

MARVEL

PROJECT MANUAL

THE MASTERS SCHOOL
INNOVATION AND ENTREPRENEURSHIP CENTER

49 CLINTON AVENUE
DOBBS FERRY, NEW YORK 10522

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**Architectural and Historical
Review Board Submission**



MARVEL

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MARVEL

1. GLAZING AND CURTAINWALL SPECIFICATIONS

SECTION 08 51 00

ALUMINUM WINDOWS AND DOORS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Division 07 Section "Metal Wall Panels"
- B. Division 07 Section "Thermal Insulation"
- C. Division 07 Section "Joint Sealants"
- D. Division 08 Section "Aluminum & Glass Entrances and Storefronts"
- E. Division 08 Section "Glass and Glazing"

1.2 SUMMARY

- A. General: Provide all windows and doors work as shown on the architectural drawings or inferred from and/or as specified in accordance with the requirements of the Contract Documents. The Contractor shall have full design responsibility for the Work of this section including but not limited to the following:

In accordance with the window schedule included in the Construction documents, there will be fixed windows, operable windows, as well as stick-build façade system and glazed entrance doors at the base of the building.

All dimensions and quantities should be extracted from architectural drawings.

- 1. This Section includes Aluminum stick build Curtain Wall system with insulated glass panels and exterior pressure cap to secure glass units. Operable windows as top hung, awning out, structurally glazed system to avoid additional exposed mullion / transom caps and framing on the exterior trim covers, any back pan materials, reinforcements, aluminum copings, and metal panels.
- 2. Aluminum punch window system. Thermally broken aluminum frame with insulated glass unit infill. Operable units as per Architectural drawings.
- 3. All sealants, caulking, joint filers and gaskets in conjunction with the above components for weather tight performance in the fabrication and erection of the fenestration systems.
- 4. All anchorage of above components, including pre-set inserts in concrete slab, bracing to or bracing of structure, kickers, reinforcing, etc. as required. The Subcontractor shall be responsible for bracing structure when wall kickers induce rotation into structural members.
- 5. Provide all necessary and required design and engineering labor for the complete and total design of the window and door systems, signed and sealed by licensed engineer in the state of New York.
- 6. Provide all exterior system materials and labor for the visual and install mock-up prior to installation. All systems must have performance data that meets or exceeds required codes, otherwise performance test mock-up will be required according to drawings and specification documents. The subcontractor shall be responsible for the interface of the exterior wall systems, including the coordination of all trades (including but not limited to air and moisture barriers, sealants, insulation, etc), including inside drywall, if necessary.
- 7. Field testing of installed work is recommended, however the required testing will be determined by the special inspector.

- a. Water-spray test: Shall be done prior to any interior finishes being installed. The test shall be conducted according to AAMA 501.2 and shall not evidence water penetration per the weather proofing requirements indicated.
 - b. After all seals and barriers are installed in the skylight and adjacent assemblies, test the primary drainage to check all seams. This is typically done by pouring water at the high point of each channel to observe that the water drains leak free and to ensure that evaporation can occur in the interior channels. There shall be no evidence of water penetration.
 - c. All tests are to be performed and repeated until the tests pass.
- 8. All necessary steel or aluminum reinforcement members.
 - 9. All internal (to the system) vents, weeps, weep tubes, bellows, baffles, closures, end dams, gutters, flashings, trim as shown or as may be required in conjunction with system or to join systems to adjacent construction.
 - 10. Fire safing and smoke seals at slab edges, including support system, including acoustical insulation and acoustical sealants.
 - 11. Patching of sprayed on fire proofing at kickers, anchor, or bracing attachments.
 - 12. Protection and cleaning.
 - 13. All engineering calculations and shop drawings of the system, including anchorages. Drawing shall be presented so other contractors can coordinate their work.
 - 14. All exterior wall insulation and air/vapor barrier required on above (perimeter sealing, etc)
 - 15. Thermal analysis will be provided for all system types to prove thermal performance does not exceed the architect's stated requirements, and to ensure the dew point does not run through materials without vapor protection, or in the case of skylights, to ensure that there are condensation gutters in place to capture any and all condensation.
 - 16. Coordination and reinforcing for window washing or Building Maintenance Equipment, tie-back, anchors, brackets, rails, etc. that interfaces with the system.
 - 17. Integration of exterior light fixtures, wiring conduit, transformers and associated accessories.

1.3 REFERENCES

- A. Performance class designations according to AAMA/WDMA 101/I.S.2/NAFS
 - 1. AW: Architectural.
- B. Performance grade number according to AAMA/WDMA 101/I.S.2/NAFS:
- C. Design pressure number in psf used to determine the structural test pressure and water test pressure.
- D. Structural Test Pressure: For uniform load structural test, is equivalent to 150 percent of the design pressure.
- E. Minimum Test Size: Products must be tested at maximum size indicated in contract documents to comply with requirements for performance class.

1.4 PERFORMANCE REQUIREMENTS

- A. Delegated Design: A qualified Professional Engineer licensed in the State of New York as defined in Section 014000 "Quality Requirements" must provide calculations for all systems and

their elements, and submit them with the fabricators shop drawings to be reviewed by the Building Engineer for load transfers, etc, the Architect, Ownership, and any additional consultants deemed relevant.

