SECTION 08910
GLAZED ALUMINUM CURTAIN WALLS

PART 1 - GENERAL

1.01 PROVISIONS INCLUDED

A. The general provisions of the Contract, including General and Supplementary General Conditions, and Division 1 General Requirements, apply to work specified in this Section.

1.02 SUMMARY

A. This Section specifies a stick-framed glazed aluminum curtain wall system, including engineering and structural reinforcement as required.

B. Single Contractor Responsibility: The intent is to have the curtain wall subcontractor retain responsibility for the complete assembly, including engineering design, furnishing and installation of primary components listed below, and of supports, anchors, and accessories required for a complete installation. Primary components of the glazed curtain wall system include:

1. Aluminum curtain wall framing system.
2. Internal steel reinforcement.
3. Anchors, shims, fasteners, inserts, accessories, and support brackets.
4. Flashing within the curtain wall system.
5. Joint sealing within the curtain wall system.
6. Glazing into the curtain wall system.
7. Insulated metal spandrel panels.
8. Formed aluminum closure panel.

C. Related Work Specified in Other Sections:
1. Thermal insulation: Section 07210.
2. Firestopping between curtain wall and floor slabs: Section 07840.
3. Perimeter sealants: Section 07920.
4. Specifications for glass and glazing accessories: Section 08800.

1.03 REFERENCES

A. Aluminum Association (AA): Designation System for Aluminum Finishes.

B. Architectural Aluminum Manufacturers Association (AAMA):
1. AAMA 501.2: Field Check of Metal Storefronts, Curtain Walls and Sloped Glazing Systems for Water Leakage.
2. AAMA 607: Voluntary Guide Specification and Inspection methods for Clear Anodic Finishes for Architectural Aluminum."
3. AAMA 1503: Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections.

4. AAMA 2604: Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels.
5. AAMA 2605: Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.

C. American Society for Testing and Materials
1. ASTM E 283, Test Method for Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors.
2. ASTM E 330, Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
3. ASTM E 331, Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
4. ASTM E 783, Test Method for Field Measurement of Air Leakage through Installed Exterior Windows and Doors.
5. ASTM E 1105, Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Curtain Walls, and Doors by Uniform Cyclic Static Air Pressure Difference.

D. American Society of Civil Engineers (ASCE): ASCE 7, "Minimum Design Loads for Buildings and Other Structures.

E. Glass Association of North America (GANA): "Glazing Manual."

1.04 DESIGN CRITERIA

A. General: Provide glazed aluminum curtain-wall systems, including anchorage, capable of withstanding, without failure, the effects of the following:
1. Structural loads.
2. Movements of supporting structure indicated on Drawings including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
3. Dimensional tolerances of building frame and other adjacent construction.
4. Failure includes the following:
a. Deflection exceeding specified limits.
b. Thermal stresses transferred to building structure.
c. Framing members transferring stresses, including those caused by thermal and structural movements, to glazing.
d. Noise or vibration created by wind and thermal and structural movements.
e. Loosening or weakening of fasteners, attachments, and other components.
f. Sealant failure.

B. Design Wind Load: Engineer, fabricate and erect curtain wall system, including glazing, to withstand the following wind loads:

1. For elements of framing within 10 feet of salient corners, and for parapets, 38 pounds per square foot inward and outward.

2. For elements of framing located more than 10 feet from salient corners 25 psf action inward and outward.

C. Seismic Loads: Calculate according to requirements of BOCA 1999; wind loads will govern.

D. Structural-Test Performance: Provide glazed aluminum curtain-wall systems, including anchorage, capable of withstanding test pressure indicated without material and deflection failures and permanent deformation of structural members exceeding 0.2 percent of span when tested according to ASTM E 330.
1. Submit reports of tests performed on manufacturer's standard assemblies.
2. Test Pressure: 150 percent of positive and negative wind-load design pressures.
3. Test Duration: As required by design wind velocity but not less than 10 seconds.

E. Deflection of Framing Members:

1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span or 3/4 inch (19 mm), whichever is smaller.

2. Deflection Parallel to Glazing Plane: Limited to 1/360 of clear span or 1/8 inch (3.2 mm), or 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), whichever is smallest.
   a. Operable Units: Provide a minimum 1/16-inch (1.6-mm) clearance between framing members and operable units.

F. Thermal Movements: Provide glazed aluminum curtain-wall systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Range: 120°F (67°C), ambient; 180°F (100°C), material surfaces.

