

## SECTION 084426 - STRUCTURAL-SEALANT-GLAZED CURTAIN WALLS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:

- 1. Factory-glazed two-sided structural-sealant-glazed curtain wall system with aluminum framing.

- B. Related Sections:

- 1. Division 7 Section "Building Insulation" for insulation materials field installed with structural-sealant-glazed curtain-wall systems.
  - 2. Division 7 Section "Fire-Resistive Joint Systems" and "Building Insulation" for perimeter fire-containment systems (safing insulation) field installed with structural-sealant-glazed curtain-wall systems.
  - 3. Division 7 Section "Joint Sealants" for installation of joint sealants installed with structural-sealant-glazed curtain-wall systems and for sealants to the extent not specified in this Section.
  - 4. Division 8 Section "Glazing" for insulating-glass requirements.

#### 1.3 PERFORMANCE REQUIREMENTS

- A. General: Provide structural-sealant-glazed curtain-wall systems, including anchorage, capable of withstanding, without failure, the effects of the following:

- 1. Structural loads.
  - 2. Thermal Movements
  - 3. Movements of supporting structure indicated on Drawings including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
  - 4. Dimensional tolerances of building frame and other adjacent construction.
  - 5. Failure includes the following:
    - a. Deflection exceeding specified limits.
    - b. Thermal stresses transferred to building structure.
    - c. Framing members transferring stresses, including those caused by thermal and structural movements, to glazing.
    - d. Glazing-to-glazing contact.
    - e. Noise or vibration created by wind and thermal and structural movements.
    - f. Loosening or weakening of fasteners, attachments, and other components.
    - g. Sealant failure.

- B. Delegated Design: Design aluminum-framed systems, including comprehensive engineering analysis by a qualified Licensed Engineer in the State of NJ, using performance requirements and design criteria indicated
- C. Structural Sealant: Capable of withstanding tensile and shear stresses imposed by curtain-wall systems without failing adhesively or cohesively. Provide sealant that fails cohesively before sealant releases from substrate when tested for adhesive compatibility with each substrate and joint condition required.
1. Adhesive failure occurs when sealant pulls away from substrate cleanly, leaving no sealant material behind.
  2. Cohesive failure occurs when sealant breaks or tears within itself but does not separate from each substrate because sealant-to-substrate bond strength exceeds sealant's internal strength.
- D. Structural-Sealant Joints: Designed to produce tensile or shear stress in structural-sealant joints of less than 20 psi.
- E. Structural Loads:
1. Wind Loads: As indicated on Drawings.
- F. Structural-Test Performance: Provide structural-sealant-glazed curtain-wall systems as follows:
1. When tested at positive and negative wind-load design pressures, systems do not evidence deflection exceeding specified limits.
  2. When tested at 150 percent of positive and negative wind-load design pressures, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
  3. Test Duration: As required by design wind velocity but not less than 10 seconds.
- G. Deflection of Framing Members:
1. Deflection Normal to Wall Plane: Limited to  $1/175$  of clear span for spans up to 13 feet 6 inches and to  $1/240$  of clear span plus  $1/4$  inch for spans greater than 13 feet 6 inches or an amount that restricts edge deflection of individual glazing lites to  $3/4$  inch, whichever is less.
  2. Deflection Parallel to Glazing Plane: Limited to  $1/360$  of clear span or  $1/8$  inch, whichever is smaller.
  3. Cantilever Deflection: Where framing members overhang an anchor point, limited to 2 times the length of cantilevered member, divided by 175.
- H. Thermal Movements: Provide structural-sealant-glazed 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 Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
  2. Test Performance: No buckling, stress on glass, glazing edge-seal failure, sealant failure, excess stress on curtain-wall framing, anchors and fasteners, or reduction of performance when tested according to AAMA 501.5.
    - a. Test High Exterior Ambient Air Temperature: That which produces an exterior metal surface temperature of 180 deg F (82 deg C).
    - b. Test Low Exterior Ambient Air Temperature: 0 deg F (minus 18 deg C).
    - c. Test Interior Ambient Air Temperature: 75 deg F (24 deg C).