- B. General: Provide aluminum windows capable of complying with performance requirements indicated, based on testing manufacturer's windows that are representative of those specified, and that are of minimum test size indicated below:
- C. Structural Performance: Provide steel windows capable of withstanding the effects of the following loads, based on testing units representative of those indicated for Project that pass AAMA/WDMA 101/I.S.2/NAFS, Uniform Load Structural Test:
 - 1. See Structural Drawings for all anticipated movement and building design loads
 - 2. Design Wind Loads: Determine loads based on values provided by the Project Engineer.
 - 3. Deflection: Design glass framing system to limit lateral deflections of glass edges to less than 1/175 of glass-edge length or 3/4 inch whichever is less for spans up to 13'6", or 1/240 + .25" for spans greater than 13'6", at design pressure based on testing performed according to AAMA/WDMA 101/I.S.2/NAFS, Uniform Load Deflection Test or structural computations.
 - 4. In the case of skylights, Pedestrian Live Loads shall be designed according to NYC building codes, and as required by project occupancy, which ever is more stringent.
- D. Story Drift: Provide aluminum-framed systems that accommodate design displacement of adjacent stories indicated according to engineers anticipated movement.
- E. Thermal Movements: Provide windows, including anchorage, that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of 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.
- F. AAMA/WDMA Performance Requirements: Provide aluminum windows of performance indicated that comply with AAMA/WDMA 101/I.S.2/NAFS.
 - 1. Performance Class and Grade: AW 60.
- G. Air Infiltration: Maximum rate not more than indicated when tested according to AAMA/WDMA 101/I.S.2/NAFS, Air Infiltration Test.
 - 1. Maximum Rate: 0.3 cfm/sq. ft. of area at an inward test pressure of 6.24 lbf/sq. ft.
- H. Water Resistance: No water leakage as defined in AAMA/WDMA referenced test methods at a water test pressure equaling that indicated, when tested according to AAMA/WDMA 101/I.S.2/NAFS, Water Resistance Test.
 - 1. Test Pressure: 20 percent of positive design pressure, but not more than 15 lbf/sq. ft.
- I. Life-Cycle Testing: Test according to AAMA 910 and comply with AAMA/WDMA 101/I.S.2/NAFS.
- J. Operating Force and Auxiliary (Durability) Tests: Comply with AAMA/WDMA 101/I.S.2/NAFS for operating window types indicated.
- K. Ambient Design Data: Ensure no condensation occurs within the following conditions
 - a. Internal Dry Bulb = 70 deg F
 - b. Internal Relative Humidity = 30%
 - c. Summer External Dry Bulb = 110 deg F
 - d. Summer Relative Humidity = 100%
 - e. Winter External Dry Bulb = 10 deg F

f. Winter Relative Humidity = 15%

L. Thermal Transmittance:

1. Fenestration Assembly (fixed glass) U-factor of 0.34 Btu/sq. ft. x h x deg F
2. Fenestration Assembly (operable glass) U-factor of 0.40 Btu/sq. ft. x h x deg F
3. NFRC 100 maximum whole-door U-factor of 0.77 Btu/sq. ft. x h x deg F

Building Envelope U-Value requirements:

- 1). The values are driven by code as well as standards for proper construction

M. Acoustic Performance Requirements

1. The works, including all interfaces, shall not generate any unacceptable levels of audible noise during the anticipated working and environmental conditions.
2. OITC requirements/requests: OITC 31

N. Fire Performance Requirements

1. All elements of the works shall be either non-combustible or not easily ignitable with low flame spread characteristics, and shall not produce excessive quantities of smoke or toxic gases. Materials and assemblies must meet NFPA standards and dimising walls touching curtainwall panels shall be properly sealed to achieve smoke seals and fire rating.
2. The works shall meet the requirements of the Fire Consultant Report.

O. Shadow Box

1. All components within shadow box to withstand high temperature loads without showing signs of deterioration or failure, including but not limited to glass coating, interlayer, gaskets, silicone, and shadow box metal panel. Materials and construction of shadow box to accommodate thermal movements up to 140 degrees Celsius. Provide CFD analysis for shadow box areas.

1.5 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, fabrication methods, dimensions of individual components and profiles, hardware, finishes, and operating instructions for each type of aluminum window or door indicated.
- B. Shop Drawings: Include plans, elevations, sections, details (3" = 1'-0" as smallest detailing scale), 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. Window cleaning provisions.
 9. Window System Operators: Show locations, mounting, and details for installing operator components and controls

10. Test data confirming compliance with air and water infiltration criteria defined by AAMA performance class and grade.
 11. For installed products indicated to comply with design loads, include structural analysis data prepared by or under the supervision of a qualified professional engineer detailing fabrication and assembly of aluminum windows and used to determine the following:
 - a. Structural test pressures and design pressures from wind loads indicated.
 - b. Deflection limitations of glass framing systems.
- C. Samples for Initial Selection: For units with factory-applied color finishes.
1. Include 12" x 12" samples of glazing
 2. Include similar Samples of hardware and accessories involving color selection.
- D. Samples for Verification: For aluminum windows and components required, prepared on 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 aluminum windows. Use same designations indicated on Drawings.
- F. Qualification Data: For Installer, manufacturer, professional engineer and testing agency.
- G. Field quality-control test reports.
- H. Product Test Reports: Based on evaluation of comprehensive tests performed within the last four years 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. Sustainability Data: For each Sustainability Focus Material in Accordance with Section 018113 "Sustainable Requirements Summary".
- J. Maintenance Data: For operable window sash, operating hardware, weather stripping, window system operators and finishes to include in maintenance manuals.
- K. Warranty: Special warranty specified in this Section.

1.6 QUALITY ASSURANCE

A. VISUAL MOCK-UPS

A. Prior to the start of fabrication of job material provide a Visual Mock-up of the typical Window types as shown in the design drawings, complete in all respects including glass, framing, supports and operable panels.

C. Placement and orientation of the mock-up shall be such that it may be viewed from both the interior and the exterior, at various distances and angles, and under natural daylight and artificial lighting conditions.

D. Demonstrate the proposed range of aesthetic effects regarding each element prescribed herein.

E. Mockup will have finished surface including surface preparation and paint system.

- B. Installer Qualifications: An installer acceptable to steel window manufacturer for installation of units required for this Project.
 - 1. Installer's responsibilities include providing professional engineering services needed to assume engineering responsibility.
 - 2. Engineering Responsibility: Preparation of data for aluminum windows, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
- C. Manufacturer Qualifications: A manufacturer capable of fabricating aluminum windows that meet or exceed performance requirements indicated and of documenting this performance by inclusion in lists and by labels, test reports, and calculations.
- D. Source Limitations: Obtain aluminum framed windows through one source from a single manufacturer.
- E. Product Options: Information on Drawings and in Specifications establishes requirements for aluminum framed windows' 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
- F. Product Options: Drawings indicate size, profiles, and dimensional requirements of aluminum framed windows and are based on the specific system indicated. Do not modify size and dimensional requirements.
 - 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
- G. Fenestration Standard: Comply with AAMA/WDMA 101/I.S.2/NAFS, "North American Fenestration Standard Voluntary Performance Specification for Windows, Skylights and Glass Doors," for definitions and minimum standards of performance, materials, components, accessories, and fabrication. Comply with more stringent requirements if indicated.
 - 1. Provide AAMA WDMA certified aluminum framed windows with an attached label.
- H. Mockups: Build mockups 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.