G. Air Infiltration: Provide glazed aluminum curtain-wall systems with maximum air leakage of 0.06 cfm/sq. ft. (0.03 L/s per sq. m) of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure differential of 6.24 lbf/sq. ft. (300 Pa).

H. Water Penetration Under Static Pressure: Provide aluminum glazed curtain-wall systems that do not evidence water penetration when tested according to ASTM E 331 at a minimum differential static pressure of 15 lbf/sq. ft. (719 Pa).

I. Average Thermal Conductance: Provide glazed aluminum curtain-wall systems with average U-factor of not more than 0.63 Btu/sq. ft. x h x deg F when tested according to AAMA 1503.

J. Condensation Resistance: Provide glazed aluminum curtain-wall systems with condensation-resistance factor (CRF) of not less than 61 when tested according to AAMA 1503.

1.05 SUBMITTALS

A. Product Data: Include manufacturer's specifications for materials and fabrication, installation instructions, and recommendations for maintenance.

B. Shop Drawings: Show adaptation of manufacturer's standard glazed aluminum curtain wall system to the project; include typical unit elevations at 1/2-inch scale and details at 3-inch scale. Show dimensions, profiles of members, anchorage system, interface with building construction, and glazing.

1. Include setting drawings, templates, and directions for the installation of anchor bolts and other anchors installed as a unit of work under other sections.

C. Engineering Calculations: Include structural analysis data signed and sealed by the qualified professional engineer responsible for its preparation. Provide sufficient information on material properties to permit Architect's structural engineer to review this analysis. Demonstrate that curtain wall design complies with the structural performance requirements, and with other structural requirements, such as points of support which may be shown in the contract documents, curtain wall dead loads, and floor deflections.

D. Samples of Metal Finish: For verification metal finish, samples on 12-inch-long sections of extrusions or formed shapes and on 6-inch-squares of aluminum sheet or plate.

E. Cutaway sample of each vertical-to-horizontal intersection of system, made from 12 inch (300-mm) lengths of full-sized components and showing details of joinery, anchorage, expansion provision, glazing, flashing and drainage.

F. Welder certificates indicating that welders comply with requirements specified in "Quality Assurance" Article.

G. Product Test Reports: Provide test reports from a qualified independent testing laboratory that show compliance of the manufacturer's stock glazed aluminum curtain wall system with performance requirements indicated based on comprehensive testing of the system by the laboratory within the last 3 years current production of the system by the manufacturer.

H. Closeout Submittals:
1. Cleaning and maintenance instructions for exposed finishes.
2. Report on instruction of Owner's personnel, signed by individuals receiving instruction.

1.06 QUALITY ASSURANCE

A. Source Limitations: Provide primary components of the aluminum curtain wall from a single manufacturer. Furnish secondary components and accessories from the same manufacturer, or from a manufacturer acceptable to the primary curtain wall manufacturer.

B. Professional Engineer: The manufacturer shall engage a professional engineer, licensed to practice in jurisdiction where project is located and experienced in providing structural design for

curtain wall systems, to prepare or supervise the preparation of the engineering calculations required under the Submittals article.

C. Installer Qualifications: Engage an experienced Installer who has successfully completed installation of glazed curtain wall systems similar in material, design, and extent to that indicated for the Project and who is acceptable to the curtain wall manufacturer.

D. Glazier Qualifications: For performing field glazing, engage an experienced glazier who has completed glazing similar in material, design, and extent to that indicated for Project with a record of successful in-service performance.

E. Welding Standards: Comply with applicable provisions of AWS D1.2, "Structural Welding Code--Aluminum." Engage welders who have satisfactorily passed AWS qualification tests for welding processes involved and who are currently certified for these processes.

F. Field-Constructed Mockup: Provide curtain wall panel for installation in the coordinated masonry, curtain wall and glazing mock-up described in Section 04810, to demonstrate aesthetic effects and quality of materials and execution.

G. Preinstallation Conference: Before beginning curtain wall installation, conduct a Pre-installation conference at the Project site with the curtain wall system manufacturer, installer, and other interested parties to review procedures, schedules, and coordination of the curtain wall installation with other elements of the Work. Comply with requirements of Section 01310, "Project Management and Coordination."

1.07 DELIVERY, STORAGE AND HANDLING

A. Comply with manufacturer's instructions for protecting, handling, and installing fabricated curtain wall components, with particular care and attention to preservation of applied finishes.