- I. Air Infiltration: Provide structural-sealant-glazed curtain-wall systems with maximum air leakage of 0.06 cfm/sq. ft. of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure differential of 6.24 lbf/sq. ft..
- J. Water Penetration Under Static Pressure: Provide structural-sealant-glazed curtain-wall systems that do not evidence water penetration when tested according to ASTM E 331 at a minimum differential static pressure of 20 percent of positive design wind load, but not less than 10 lbf/sq. ft..
- K. Water Penetration Under Dynamic Pressure: Provide structural-sealant-glazed curtain-wall systems that do not evidence water leakage when tested according to AAMA 501.1 under dynamic pressure equal to 20 percent of positive design wind load, but not less than 10 lbf/sq. ft..
  - 1. Maximum Water Leakage: No uncontrolled water penetrating systems or appearing on systems' normally exposed interior surfaces from sources other than condensation. Water controlled by flashing and gutters that is drained to exterior and cannot damage adjacent materials or finishes is not considered water leakage.
- L. Condensation Resistance: Provide structural-sealant-glazed curtain-wall systems with condensation-resistance factor (CRF) of not less than 55 when tested according to AAMA 1503.
- M. Average Thermal Conductance: Provide structural-sealant-glazed curtain-wall systems with average U-factor of not more than 0.66 Btu/sq. ft. x h x deg F when tested according to AAMA 1503.

#### 1.4 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of product indicated.
- B. Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication and assembly of structural-sealant-glazed curtain-wall systems.
  - 1. Include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Samples for Initial Selection: For units with factory-applied color finishes.
- D. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
- E. Fabrication Sample: Of each vertical-to-horizontal intersection of systems, made from 12-inch lengths of full-size components and showing details of the following:
  - 1. Joinery.
  - 2. Anchorage.
  - 3. Expansion provisions.
  - 4. Glazing.
  - 5. Flashing and drainage.
- F. Welding certificates.
- G. Qualification Data: For Installer.
- H. Preconstruction Sealant Test Reports: Compatibility and adhesion test reports from sealant manufacturer indicating that materials forming joint substrates and joint-sealant backings have been tested for

compatibility and adhesion with sealants; include sealant manufacturer's interpretation of test results for sealant performance and recommendations for primers and substrate preparation needed to obtain adhesion.

- I. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for structural-sealant-glazed curtain-wall systems.
- J. Field quality-control test and inspection reports.
- K. Warranties: Special warranties specified in this Section.

#### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Capable of assuming engineering responsibility and performing work of this Section and who is acceptable to manufacturer.
  - 1. Engineering Responsibility: Preparation of data for structural-sealant-glazed curtain-wall systems including the following:
    - a. Shop Drawings based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project and submission of reports of tests performed on manufacturer's standard assemblies.
    - b. Quality-control program development and reporting complying with ASTM C 1401 recommendations including, but not limited to, system material qualification procedures, preconstruction sealant-testing program, and procedures and intervals for system fabrication and installation reviews and checks.
- B. Testing Agency Qualifications: An independent agency qualified according to ASTM E 699 for testing indicated.
- C. Product Options: Information on Drawings and in Specifications establishes requirements for systems' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.
  - 1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.
- D. Welding: Qualify procedures and personnel according to AWS D1.2, "Structural Welding Code--Aluminum."
- E. Structural-Sealant Glazing: Comply with recommendations in ASTM C 1401, "Guide for Structural Sealant Glazing."
- F. Structural-Sealant Joints: Design reviewed and approved by structural-sealant manufacturer.
- G. Mockups: Build mockups to demonstrate aesthetic effects and set quality standards for fabrication and installation.
  - 1. Build mockup of typical wall area as shown on Drawings.