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 windows without field measurements. Coordinate wall construction to ensure that actual opening dimensions correspond to established dimensions.
- B. All external areas of the Contract Work shall be accessible for maintenance and repair.
 - 1. Adjust loads imposed on the Contract Work as necessary for the type and orientation of maintenance equipment anticipated. The Contract Work shall sustain safely, and without damage, access and specified maintenance loads.

2. All gaskets, where possible, shall be accessible for inspection/replacement.

1.8 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. Faulty operation of movable sash and hardware.
 - d. Deterioration of metals, other materials, and metal finishes beyond normal weathering.
 - e. Failure of insulating glass.
 2. Warranty Period:
 - a. Window: 10 years from date of Substantial Completion
 - b. Glazing: 20 years from date of Substantial Completion.
 - c. Metal Finish: 20 years from date of Substantial Completion.
 - d. Workmanship: 5 years from date of Substantial Completion
 - e. Gaskets and Sealants: 20 years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products from Clients product list. The architectural drawings were designed using profiles by Kawneer Profiles shall be the same or equivalent to the following systems:
 1. Stick-build Curtain Wall Facade: Kawneer 1600
 2. Operable Windows: Kawneer -1600 UT (structurally glazed)
 3. Thermally Broken Window: Kawneer - Projected Window 8225 TL
- B. MATERIALS
 1. Aluminum Extrusions: Alloy and temper recommended by aluminum window manufacturer for strength, corrosion resistance, and application of required finish, but not less than 22,000-psi ultimate tensile strength, not less than 16,000-psi minimum yield strength, and not less than 0.062-inch thickness at any location for the main frame and sash members.
 2. Steel hollow section: Structural Steel Shapes, Plates and Bars as follows:
 - a. Include snap-on aluminum trim that conceals fasteners.
 3. Cold-Formed Structural Steel Tubing: ASTM A 500, Grade B.
 4. Hot-Formed Structural Steel Tubing: ASTM A 501.
 5. Steel Pipe: ASTM A 53, Type E or S, Grade B.
 - a. Weight Class: Standard.

- b. Finish: Galvanized
- C. Fasteners and Accessories: Manufacturer's standard, corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials. All materials should be considered for galvanic corrosion, and coatings shall be provided as needed.
 - 1. At pressure caps, use ASTM A 193 stainless-steel screws.
 - 2. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
 - 3. Reinforce members as required to receive fastener threads
 - 4. Use exposed fasteners with countersunk Phillips screw heads, fabricated from Series 300 stainless steel.
- D. Anchors, Clips, and Accessories: Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated.
- E. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning window components.
- F. Compression-Type Weather Stripping: Provide compressible weather stripping designed for permanently resilient sealing under bumper or wiper action and for complete concealment when window is closed.
 - 1. Weather-Stripping Material: Manufacturer's standard system and materials complying with AAMA/WDMA 101/I.S.2/NAFS.
- G. Replaceable Weather Seals: Comply with AAMA 701/702.
- H. Sealant: For sealants required within fabricated windows, provide window manufacturer's standard, permanently elastic, nonshrinking, and nonmigrating type recommended by sealant manufacturer for joint size and movement.
- I. Interior Trim: As indicated on Drawings.
- J. Sustainable Characteristics
 - a. Sustainability Characteristics for each Sustainability Focus Material in Accordance with Section 018113 Appendix A and Appendix B.
- K. Glazing: As indicated in Division 08 "Glass and Glazing"

2.2 HARDWARE

- A. General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon steel complying with AAMA 907, or other corrosion-resistant material compatible with aluminum; designed to smoothly operate, tightly close, and securely lock windows, and sized to accommodate sash or ventilator weight and dimensions. Do not use aluminum in frictional contact with other metals.
 - 1. Exposed Hardware Color and Finish: To be determined by Architect
- B. Locks and Latches: Designed to allow unobstructed movement of the sash across adjacent sash in direction indicated and operated from the inside only.
- C. Trickle Vents: Not required for this project.

- D. Gear-Type Rotary Operators: Comply with AAMA 901 when tested according to ASTM E 405, Method A.
 - 1. Operation Function: All ventilators move simultaneously and securely close at both jambs without using additional manually controlled locking devices.
- E. Window Opening Hinges: Comply with AAMA 904.
 - 1. Locking mechanism and handles for manual operation.
 - 2. Friction Shoes: Provide friction shoes of nylon or other nonabrasive, nonstaining, noncorrosive, durable material
 - 3. Limit Devices: Manufacturer recommended limit device designated to restrict sash opening to 4 inches for ventilation.

2.3 DOORS

- A. AAMA/WDMA/CSA Performance Requirements: Provide manual-swing operation aluminum-framed glass doors of performance indicated that comply with AAMA/WDMA/CSA 101/I.S.2/A440.
 - 1. Performance Class and Grade: AW60
- B. Condensation Resistance: Provide aluminum-framed glass doors with a minimum CRF when tested according to AAMA 1503, CR determined according to NFRC 500 of 45.
- C. Thermal Transmittance: Provide aluminum-framed glass doors with a maximum whole fenestration product U-factor indicated, when tested according to determined according to AAMA 1503.
 - 1. U-Factor: (0.77Btu/hr.ft².°F, or less) glazing
- D. Solar Heat-Gain Coefficient (SHGC): use glazing type as indicated in drawings and from Section 088000 'Glass and Glazing'.
- E. Air Leakage Resistance: Maximum rate not more than indicated when tested according to AAMA/WDMA/CSA 101/I.S.2/A440, Air Leakage Resistance Test.
 - 1. Maximum Rate: 0.1 cfm/sq. ft. of area at an inward test pressure of 6.2 lbf/sq. ft.
- F. Water Penetration Resistance: No water leakage as defined in the AAMA/WDMA/CSA referenced test methods at a water test pressure equaling that indicated, when tested according to AAMA/WDMA/CSA 101/I.S.2/A440, Water Penetration Resistance Test.
 - 1. Test Pressure: 20 percent of positive design pressure, but not more than 12 lbf/sq. ft.
- G. Life-Cycle Testing: Tested according to and complying with AAMA/WDMA/CSA 101/I.S.2/A440.
- H. Operating Force and Auxiliary (Durability) Tests: Tested according to and complying with AAMA/WDMA/CSA 101/I.S.2/A440.