1.08 PROJECT CONDITIONS

A. Field Measurements: Take field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay.

1. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabrication without field measurements. Coordinate construction to ensure that actual dimensions correspond to guaranteed dimensions.

B. Furnish inserts at proper times for setting in concrete formwork, masonry, and similar work indicated to support curtain wall work.

1.09 WARRANTY

A. Manufacturer's Warranty: Submit a written warranty, executed by the curtain wall system manufacturer, warranting that glazed aluminum curtain wall components furnished by the manufacturer under this section are new and of good quality, free from defects, and in

conformance with the Contract documents, and further agreeing to repair or replace curtain wall components that deteriorate or are defective with respect to materials or workmanship within the specified warranty period.

1. Defects include, but are not limited to, the following:
   a. Glass breakage.
   b. Structural failures such as excessive deflection or deformation.
   c. Excessive water leakage or air infiltration.
   d. Deterioration of metals.
   e. Deterioration or discoloration of finish.

2. Warranty Period: 10 years after the date of Substantial Completion.

B. Installer's Warranty: Provide a written warranty covering workmanship of the glazed aluminum curtain wall installation, and parts and labor for replacement of components furnished by the installer outside the manufacturer's warranty, and agreeing to return to the project site and repair or replace work which is defective or does not conform to the Contract Documents.

1. Warranty Period: 3 years after the date of Substantial Completion.

C. These special warranties shall be in addition to and not in lieu of other warranties in these Contract Documents and other rights and remedies available to the Owner under these Contract Documents or under law.

PART 2 - PRODUCTS

2.01 SYSTEM DESCRIPTION

A. System Type: Pressure-glazed curtain wall, with flush glazed appearance without projecting stops, 2-1/2 inch face dimension for vertical and horizontal framing members; 5-3/4" and 7-1/4" mullion depths as shown on the Drawings.

B. Products: Subject to compliance with requirements, furnish one of the following systems:
1. Vistawall Architectural Products; "CW250 Wall"; 2-1/2" face width.
2. EFCO Corporation; "5600"; 2-1/4 inch face width.
3. Kawneer Corporation; "1600"; 2-1/2 inch face width.
4. Wausau Metals Corporation; "6250 Series SuperWall"

C. Basis of Specification: Drawings and specifications are based on EFCO "5600" curtain wall system. Minor deviations in profile and dimensions to accommodate standard curtain wall system by one of the other named manufacturers will be acceptable, provided the system otherwise complies with these specifications, and the deviations do not, in the Architect's opinion, alter the design intent. Comply with Section 01620, "Product Options and Substitutions," to propose products of another manufacturer.

2.02 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated, complying with the requirements of standards indicated below.

1. Sheet and Plate: ASTM B 209 (ASTM B 209M).

2. Extruded Bars, Rods, Shapes, and Tubes: ASTM B 221 (ASTM B 221M).

3. Extruded Structural Pipe and Tubes: ASTM B 429.

4. Welding Rods and Bare Electrodes: AWS A5.10.

B. Steel Reinforcement: ASTM A 36 (ASTM A 36M) for structural shapes, plates, and bars; ASTM A 611 for cold-rolled sheet and strip; or ASTM A 570 (ASTM A 570M) for hot-rolled sheet and strip.

C. Thermal Separator: Dual durometer, extruded polyvinyl chloride (PVC); composition, rigidity and hardness as recommended with the manufacturer to suit project conditions.

D. Glazing Gaskets: Manufacturer's standard gaskets for dry-glazed assembly.

E. Framing System Gaskets and Joint Fillers: As recommended by manufacturer for joint type.

F. Framing System Sealants and Joint Fillers: For joints within the glazed aluminum curtain wall system, furnish products specified in Section 07920, "Joint Sealants," and as follows:

1. Control and expansion joints: For sealing control and expansion joints within the curtain wall construction provide two- or multi-component polyurethane construction sealant and compatible backer rods.

2. Pigmented Narrow Joint Sealant: For sealing hairline metal-to-metal joints, furnish manufacturer's standard, solvent-release-curing, pigmented synthetic rubber sealant complying with AAMA 803.3 and formulated for sealing joints 3/16 inch or smaller in width.

G. Concealed Flashing: Dead-soft 26-gage stainless steel concealed flashing of type selected for compatibility by the manufacturer.

H. Anchors: Aluminum or steel for perimeter and floor line anchors. If steel anchors are used, provide insulation which prevents galvanic action.

I. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum or non-magnetic stainless steel.
1. Brackets not exposed to weather or abrasion may be hot-dip galvanized steel complying with ASTM A 386.
2. Provide nonstaining, nonferrous shims for installation and alignment of curtain wall work.

