in the pit before the plunger reaches its down limit of travel.
- D. Work Light and Plug Receptacles: Provide on top and bottom of car with lamp guards.
- E. Car Guide Shoes: Provide spring mounted rubber tired roller guide shoes mounted to top and bottom of the car frame to engage the guide rails. Where Omega or Hat type rails are allowed, provide manufacturer's standard slide guide shoes.
- F. Door Operator: Provide high-speed, heavy duty master electric power door operator to automatically open and close the car and hoistway doors. The operator shall utilize velocity and distance feedback control. The doors shall be capable of smooth and quiet operation without slam or shock.
 - 1. Opening speed shall not be less than 3.0 feet per seconds with reversal in no more than 2 1/2-inches.
 - 2. An auxiliary closing device shall automatically close hoistway doors if the car leaves the landing zone.
 - 3. In case of power interruption, it shall be possible to manually operate the car and hoistway doors from inside the cab, when the car is within the landing zone.
- G. Car Door Contacts: Electrical contacts shall prevent operation of the elevator by normal operating devices unless car doors are closed or within tolerances allowed by code.
- H. Door Restrictor: Provide mechanical door restrictor to prohibit the opening of car doors by more than 4-inches when outside unlocking zone.
- I. Door Reversal System: Provide door detector that projects an infrared curtain of light guarding the door opening. Arrange to reopen doors if one beam of the curtain is penetrated. Unit shall have Transmitters and Receivers spaced at a minimum distance to provide maximum amount of protection within the height of the doorway. Systems which have the ability to turn off individual zones within the curtain will not be allowed.
- J. Differential Door Timing: Provide adjustable timers to vary the time that the doors remain open in response to a car or hall call. The doors shall remain open for four-seconds in response to a car call and five to eight-seconds for a hall call. This time shall be reduced to two-seconds, if the proximity detector is interrupted. The doors shall remain open as long as passengers are crossing the threshold.

- K. Nudging: When doors are prevented from closing for 20-seconds due to failure of the proximity device or obstruction, doors shall remain open and an alarm shall sound.
- L. Car-Top Service Guardrail: Provide on the cab top a guardrail assembly with top and intermediate rails, 42-inches and 21-inches high, respectively, with stationary posts and continuous steel toe plate to protect inspectors or service personnel when required by Code.

2.9 CAR ENCLOSURES

- A. Provide manufacturer's standard pre-engineered car enclosures, of the selections indicated. Include ventilation, lighting, ceiling finish, wall finish, access doors, doors, power door operators, sill (threshold), trim and accessories. Provide horizontal sliding doors of manufacturer's standard flush panel type, with operation and number of panels. Provide manufacturer's standard protective edge trim system for door and wall panels, except as otherwise indicated. Fabricate car with recesses and cutouts for signal equipment.
- B. Passenger Car:
 - 1. Shell: Reinforced 14 gauge textured stainless steel formed panels using Rigidized Metals, (RM), 5.WL or equal.
 - 2. Canopy: Reinforced 12 gauge furniture steel with hinged exit operable from car top only. Finish with white, reflective baked enamel.
 - 3. Front Return Panel: 14 gauge stainless steel, No. 4 finish.
 - 4. Entrance Columns: 14 gauge stainless steel, No. 4 finish.
 - 5. Transom: 14-gage stainless steel, No. 4 finish.
 - 6. Car Door Panels: Reinforced minimum 16 gauge stainless steel, RM 5.WL textured finish. Same construction as hoistway door panels. Architectural metal cladding shall wrap around leading and trailing edge of panel and return a minimum of 1/2-inch on rear side of leading edge of panels.
 - 7. Sills: Extruded nickel silver with grooved surface, 1/4-inch thickness; mill finish.
 - 8. Flooring: By others.
 - 9. Ventilation: Two-speed fan mounted in ceiling.
 - 10. Lighting: Fluorescent fixtures mounted in ceiling with protective diffuser and steel guard over fixtures on car top.
 - 11. Handrails: 1 1/4 -inches diameter stainless steel handrail with capped ends mounted on both sides and rear of the car, 32-inches above the car floor. No. 4 finish. Bolt rails through car walls from back and mount on 1 1/2-inches long solid round stainless steel standoff spacers no more than 18 inches O.C. Return handrail ends to car walls.
 - 12. Guardrails: 4-inches x 3/8-inch solid stainless steel flat stock bars mounted on both sides and rear of the car, 8-inches above car floor. No. 4 finish. Bolt rails through car walls from back and mount on 1 1/2 inches long solid round stainless steel standoff spacers no more than 18 inches O.C. Return guardrail ends to car walls.
 - 13. Pads, pad hangers and studs: Provide W. E. Palmer Company vinyl quilted pads for each wall and front returns. Provide proper cutout for car control devices. Provide W. E. Palmer Company 'Adapt-A-Clamp Eye Clamp 3000P' devices for hanging pads; one unit for each stud. Mount stainless steel studs around top perimeter of cab to support pads.