2.4 GLAZING

- A. Glazing: As specified in Division 08 Section
- B. Spacers, Setting Blocks, and Gaskets: Manufacturer's standard elastomeric types.
- C. Bond-Breaker Tape: Manufacturer's standard tetrafluoroethylene-fluorocarbon or polyethylene material to which sealants will not develop adhesion.
- D. Glazing Sealants: As specified in Division 07 Section "Joint Sealants."
 - 1. Provide sealants for use inside of the weatherproofing system that have a VOC content as indicated when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2. 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 metal-framed skylights indicated.
 - a. VOC Content: 6.3 lb/cuft or less.
 - b. Color: Custom Color as Selected by Architect.
3. 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 components with which it comes in contact; and recommended in writing by structural- and weatherseal-sealant and metal-framed skylight manufacturers for this use.
 - a. VOC Content: 15.6 lb/cuft or less.
 - b. Color: Matching structural sealant.

2.5 ENTRANCE DOOR HARDWARE

- A. Heavy-duty entrance door hardware units in sizes, quantities, and types recommended by manufacturer for all-glass entrance systems indicated. For exposed parts, match metal and finish of patch and rail fittings.
- B. Butt Hinges: BHMA A156.1, Grade 1, radius corner.
 1. Nonremovable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while entrance door is closed.
 2. Exterior Hinges: Stainless steel, with stainless-steel pin
 3. Quantities: All quantities should be by manufacturer's standard recommended designs, but can be estimated as:
 - a. For doors up to 87 inches high, provide 3 hinges per leaf.
 - b. For doors more than 87 and up to 120 inches high, provide 4 hinges per leaf.
 - c. Quantities to be verified by door fabricator to support door load.
- C. Concealed Floor Closers and Top Pivots: Center hung; BHMA A156.4, Grade 1; including cases, bottom arms, top walking beam pivots, plates, and accessories required for complete installation.
 1. Sliding or Swing: Single or Double acting.
 - a. Positive Dead Stop: Coordinated with hold-open angle if any, or at angle selected.
 2. Hold Open: Automatic, at angle selected or Selective.
 3. Opening-Force Requirements:
 - a. Egress Doors: Not more than 15 lbf to release the latch and not more than 30 lbf to set the door in motion and not more than 15 lbf to open the door to its minimum required width.
 - b. Accessible Interior Swinging Sliding Doors: Not more than 5 lbf to fully open door.
- D. Concealed Overhead Holder: BHMA A156.8, Grade 1, with dead-stop setting coordinated with concealed floor closer.
- E. Push-Pull Set: No.4 Stainless steel finish (Blumcraft DB-130 or equal).

- F. Electric Strikes: Blumcraft Folger Adam #310 or equal for Residential Vestibules.
- G. Single-Door and Active-Leaf Locksets: Center-housing deadbolt with pulls, Center-housing combination deadbolt and latchbolt with lever handles, Bottom-fitting or bottom-rail deadbolt.
 - 1. Deadbolt operated by key outside and key thumb turn inside.
- H. Inactive-Leaf Locksets: Bottom-fitting or bottom-rail deadbolt.
 - 1. Deadbolt operated by key outside and key thumb turn inside.
- I. Exit Devices: UL 305.
 - 1. Function: Operation by push-pull when inside operator is locked down (dogged); outside operation by key.
 - 2. Latching: At threshold or floor plate, door head, threshold or floor plate and door head.
 - 3. Style: Exposed vertical rod, Concealed vertical rod in housing style indicated
 - 4. Provide exit devices on both leaves of pairs of doors.
- J. Threshold: Not more than 1/2 inch high.

2.6 FABRICATION

- A. Fabricate aluminum framed windows and doors in sizes indicated. Include a complete system for assembling components and anchoring windows.
- B. Fabricate framed windows and doors that are reglazable without dismantling sash or ventilator framing
- C. Thermally Improved Construction: windows with an integral, concealed, low-conductance thermal barrier; located between exterior materials and window members exposed on interior side; in a manner that eliminates direct metal-to-metal contact.
 - 1. Provide thermal-break construction that has been in use for not less than three years and has been tested to demonstrate resistance to thermal conductance and condensation and to show adequate strength and security of glass retention
 - 2. Provide thermal barriers tested according to AAMA 505; determine the allowable design shear flow per the appendix in AAMA 505.
 - 3. Provide hardware with low conductivity or nonmetallic material for hardware bridging thermal breaks at frame or vent sash.
- D. Weather Stripping: Provide full-perimeter weather stripping for each operable sash and ventilator
- E. Weep Holes: Provide weep holes and internal passages to conduct infiltrating water to exterior
- F. Provide water-shed members above side-hinged ventilators and similar lines of natural water penetration
- G. Mullions: Provide mullions and cover plates as shown, matching window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections, as indicated. Provide mullions and cover plates capable of withstanding design loads of window units
- H. Subframes: Provide subframes with anchors for window units as shown, of profile and dimensions indicated but not less than 0.062-inch thick extruded aluminum. Miter or cope corners, and weld and dress smooth with concealed mechanical joint fasteners. Finish to match window units. Provide subframes capable of withstanding design loads of window units

- I. Factory-Glazed Fabrication: Glaze aluminum windows in the factory where practical and possible for applications indicated. Comply with requirements in Division 08 Section "Glazing" and with AAMA/WDMA 101/I.S.2/NAFS
- J. Glazing Stops: Provide snap-on glazing stops coordinated with Division 08 Section "Glazing" and glazing system indicated. Provide glazing stops to match sash and ventilator frames.

2.7 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. 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.