J. Fasteners and Accessories: Provide manufacturer's standard non- corrosive fasteners and accessories compatible with materials used in the framing system and with exposed portions that match finish of the curtain wall system. Where movement is expected, provide slip-joint linings of sheets, pads, shims, or washers of fluorocarbon resin or a similar material recommended by the manufacturer.

1. Where fasteners anchor into aluminum less than 0.125-inch thick, provide noncorrosive pressed-in splined grommet nuts or other type reinforcement to receive fastener threads.

K. Concrete or Masonry Inserts: Cast-iron, malleable iron or hot-dip galvanized steel inserts complying with ASTM A 386.

L. Bituminous Paint: Cold-applied asphalt-mastic paint complhing with SSPC-Paint 12, except containing no asbestos; formulated for 30-mil (0.762 mm) thickness per coat.

2.03 INSULATED METAL INFILL PANELS

A. Panel Fabrication: Manufacturer's standard laminated aluminum-faced panels made up of two sheets of aluminum bonded to stabilizer sheets with a foamed insulation core.

1. Panel Thickness: 1-inch.
2. Exterior Face Sheet: 0.032 inch (0.8 mm) thick minimum aluminum, smooth texture, Class 1 clear anodized finish.
3. Stabilizer Sheets: 1/8-inch-thick tempered hardboard.
4. Core: Rigid, closed-cell, polyisocyanurate thermal insulation with an aged thermal-resistively value of 7.2°F x h x sq. ft./Btu x in. at 75°F (50 K x m/W at 24°C).
5. Interior Face Sheet: 0.032 inch (0.8 mm) minimum thickness aluminum, mill finish.

B. Tolerances:
1. Flat with no deviations in plane exceeding 1/16 inch in 24 inches (1.5 mm in 6000 mm) or 1/8 inch (3 mm) over the entire panel.
2. Length and Width: 0.8% of panel dimension.
3. Thickness: ±1/16 inch.

C. Fabricate panels so that, when the panels are installed, the grain on the face sheets will run vertically on all panels.

2.04 FORMED ALUMINUM CLOSURE PANELS

A. Form panels from sheet material as detailed. Finish to match aluminum framing. Attach panel before placing insulation and spandrel panel.

2.05 METAL FINISHES

A. General: Comply with the NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.

B. Finish designations prefixed by "AA" conform to the system established by the Aluminum Association for designating aluminum finishes.

C. Class I, Clear Anodic Finish: 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.

1. Application: Exterior-exposed components and both sides of doors.

2.06 DESIGN AND FABRICATION

A. Engineering: Engineer curtain wall to meet performance requirements specified, with spans and profiles shown, and employing points of supports indicated on structural drawings. Provide internal reinforcing as necessary.

B. Provide structural subframes, subsills, and reinforcing as necessary to meet performance requirements. Provide shear blocks for fastening of mullions.

C. Fabricate curtain wall rails and mullions from extruded aluminum members of size and profile shown on drawings; minimum extrusion thickness for vertical and horizontal mullions 0.125 inches. Form shapes with sharp profiles, straight and free of defects or deformations.

1. Protect exposed metal finishes from damage during fabrication.

2. Project requires special mullion cover shapes; refer to Drawings.

D. Fabricate components that, when assembled, have the following characteristics:
1. Accurately fitted joints with ends coped or mitered.
2. Internal guttering systems or other means to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.
3. Physical and thermal isolation of glazing from framing members.
4. Accommodations for thermal and mechanical movements of glazing and framing to prevent glazing-to-glazing contact and to maintain required glazing edge clearances.
5. Concealed fasteners.

E. After fabrication, clearly mark components to identify their locations in the Project according to the approved Shop Drawings.

F. Prepare components to receive concealed fasteners and anchor and connection devices.

G. Drainage; Control of Water: Fabricated components to drain to the exterior water passing joints, condensation occurring in glazing channels, condensation occurring within framing members, and moisture migrating within the system.

H. Thermal Break: Fabricate aluminum members with a flexible, non-metallic thermal break between interior and exterior metal components; maintain at least 3/8 inch (0.5 mm) gap between metal components; locate thermal break to exterior side of glass plane.

I. Factory-Assembled Frame Units:

1. Rigidly secure nonmovement joints.
2. Seal joints watertight, unless otherwise indicated.
3. Pressure equalize system at its interior face.