2. Field testing shall be performed on mockups according to requirements in Part 3 "Field Quality Control" Article.

#### 1.6 PROJECT CONDITIONS

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

#### 1.7 WARRANTY

- A. Special Assembly Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of structural-sealant-glazed curtain-wall systems that do not comply with requirements or that deteriorate as defined in this Section within specified warranty period.
  1. Failures include, but are not limited to, the following:
    - a. Structural failures including, but not limited to, excessive deflection.
    - b. Noise or vibration caused by thermal movements.
    - c. Adhesive or cohesive sealant failures.
    - d. Water leakage.
    - e. Failure of operating components to function normally.
  2. Warranty Period: 10 years from date of Substantial Completion.
- B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes fail within specified warranty period. Warranty does not include normal weathering.
  1. Warranty Period: 20 years from date of Substantial Completion.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Basis-of-Design Product: The design for structural-sealant-glazed curtain-wall systems is based on "Reliance Curtain Wall System" by Oldcastle Building Envelope. Subject to compliance with requirements, provide the named product or a comparable product by an approved manufacturer, including, but not limited to one of the following:
  1. Arch Aluminum & Glass Co., Inc.
  2. EFCO Corporation.
  3. Kawneer.
  4. United States Aluminum.
  5. Wausau Window and Wall Systems.
  6. YKK AP America Inc.

## 2.2 FRAMING SYSTEMS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
  - 1. Sheet and Plate: ASTM B 209.
  - 2. Extruded Bars, Rods, Shapes, and Tubes: ASTM B 221.
  - 3. Extruded Structural Pipe and Tubes: ASTM B 429.
  - 4. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.
- B. Steel Reinforcement: With manufacturer's standard corrosion-resistant primer complying with SSPC-PS Guide No. 12.00 applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.
  - 1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
  - 2. Cold-Rolled Sheet and Strip: ASTM A 611.
  - 3. Hot-Rolled Sheet and Strip: ASTM A 570/A 570M.
- C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
- D. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
  - 1. Where fasteners are subject to loosening or turn out from thermal and structural movements, wind loads, or vibration, use self-locking devices.
  - 2. Reinforce members as required to receive fastener threads.
  - 3. At movement joints, use slip-joint linings, spacers, and sleeves of material and type recommended by manufacturer.
- E. Anchors: Three-way adjustable anchors that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.
  - 1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.
- F. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.
- G. Framing Gaskets: As recommended by manufacturer for joint type.
- H. Framing Sealants: As recommended by manufacturer for joint type.

## 2.3 GLAZING SYSTEMS

- A. Glazing: Factory glazed as specified in Division 8 Section "Glazing."
- B. Spacers, Setting Blocks, Gaskets, and Bond Breakers: Manufacturer's standard permanent, nonmigrating types compatible with sealants and suitable for joint movement and system performance requirements.
- C. Glazing Sealants: As recommended by manufacturer for joint type, refer to Division 7 Section "Joint Sealants." and as follows:

1. Structural Sealant: ASTM C 1184, neutral-curing silicone formulation compatible with system components with which it comes in contact, specifically formulated and tested for use as structural sealant, and approved by structural-sealant manufacturer for use in curtain-wall systems indicated.
  - a. Color: Black.
  - b. Type: Single component.
  - c. Minimum Tensile Strength: 50 psi.
  - d. Modulus of Elasticity: As required by structural-sealant-glazed curtain-wall system design to meet performance requirements.
  
2. Weatherseal Sealant: ASTM C 920 for Type S, Grade NS, Class 25, Uses NT, G, A, and O; neutral-curing silicone formulation compatible with structural sealant and other system components with which it comes in contact; and recommended by structural- and weatherseal-sealant and curtain-wall manufacturers for this use.
  - a. Joint Movement Capability: Accommodates a 50 percent increase or decrease in joint width at time of application when measured according to ASTM C 719.
  - b. Color: Matching structural sealant.

#### 2.4 ACCESSORY MATERIALS

- A. Perimeter Fire-Containment Systems (Safing Insulation): Specified in Division 7 Section "Fire-Resistive Joint Systems" and "Building Insulation."

#### 2.5 FABRICATION

- A. Form aluminum shapes before finishing, as follows:
  1. First Floor Curtain Wall: 6-inch by 2-1/2-inch
  2. Clearstory Curtain Wall: 4-1/2-inch by 2-1/2-inch
  
- B. Fabricate components that, when assembled, have the following characteristics:
  1. Sharp profiles, straight and free of defects or deformations.
  2. Accurately fitted joints with ends coped or mitered.
  3. Internal guttering systems or other means to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.
  4. Physical and thermal isolation of glazing from framing members.
  5. Accommodations for thermal and mechanical movements of glazing and framing to prevent glazing-to-glazing contact and to maintain required glazing edge clearances.
  6. Structural-sealant joints that do not carry gravity loads of glazing.
  7. Provisions for field replacement of glazing from exterior. Include accommodations for using temporary support device (dutchman) to retain glazing in place while sealant cures.
  