2.8 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes. Exterior surfaces to meet the requirements for AAMA 2605 or greater to achieve required warranties.
 - 1. Color: As determined by Architects
- B. All visually exposed Internal Surfaces: High-Performance Powder-Coat Finish (Two-Coats min.): AA-C12C40R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: conversion coating; Organic Coating: manufacturer's standard two-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color 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 2604 and with coating and resin manufacturers' written instructions.
 - 1. Color and Gloss: As determined by Architects

2.9 SOURCE QUALITY CONTROL

- A. Structural-Sealant Glazing: Perform quality-control procedures complying with ASTM C 1401 recommendations including, but not limited to, material qualification procedures, sealant testing, and fabrication reviews and checks. Delete paragraph above or below; if both are required, indicate location of each system on Drawings, in schedules, or by inserts.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work. Verify rough opening dimensions, levelness of sill plate, and operational clearances. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure a coordinated, weathertight window installation..
 - 1. Masonry Surfaces: Visibly dry and free of excess mortar, sand, and other construction debris.

2. Wood Frame Walls: Dry, clean, sound, well nailed, free of voids, and without offsets at joints. Ensure that nail heads are driven flush with surfaces in opening and within 3 inches of opening.
3. Metal Surfaces: Dry; clean; free of grease, oil, dirt, rust, corrosion, and welding slag; without sharp edges or offsets at joints.
4. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with Drawings, Shop Drawings, and manufacturer's written instructions for installing windows, hardware, accessories, and other components.
- B. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction.
- C. Set sill members in bed of sealant or with gaskets, as indicated, for weathertight construction.
- D. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.
- E. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials
- F. Connect automatic operators to building electrical system.

3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections and prepare test reports.
 1. Testing and inspecting agency will interpret tests and state in each report whether tested work complies with or deviates from requirements.
- B. Testing Services: Testing and inspecting of installed windows shall take place as follows:
 1. Testing Methodology: Testing of windows for air infiltration and water resistance shall be performed according to AAMA 502, Test Method A or B, by applying same test pressures required to determine compliance with AAMA/WDMA 101/I.S.2/NAFS in Part 1 "Performance Requirements" Article.
 2. Testing Extent: Three windows as Selected by Architect and a qualified independent testing and inspecting agency. Windows shall be tested immediately after installation. Perform a total of three test. After 10% completion, after 50% completion and after 80% completion.
 3. Test Reports: Shall be prepared according to AAMA 502.
- C. Remove and replace non complying aluminum window and retest as specified above.
- D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.4 ADJUSTING, CLEANING, AND PROTECTION

- A. Adjust operating sashes and ventilators, screens, hardware, operators, and accessories for a tight fit at contact points and weather stripping for smooth operation and weathertight closure. Lubricate hardware and moving parts.

- B. Clean aluminum surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances of your own generated debris.
- C. Clean factory-glazed glass immediately after installing windows from your own generated debris. Comply with manufacturer's written recommendations for final cleaning and maintenance. Remove nonpermanent labels, and clean surfaces.
- D. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.
- E. Protect window/door surfaces from contact with contaminating substances resulting from construction operations. In addition, monitor window surfaces adjacent to and below exterior concrete and masonry surfaces during construction for presence of dirt, scum, alkaline deposits, stains, or other contaminants. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written recommendations.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain window/door operating system.

END OF DOCUMENT

SECTION 08 80 00

GLASS AND GLAZING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Division 04 Section "Unit Masonry"
- B. Division 07 Section "Thermal Insulation"
- C. Division 07 Section "Vapor Permeable / Impermeable Air Barrier Membranes"
- D. Division 07 Section "Metal Wall Panels"
- E. Division 08 Section "Joint Sealants"
- F. Division 08 Section "Aluminum Windows and Doors"
- G. Division 08 Section "All-glass Entrances and Storefronts"

1.2 REFERENCES

- A. The glass and glazing work, except as otherwise shown or specified shall comply with the minimum requirements of the latest edition of the following codes, specifications, guidelines and standards. Where conflicting requirements arise, follow the more stringent.
 - 1. GANA Glazing Manual (Formally FGMA) – Latest Edition
 - 2. ASTM C509, Cellular Preformed Rubbers
 - 3. ASTM C864, Compression Seals Spacers and Setting Blocks
 - 4. ASTM C998, Test for Glass Under Static Loads by Non-Destructive Methods
 - 5. ASTM C1036, Standard Specification for Flat Glass
 - 6. ASTM C1048, Standard Specification for Heat Treated Flat Glass
 - 7. ASTM C1401 "Standard Guide for Structural Sealant Glazing."
 - 8. ASTM E 546, Standard Test Method for Frost Point of Sealed Insulating Glass Units
 - 9. ASTM E 576, Standard Test Method for Dew/Frost Point of Sealed Insulating Glass Units in Vertical Position
 - 10. ASTM E773, Standard Test Method for Sealed Durability of Insulating Glass Units
 - 11. ASTM E774, Standard Specification for Sealed Insulating Glass Units
 - 12. ASTM E997, Test for Glass Under Static Loads by Destructive Methods
 - 13. ASTM E90 - 09 Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
 - 14. ASTM E596-96 Standard Test for Laboratory Measurement of Noise Reduction of Sound-Isolating Enclosures
 - 15. AAMA, "Metal Curtain Wall Specification Manual"
 - 16. AAMA TIR-A7, "Sloped Glazing Guidelines and Glass Design for Sloped Glazing"
 - 17. AAMA CWS-12, "Structural Properties of Glass"
 - 18. AAMA 807.1, "Glazing tapes"
 - 19. Federal Standard CPSC 16 CFR 1201
 - 20. ANSI Z97.1-1984, Safety Glazing Material

21. Insulating Glass Manufacturer's Alliance (IGMA): IGMA Publication for Insulating Glass: SIGMA TM-3000, "Glazing Guidelines for Sealed Insulating Glass Units

1.3 SUMMARY

- A. Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
1. Windows.
 2. Doors.
 3. Glazed window wall systems.
 4. Storefront framing.
 5. Glazed entrances.

1.4 DEFINITIONS

- A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.
- C. Interspace: Space between lites of an insulating-glass unit.