J. Welding: If welding is required for assembly, comply with referenced AWS standard and approved Shop Drawings. Weld before finishing components. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

K. Provisions for Glazing:

1. Design system for glazing from exterior.

2. Provide clearances for type of glass indicated according to the GANA "Glazing Manual" or the glass manufacturer's recommendations, whichever requires greater clearances.

3. Design system for dry-glazing with pressure plate and snap-on cover, with manufacturer's standard dense EPDM gaskets at interior and exterior.

L. Metal Protection: Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with specified metal coating or by applying sealant or tape recommended by manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

M. Flashing and Running Trim: Brake-formed or extruded aluminum of thicknesses indicated, finished to match curtain wall framing, formed with clean, sharp bends, arrises, lines, and edges. Make provision for expansion in long runs of flashing and trim; fabricate expansion joints with clips and splice-plates behind. Furnish splice plates, clips, cleats, and other accessories and fasteners necessary for complete, and watertight, installation.

1. Sill Flashing: 0.060 inch minimum thickness

2. Running Trim: 0.080 inch minimum thickness. Fabricate in 8' to 10' lengths.

3. Splice Plates: Same material, gauge, and finish as the items being spliced.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of glazed aluminum curtain wall system. Verify that openings are dimensionally within allowable tolerances, plumb and level, and provide a solid anchoring surface. Do not proceed with installation until unsatisfactory conditions have been corrected or accommodations acceptable to Architect have been made.

3.02 PREPARATION

A. Clean openings into which curtain wall is going to be installed; remove loose material and contaminants which may damage finishes.

B. Inspect curtain wall components before installation and discard and replace damaged members.

3.03 ERECTION TOLERANCES

A. Erection Tolerances: Install glazed aluminum curtain wall system to comply with the following maximum tolerances:

1. Plumb: 1/8 inch in 10 feet (3 mm in 3 m); 1/4 inch in 40 feet (6 mm in 12 m).

2. Level: 1/8 inch in 20 feet (3 mm in 6 m); 1/4 inch in 40 feet (6 mm in 12 m).

3. Alignment: Where surfaces abut in line, limit offset from true alignment to 1/16 inch (1.5 mm); where a reveal or protruding element separates aligned surfaces by less than 2 inches (50.8 mm), limit offset to 1/2 inch (12.7 mm).

4. Location: Limit variation from plane or location shown on Shop Drawings to 1/8 inch in 12 feet (3 mm in 3.7 m); 1/2 inch (12.7 mm) over total length.

3.04 INSTALLATION

A. General: Install curtain wall in strict accordance with manufacturer's printed instructions, and with approved shop drawings. Comply with manufacturer's written instructions for protecting, handling, and installing glazed aluminum curtain wall system. Do not install damaged components. Fit joints to produce hairline joints free of burrs and distortion. Rigidly secure non-movement joints. Seal joints watertight, unless otherwise indicated. Provide means to drain water to the exterior to produce a permanently weatherproof system.

B. Set sill members in a bed of butyl sealant for watertight performance.

C. Metal Protection: Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

D. Install components and flashing as required to drain water to the exterior, including water passing joints, condensation occurring in glazing channels, condensation occurring within framing members, and moisture migrating within the system.

E. Apply sealants and gaskets at joints and intersections within the curtain wall to provide a weather tight installation. Comply with applicable provisions of Section 07920, Joint Sealants. Wipe off excess sealant and leave exposed surfaces and joints clean.

F. Install framing members plumb and true in alignment with established lines and grades.

G. Anchorage: After system components are positioned, fix connections to building structure as indicated on Shop Drawings.

1. Provide separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.

H. Welding: Weld components to comply with referenced standard and Shop Drawings, unless otherwise indicated. Weld in concealed locations to minimize distortion or discoloration of finish. Protect glazing surfaces from welding.

I. Install gaskets, fillers and sealants at joints and intersections within the curtain wall system to provide a weather-tight installation.

J. Clean the completed system, inside and out, promptly after erection and installation of glass and sealants, allowing for nominal curing of liquid sealants.

3.05 GLAZING

A. Install vision glass, spandrel glass, and insulated metal panels in accordance with curtain wall manufacturer's printed instructions, and with the combined recommendations of manufacturers of glass, sealants, gaskets, and other glazing materials, and with recommendations in referenced glazing publications, where these are more stringent.