2.10 SIGNAL EQUIPMENT

- A. General: Provide signal equipment to comply with requirements indicated below:
 - 1. Provide illuminated hall-call and car-call buttons that light up when activated and remain lighted until call or other function has been fulfilled; vandal-resistant units.
 - 2. Fabricate signal equipment with exposed surfaces of stainless steel with No. 4 finish.
- B. Car Control Stations: Provide car control station in each car with flush-mounted metal faceplates, containing call button for each landing served, and other buttons, switches and controls required for specified car operation and control. Mount at height complying with ADA "Accessibility Guidelines for Buildings and Facilities", Federal Register; and, to the extent more stringent, with Illinois Accessibility or Chicago Building Code. Mount in return panel adjacent to car door. Provide operating device symbols as required by Code. Mark other buttons and switches with manufacturer's standard identification for required use or function.
 - 1. Provide a lockable service cabinet with concealed hinges. Cabinet door shall be flush with the faceplate with hairline joints. Door shall include a flush integral frame for viewing the operating permit. The window shall be constructed of durable Plexiglas or similar material and be accessible from the backside of the cabinet door. Size window to fit City of Chicago operating certificate.
 - a. Cabinet shall contain the following devices:
 - 1) Light toggle switch.
 - 2) Two-speed fan switch.
 - 3) Keyed inspection switch.
 - 4) Independent service toggle switch.
- C. Car Position Indicator: Provide segmented digital readout type with 2-inch high (minimum) indications. Locate at top of each car control station. Indicator shall provide car position and direction of travel and include an adjustable electronic floor passing chime. As the car passes or stops at a floor served by the elevator, the corresponding designation shall illuminate, and an audible signal shall sound. The audible signal shall be no less than 20-decibels with a frequency no higher than 1500 Hz.
- D. Hall Push-Button Stations: Provide vandal-resistant hall push-button station at each landing. Station shall be flush mounted with centerline of button(s) at 42-inches above finished floor. Stainless steel No. 4 finish.
- E. Car Lanterns: Provide units with illuminated "up" and/or "down" signal arrow(s) as applicable. Provide vandal-resistant units. Match material and finish of car door jambs. Adjustable chimes shall be provided that shall sound once for up and twice for the down direction of travel. The lantern shall illuminate for corresponding direction of car travel and the chime shall sound when the elevator is at a predetermined distance from the scheduled floor stop.
- F. Telephone: Provide pushbutton activated telephone in main car operating panel with speaker grille, signage and indicators. Provide automatic dialer programmed to CPS 24-hour call center.
- G. Emergency Lights: Provide fixture below car position indicator in main car control station.

- H. Alarm System: Provide emergency alarm bell properly located within building and audible outside hoistways, equipped to sound automatically in response to emergency stops and in response to "Alarm" button at each car control station.
- I. Emergency Return Switch and Box: Mount in lobby and identify purpose with permanent engraving. Provide flush-mounted box with lockable hinged cover below call button to contain keys and instructions for emergency use of elevators. Box faceplate material to match call button faceplate and contain engraved letters, "Emergency Only" in 1/2-inch tall letters.
- J. Graphics: Provide graphics required by local authorities and ADA, including but not limited to:
 - 1. No smoking. Locate in car.
 - 2. Capacity plate. Locate in car.
 - 3. Emergency use of stairways. Locate in lobbies.
 - 4. Floor designations. Locate on hoistway jambs.
 - 5. Elevator number. Locate on upper section of left jamb.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Prior to commencing elevator installation, examine hoistways, hoistway openings, pits and machine rooms, as constructed, and verify all critical dimensions, and examine supporting structure and all other conditions under which elevator work is to be installed. Notify Architect in writing of any dimensional discrepancies or other conditions detrimental to the proper installation or performance of elevator work. Do not proceed with elevator installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF ELEVATOR SYSTEM