1.5 PERFORMANCE REQUIREMENTS

- A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction. Provide data sheets for review and acceptance by Architects and of glass build-ups. Data sheets shall cover the following criteria:
1. Light transmission factor.
 2. External light reflectance.
 3. Total solar transmission (g-value).
 4. Color rendition index of glass.
 5. High performance coatings.
 6. Low E coatings.
 7. Safety glass requirements.
 8. Acoustic rating (tested)
 9. Bird friendly design and construction requirements.
- B. Delegated Design: Design glass, including comprehensive engineering analysis according to ASTM E 1300 by a qualified professional engineer, using the following design criteria.
- C. Design Wind Pressures: Determine loads based on NYC Building Code 2014 and ASCE 7-05
1. Vertical Glazing: For glass surfaces sloped 15 degrees or less from vertical, design glass to resist design wind pressure based on glass type factors for short-duration load.
 2. Sloped Glazing: For glass surfaces sloped more than 15 degrees from vertical, design glass to resist each of the following combinations of loads:
 - a. Outward design wind pressure minus the weight of the glass. Base design on glass type factors for short-duration load.

- b. Inward design wind pressure plus the weight of the glass plus half of the design live load. Base design on glass type factors for short-duration load.
 - c. Half of the inward design wind pressure plus the weight of the glass plus the design live load. Base design on glass type factors for long-duration load.
 - 3. Glass Type Factors for Wired, Patterned, and Sandblasted Glass:
 - a. Short-Duration Glass Type Factor for Wired Glass: 0.5.
 - b. Long-Duration Glass Type Factor for Wired Glass: 0.3.
 - c. Short-Duration Glass Type Factor for Patterned Glass: 1.0.
 - d. Long-Duration Glass Type Factor for Patterned Glass: 0.6.
 - e. Short-Duration Glass Type Factor for Sandblasted Glass: 0.5.
 - 4. Thickness of Patterned Glass: Base design of patterned glass on thickness at thinnest part of the glass
 - 5. Probability of Breakage for Sloped Glazing: For glass surfaces sloped more than 15 degrees from vertical, design glass for a probability of breakage not greater than 0.001
 - 6. Maximum Lateral Deflection for Glass: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than span/100, or 1" depending on whichever is less. An increased allowance for deflection can be considered so long as the glass manufacturer provides the same full warranty.
 - 7. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.
 - D. Acoustic Performance Requirements
 - 1. The works, including all interfaces, shall not generate any unacceptable levels of audible noise during the anticipated working and environmental conditions.
 - 2. All window and doors are required to have OITC 31 rating. (Assembly rating)
 - E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
 - 1. Temperature Change (range): 120 deg F, ambient; 180 deg F, material surfaces.
- 1.6 PRECONSTRUCTION TESTING
- A. Preconstruction Adhesion and Compatibility Testing: Test each glazing material type, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.
 - 1. Testing will not be required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.
 - 2. Use ASTM C 1087 to determine whether priming and other specific joint-preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.
 - 3. Test no fewer than eight Samples of each type of material, including joint substrates, shims, sealant backings, secondary seals, and miscellaneous materials.
 - 4. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.

5. For materials failing tests, submit sealant manufacturer's written instructions for corrective measures including the use of specially formulated primers.

1.7 SUBMITTALS

- A. Product Data: For each glass product and glazing material indicated.
- B. Glass Samples: For each type of glass product other than clear monolithic vision glass, the following products; 12 inches square.
 1. Tinted glass.
 2. Coated glass.
 3. Bird protective UV-Coated glass.
 4. Laminated glass with interlayer.
 5. Insulating glass.
- C. Glazing Accessory Samples: For gaskets, sealants and colored spacers, in 12-inch lengths. Install sealant Samples between two strips of material representative in color of the adjoining framing system.
- D. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings and glass schedule.
- E. Sustainability Data: For each Sustainability Focus Material in Accordance with Section 018113 "Sustainable Requirements Summary".
- F. Delegated-Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 1. For glass indicated to comply with performance requirements and design criteria including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 2. Submit certification from the glass manufacturer that the glass manufacturer has reviewed all glazing details and thicknesses and finds same suitable for the purpose intended in accordance with these specifications.
 3. Submit certification from sealant manufacturer that the sealant manufacturer has reviewed all sealant details and that when exposed to the specified wind loads the stress in the silicone sealant of dimensions shown does not exceed manufacturers recommendations.
 4. Submit glass stress analysis due to thermal gains for coated kind AN, HS and FT.
 5. All calculation sheets shall be one size and submission shall bear the seal of a Professional Engineer registered in the State of New York.
- G. Thermal Performance Calculations
 1. Submit calculations and/or test data demonstrating solar shading and thermal transfer values across glass assemblies.
- H. Qualification Data: For installers and manufacturers of insulating-glass units with sputter-coated, low-e coatings, glass testing agency and sealant testing agency.
- I. Product Certificates: For glass and glazing products, from manufacturer.
- J. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for tinted glass, coated glass, insulating glass, glazing sealants and glazing gaskets.

1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.
 - K. Preconstruction adhesion and compatibility test report.
 - L. Warranties: Sample of special warranties.
- 1.8 QUALITY ASSURANCE
- A. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved and certified by coated-glass manufacturer.
 - B. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.
 - C. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.
 - D. Acoustic testing according to ASTM E1332-10a.
 - E. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.
 - F. Source Limitations for Glass: Obtain ultraclear float glass, coated float glass, laminated glass and insulating glass from single source from single manufacturer for each glass type.
 - G. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.
 - H. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
 1. GANA Publications: GANA's "Laminated Glazing Reference Manual" and GANA's "Glazing Manual."
 2. AAMA Publications: AAMA GDSG-1, "Glass Design for Sloped Glazing," and AAMA TIR-A7, "Sloped Glazing Guidelines."
 3. IGMA Publication for Sloped Glazing: IGMA TB-3001, "Guidelines for Sloped Glazing."
 4. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
 - I. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction or the manufacturer. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
 - J. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.
 - K. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 1. Install glazing in mockups specified in Division 08 Sections "Structural Glazed Curtain Wall" and "Aluminum Windows and Doors", including glazing methods.
 - L. Pre-installation Conference: Conduct conference at Project site.
 1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 2. Review temporary protection requirements for glazing during and after installation.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- B. Comply with insulating-glass manufacturer's written recommendations for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.10 PROJECT CONDITIONS