B. Examination: Before installing glass or insulated metal panels, examine aluminum framing, with glazier present, for compliance with the following; do not proceed with installation until unsatisfactory conditions have been corrected.
1. Manufacturing and installation tolerances, including those for size, squareness, offsets at corners.
2. Presence and functioning of water control system.
3. Minimum required face or edge clearances.
4. Effective sealing between joints of glass-framing members.

C. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove dirt and debris. Remove coatings that are not firmly bonded to substrates.

D. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

E. If necessary, prime joint surfaces where required by manufacturer to promote adhesion of sealants.

F. Setting Blocks, Spacers, Edge Blocks:

1. Install elastomeric setting blocks in sill rabbets. Size and locate blocks to comply with referenced glazing standard, unless otherwise required by glass manufacturer. Set blocks in thin course of heel bead sealant.

2. Provide spacers for glass sizes larger than 50 united inches (length plus height) to maintain required face clearances, unless gaskets or glazing tapes will perform this function. Locate spacers directly opposite each other on inside and outside face of glass.
   a. Spacer Thickness: For sealant glazing, match sealant thickness; when using glazing tape, furnish spacer in thickness slightly less than final compressed thickness of glazing tape.
   b. Bite on glass: 1/8-inch minimum.

3. Provide edge blocks to comply with requirements of referenced glazing publications, unless otherwise required by glass manufacturer.

G. Protect glass from edge damage during handling and installation by using a rolling block and suction cups to move glass; do not use pry bars. Install glass with flares or bevels at top of opening, unless otherwise indicated by manufacturer's label.

1. Remove damaged glass from Project site and legally dispose of off site. Damaged glass is glass with edge damage or other imperfections that, when installed, weaken glass and impair performance and appearance.

H. Set glass lights in each series with uniform pattern, draw, bow, and similar characteristics.

I. Secure glass and make it weathertight with gaskets in accordance with curtainwall manufacturer's standard details. Square cut gaskets at corners, butt joints, and seal corner with sealant recommended by gasket manufacturer. Install gaskets so they protrude past face of glazing stops. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lights.

1. Provide adequate anchorage for roll-in or drive-in wedge-shaped gaskets so gaskets cannot walk out when installation is subjected to movement.

J. Immediately after installation, attach crossed streamers to framing held away from glass to caution construction workers against damaging the glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.

3.06 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing agency to perform testing indicated.

B. Water Spray Test: After completing the installation of 75-feet-by-2-story minimum area of glazed aluminum curtain wall system, test system for water penetration according to AAMA 501.2 in a 2-bay area directed by Architect.

C. Adjust installation until there is no water penetration and air leakage is within specified limits. Replace components that cannot be adjusted to meet the specified requirements.

D. Repair or remove that is damaged by testing; replace to conform to specified requirements.

3.07 CLEANING AND TOUCH UP

A. Clean aluminum and glass surfaces promptly after installation. Use cleaning materials and methods recommended by the manufacturers of the metal coating and glass. Take care not to damage metal finish or glass. Remove excess glazing and sealant compounds, dirt, and other contaminants.

B. Touch up damaged finish in accordance with AAMA recommendations for field repair. For painted finish, use touch-up system matching shop-applied finish. Replace components which cannot be repaired to Architect's satisfaction.

3.08 PROTECTION

A. Protect installed curtain wall from damage throughout the rest of the construction period. Comply with curtain wall manufacturer recommendations for proper procedures for protection and cleaning.

B. Protect glass from contact with contaminating substances resulting from construction operations, including weld spatter. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately using methods recommended by glass manufacturer.

C. Examine glass surfaces adjacent to or below masonry at frequent intervals during construction but not less than once a month, and remove dirt, scum, alkali deposits and stains so that they do not build up.

3.09 INSTRUCTION OF OWNER'S PERSONNEL

A. Prior to the time scheduled for Substantial Completion, demonstrate proper cleaning methods and materials to the Owner's maintenance personnel. Arrange this instruction at a time convenient to the Owner; allow at least 4 hours.

3.10 FINAL CLEANING AND GLASS REPLACEMENT

A. Just prior to inspection to establish the date of Substantial Completion, remove and replace glass that is broken, chipped, cracked, abraded or otherwise damaged, whether such damage was caused by the Contractor, or the Contractor's Sub-Contractors, or by natural causes, accidents or vandalism.

B. Not more than 4 days prior to date scheduled for inspection to establish the date of Substantial Completion, clean aluminum curtain wall system thoroughly and wash glass on both faces. Use cleaning methods and materials recommended by the coating and glass manufacturers.

END OF SECTION 08910