- A. General: Comply with manufacturer's instructions and recommendations for work required during installation. Provide required facilities and installation equipment including hoist beam if required.
- B. Welded Construction: Provide welded connections for installation of elevator work where bolted connections are not required for subsequent removal or for normal operation, adjustment, inspection, maintenance and replacement of worn parts. Comply with AWS standards for workmanship and for qualifications of welding operators.
- C. Coordination: Coordinate elevator work with work of other trades, for proper time and sequence to avoid construction delays. Use benchmarks, lines and levels designated by Contractor, to ensure dimensional coordination of the work.
- D. Sound Isolation: Mount rotating and vibrating elevator equipment and components on vibration-absorption mounts, designed to effectively prevent transmission of vibrations to structure, and thereby eliminate sources of structure-borne noise from elevator system.
- E. Piping: Install pipes without routing underground.

- F. Lubrication: Lubricate operating parts of systems, including ropes, if any, as recommended by manufacturer.
- G. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails, for accurate alignment of entrances with cars. Where possible, delay final adjustment of sills and doors until car is operable in shaft. Reduce clearances to minimum, safe, workable dimension at each landing.
- H. Sills: Set sill flush with finished floor surface at landings. Coordinate with other trades to facilitate and ensure proper fastening and grouting of sills.

3.3 FIELD QUALITY CONTROL

- A. Acceptance Testing: Upon nominal completion of each elevator installation, and before permitting use of elevator (either temporary or permanent), perform acceptance tests as required and recommended by Code, and by governing regulations or agencies.
- B. Operating Tests: Load elevator to its rated capacity and operate continuously for 30 minutes over its full travel distance, stopping at each level and proceeding immediately to the next. Record temperature rise of pump motor during 30 minutes test period. Record performance failures of elevator.
- C. In addition to inspection and tests required by local authorities perform all applicable inspections and test contained in ANSI/ASME 17.2.
- D. Advise Owner, Architect and inspection department of governing agencies, in advance of dates and times tests are to be performed on elevators.

3.4 PROTECTION

- A. At completion of elevator work provide suitable protective coverings, barriers, devices, signs or such other methods or procedures to protect elevator work from damage or deterioration. Maintain protective measures throughout remainder of construction period.

3.5 FINAL ADJUSTMENTS

- A. Make a final check of each elevator operation, with Owner's personnel present and just prior to date of substantial completion. Determine that control systems and operating devices are functioning properly.

3.6 INSTRUCTIONS

- A. Instruct Owner's personnel in proper use, operations and daily maintenance of elevators. Review emergency provisions, including emergency access and procedures to be followed at time of failure in operation and other building emergencies. Train Owner's personnel in normal procedures to be followed in checking for sources of operational failures or malfunctions. Confer with Owner on requirements for a complete elevator maintenance program.

3.7 ELEVATOR SCHEDULE

Type:	Hydraulic Passenger Elevator
Capacity:	3000 lbs.
Speed:	100 FPM
Machine Type:	Hydraulic pump
Machine Location:	Room 128
Operational Control:	Selective Collective
Motor Control:	AC with Solid State Soft Starting
Power Characteristics:	3 ph 208
Stops:	4
Openings:	4
Floors Served:	1F, 1R, 2, 3.
Travel:	31 feet 7 inches.
Platform Size:	6 feet 8 inches by 4 feet 9 1/2 inches
Minimum Clear Inside:	8 feet 4 inches by 7 feet 2 3/4 inches
Entrance Size:	3'-6" wide x 7'-0" tall
Entrance Type:	Single-speed, front and rear opening
Door Operation:	Heavy Duty, Closed-Loop
Door Protection:	Infrared Detection
Car Enclosure:	Passenger Car

END OF SECTION