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

1.11 WARRANTY

- A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form in which coated-glass manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.
 - 1. Warranty Period: 10 years from date of Substantial Completion.
- B. Manufacturer's Special Warranty on Laminated Glass: Manufacturer's standard form in which laminated-glass manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.
 - 1. Warranty Period: minimum of 5 years from date of Substantial Completion.
- C. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form in which insulating-glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.
 - 1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 GLASS PRODUCTS, GENERAL

- A. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.
 - 1. Minimum Glass Thickness for Exterior Lites: Not less than required by the following:
 - a. All final glass thicknesses are to be determined by cladding contractor to resist all wind loads, which vary across the different buildings on this project.

- b. All final glass thicknesses are to be determined by cladding contractor, to provide the specified acoustic insulation in accordance with the Specification, when calculated or tested in a complete wall assembly system.
 - c. All final glass build-ups are to be determined by cladding contractor to meet all glazing safety requirements for overhead and low level glazing. Overhead glazing shall always have a laminated lower skin.
 - d. The largest of all lites shall be placed on the exterior to minimize the visual effects of "pillowing"
 - e. Inner leaf of all vertical or near vertical high level glazing shall be laminated for containment.
- B. Strength: Where float glass is indicated, provide annealed float glass, Kind HS heat-treated float glass, or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened glass is indicated, provide Kind HS heat-treated float glass or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where fully tempered glass is indicated, provide Kind FT heat-treated float glass.
- C. All Kind FT heat treated glass is to be heat soak tested, and full records are to be kept.
- D. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
 - 1. For monolithic-glass lites, properties are based on units with lites of actual design thickness required by the project.
 - 2. For laminated-glass lites, properties are based on actual design thickness required by the project.
 - 3. For insulating-glass units, properties are based on units of thickness actual design thickness required by the project.
 - 4. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBNL's WINDOW 7.2 computer program, expressed as Btu/sq. ft. x h x deg F.
 - 5. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBNL's WINDOW 7.2 computer program.
 - 6. Visible Reflectance: Center-of-glazing values, according to NFRC 300.
- E. Bird friendly materials and assemblies shall be used on the exterior wall envelope, and any associated opens up to 75 feet above grade. Materials other than bird friendly materials (defined as a threat factor of 25 or less according to American Bird Conservancy, or relevant ASTM standard) and assemblies shall not exceed an aggregate of 10 square feet within any 10 feet by 10 feet square area of exterior wall below 75 feet of grade level.
 - 1. See Exceptions:
 - a. Where ground floor transparency is required a transparent bird friendly material with a UV-reflective pattern and maximum threat factor of 27 shall be provided.
 - 2. Glass materials located at fly-through conditions 75 feet or less above grade shall be constructed with bird friendly materials.
 - 3. The exterior wall envelope installed adjacent to a green roof system on the same building shall be constructed with bird friendly materials up to 12 feet above the walking surface.

2.2 GLASS PRODUCTS

- A. Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated.
 - 1. Glass dimensional tolerance shall conform to the following:
 - a. Edge length less than 40" (1000mm): ± 0.06 "
 - b. Edge length less than 80" (2000mm): ± 0.08 "
 - c. Edge length less than 120" (3000mm): ± 0.1 "
 - d. Edge length greater than 120" (4000mm): ± 0.12 "
- B. Ultraclear Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I, complying with other requirements specified and with visible light transmission not less than 91 percent and solar heat gain coefficient not greater than 0.3 (except for storefront systems at the ground floor).
 - 1. Products: Subject to compliance with requirements and Clients list of manufacturers.
- C. Heat-Treated Float Glass: ASTM C 1048; Type I; Quality-Q3; Class I (clear) unless otherwise indicated; of kind and condition indicated. Tempered glass shall also conform to ANSI Z97.1. All heat strengthening and tempering shall be by the horizontal process, with IG units fabricated in such a manner as to have all roller distortion in a horizontal direction as installed in the building.
 - 1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
 - 2. For uncoated glass, comply with requirements for Condition A.
 - 3. For coated vision glass, comply with requirements for Condition C (other coated glass).
 - 4. Basis-of-Design Product: Subject to compliance with requirements, provide products one of the following:
 - a. Installer to offer manufacturer for architects approval
 - 5. Tint Color: None.
 - 6. Visible Light Transmittance: Refer to Glazing GL Specifications
 - 7. All fully tempered glass to be Heat soak Tested
 - 8. For fully tempered glass, the surface compressive stress shall be demonstrated by differential surface refractometer (DSR) measurement to be controlled at works at greater than 14,500 psi. For heat strengthened glass the surface compressive stress shall be demonstrated to be between 5800-7250 psi.
 - 9. Glass flatness tolerances shall conform to the following:
 - a. Maximum Overall Bow: 0.2% of smallest edge length.
 - b. Local Bow in any direction:
 - 1) Heat strengthened glass: 0.1% over a length of 12".
 - 2) Fully tempered glass: 0.167% over a length of 12".
 - 10. Roller Wave:
 - a. Glass center: 0.003" over a length of 12".
 - b. Maximum of 0.003" within 10.5" of the leading or trailing edge.