- C. 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.
  
- D. Factory-Assembled Frame Units:
  1. Rigidly secure non-movement joints.
  2. Seal joints watertight, unless otherwise indicated.
  3. Pressure equalize system at its interior face.

4. Install glazing to comply with requirements in Division 8 Section "Glazing." Prepare surfaces that will contact structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.
- E. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

## 2.6 ALUMINUM FINISHES

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- C. High-Performance Organic Finish (3-Coat Fluoropolymer): AA-C12C40R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: conversion coating; Organic Coating: manufacturer's standard 3-coat, thermocured system consisting of specially formulated inhibitive primer, fluoropolymer color coat, and clear fluoropolymer topcoat, with both color coat and clear topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA 2605 and with coating and resin manufacturers' written instructions.
  1. Color and Gloss: As selected by Architect from manufacturer's full range.

## 2.7 SOURCE QUALITY CONTROL

- A. Perform quality-control procedures complying with ASTM C 1401 recommendations including, but not limited to, system material qualification procedures, sealant testing, and system fabrication reviews and checks.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

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

### 3.2 INSTALLATION

- A. General:
  1. Comply with manufacturer's written instructions.
  2. Do not install damaged components.
  3. Fit joints to produce hairline joints free of burrs and distortion.
  4. Rigidly secure nonmovement joints.



5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
6. Weld components in concealed locations to minimize distortion or discoloration of finish. Protect glazing surfaces from welding.
7. Seal joints watertight unless otherwise indicated.

B. Metal Protection:

1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape or installing nonconductive spacers as recommended by manufacturer for this purpose.
2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within glazed aluminum curtain wall to exterior.

D. Install components plumb and true in alignment with established lines and grades.

### 3.3 ERECTION TOLERANCES

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

1. Plumb: 1/8 inch in 10 feet; 1/4 inch in 40 feet.
2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.
3. Alignment:
  - a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch wide, limit offset from true alignment to 1/16 inch.
  - b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch wide, limit offset from true alignment to 1/8 inch.
  - c. Where surfaces are separated by reveal or protruding element of 1 inch wide or more, limit offset from true alignment to 1/4 inch.
4. Location: Limit variation from plane to 1/8 inch in 12 feet; 1/2 inch over total length.

### 3.4 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Testing Services: Testing and inspecting of representative areas of glazed aluminum curtain walls shall take place as installation proceeds to determine compliance of installed assemblies with specified requirements.

1. Air Infiltration: Areas shall be tested for air leakage of 1.5 times the rate specified for laboratory testing in "Performance Requirements" Article, but not more than 0.50 cfm/sq. ft., of fixed wall area when tested according to ASTM E 783 at a minimum static-air-pressure differential of 6.24 lbf/sq. ft..
  - a. Test Area: One bay wide, but not less than 30 feet, by one story of glazed aluminum curtain wall.

- b. Perform a minimum of two tests in areas as directed by Architect.
  - c. Perform tests in each test area as directed by Architect. Perform at least three tests, prior to 10, 35, and 70 percent completion.
2. Water Penetration: Areas shall be tested according to ASTM E 1105 at a minimum uniform static-air-pressure differential of 0.67 times the static-air-pressure differential specified for laboratory testing in "Performance Requirements" Article, but not less than 6.24 lbf/sq. ft., and shall not evidence water penetration.
- a. Test Area: One bay wide, but not less than 30 feet, by one story of glazed aluminum curtain wall.
  - b. Perform a minimum of two tests in areas as directed by Architect.
  - c. Perform tests in each test area as directed by Architect. Perform at least three tests, prior to 10, 35, and 70 percent completion.
- C. Glazed aluminum curtain walls will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

END OF SECTION 084426