11. Fabricator Quality Control: Test all heat treated glass for distortions.
 - a. Test Method: GANA "TD 04-03-26 Standard Test Method for In Plant Measurement of Roll Wave in Heat Treated Architectural Glass", or ASTM C1651

2.3 LOW-EMISSIVITY COATED GLASS

- A. ASTM C1376, float glass with metallic-oxide or -nitride coating deposited by vacuum deposition process after manufacture and heat treatment (if any), and complying with other requirements specified.
 1. Kind: Kind CV (coated vision glass), except that Kind CO coated overhead glass may be used where the lower edge of the glass is more than 6 feet above the adjacent floor level or cannot be approached closer than 10 feet.
 2. Low-Emissivity coating(s) shall be neutral in transmitted and reflected color and otherwise exhibit the visual and performance characteristics of the products specified herein.
 3. Low-E coatings shall typically be applied through the MSVD (magnetic sputter vacuumed position) process.
 4. Glass lites with pyrolitic or MSVD coating shall be minimum heat-strengthened and the manufacturer shall submit glass stress analysis due to thermal gains for coated Kind AN, HS, and FT.
 5. Visual quality control acceptance criteria of the low-E coating shall be consistent with industry guidelines, subject to approval of the Architect.
 - a. Pinholes with diameters in excess of 1/16 inch are not acceptable.
 - b. Scratches no longer than 3 inches in length are acceptable provided that they occur within 3 inches of an edge. Concentrated scratches or abraded areas are not allowed.
 - c. Clusters of pinholes are not acceptable.
 6. Manufacturer shall warrant that the low-E coating will not crack, peel, fade or deteriorate for a period of ten (10) years.
 7. All low-e coating to be provided on #2 surface for double pane IG, and #2 and #4 surface for triple pane IG on all glass for all specialty glazing systems and conditions. Where the outer lite is laminated the coating shall be placed on surface #4.
 8. Provide edge deletion of low-e coating to ensure proper seal in insulated unit.
 9. All coated glass on entire project to be manufactured in a single production line to ensure uniform coating.
 10. Low-e coating uniformity to be maintained for all glass in each type of application. When viewing adjacent coated glass units, significant visible color variation from a minimum distance of 10 feet, shall not be apparent. Provide samples of color variation for review during submittal process.

2.4 LAMINATED GLASS

- A. Laminated Glass: ASTM C 1172, and complying with testing requirements in 16 CFR 1201 for Category II materials, and with other requirements specified. Use materials that have

a proven record of no tendency to bubble, discolor, delaminate, or lose physical and mechanical properties after fabrication and installation.

1. Construction: Laminate glass with polyvinyl butyral interlayer to comply with interlayer manufacturer's written recommendations.
 2. PVB interlayer shall be compatible with all glazing sealants. Plasticizer migration shall be limited to 1/8-inch when measured from the finished glass edge.
 3. Manufacturer shall warrant that the laminated glass will not develop edge separation, delamination of interlayer, haloing of the interlayer, or other defects which may affect the structural integrity of the glass assembly or otherwise compromise the requirements of the glass for a period of ten (10) years.
 4. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
 5. Interlayer Color: Clear unless otherwise indicated.
 6. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
 7. Interlayer Color: Clear unless otherwise indicated.
- B. Glass: Comply with applicable requirements in "Glass Products" Article as indicated by designations in "Laminated-Glass Types" Article. The monolithic glass panes being laminated together will be annealed to reduce visual distortions.
- C. Provide acoustic interlayer where required to meet acoustic requirements listed in window & door specification.
- D. All laminated glass with edges exposed to weathering shall be an ionoplast interlayer.

2.5 INSULATING GLASS

- A. Manufacturers: Subject to compliance with requirements and Clients list of manufacturers.
- B. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190, and complying with other requirements specified. Units shall be fabricated using the dual-seal system, consisting of two lites of glass with a primary seal of extruded polyisobutylene, and a secondary seal of structural silicone, color to be approved by Architect.
1. Insulating glass units shall be certified by the IGMA and shall comply with the ASTM E2188 and E2189.
 2. Insulating glass shall not experience fogging, wetting or staining within the sealed space, spacer corrosion, spacer migration, adhesive or cohesive failure of primary or secondary edge seal.
 3. Spacer: High performing stainless steel warm edge spacer to meet performance requirements
 4. Insulating glass shall not experience fogging, wetting or staining within the sealed space, spacer corrosion, spacer migration, adhesive or cohesive failure of primary or secondary edge seal.
 5. Desiccant: Molecular sieve or silica gel, or blend of both.
 6. Insulating glass shall not experience decrease in the air space dimension due to chemical reaction of desiccant with entrapped air. Size of insulating glass spacer shall be calculated according to the pressure differential of the inboard and outboard glass sheets in opposite

directions of each unit to prevent contact between the glass sheets in the center of the large insulated glazing units.

7. The lites comprising insulating glass units shall be heat strengthened, (or fully tempered where required to meet wind load or safety glazing requirements), as shown, specified, required, or recommended by the specified glass fabricator to insure against heat breakage and to assure adequate glass performance at the specified design pressures specified under the performance criteria herein.
 8. The insulating glass dimensional tolerances shall conform to the following:
 - a. Edge length: +0.12" (3mm), -0.08" (-2mm).
 - b. Thickness (with tempered glass): +0.08" (2mm), -0.06" (-1mm).
 - c. Thickness (with laminated glass): ± 0.06 " (.15mm)
- C. Glass: Comply with applicable requirements in "Glass Products" Article and in "Laminated Glass" Article as indicated by designations in "Insulating-Glass Types" Article and in "Insulating-Laminated-Glass Types" Article.
- D. Glass Edges:
1. Structurally glazed glass edges shall be seamed.
 2. Butt glass edges shall be seamed and ground (matte finish).
 3. Exposed edges, such as at corners, shall be arised and polished.
 4. All other edges shall have a high quality factory cut edge.
 5. Offset of ground and polished edges of laminated glass lites exposed to view to be limited to 1/16"; offset of ground and polished edges of laminated glass lites at all other locations to be limited to 1/8".
 6. All glass edges shall conform to the following requirements:
 - a. Shark teeth shall not penetrate more than half the glass thickness
 - b. Serration hackle shall not penetrate more than 10% of the glass thickness.
 - c. Flare shall not exceed 1/16" as measured perpendicular to the glass surface at the edge.
 - d. Bevel shall not exceed 1/16".
 - e. Flake chips shall not exceed 1/32" in length or 1/4" in diameter.
 - f. Rough chips exceeding the dimensions listed in Item e above shall not be permitted.
 7. Ceramic Frit Coating on Glass Perimeter:
 - a. Provide custom ceramic frit on interior and exterior glass lite surfaces required to mask the edge spacer and mask building elements.
 - b. Heat treated glass with ceramic coating to comply with ASTM C1048 and requirements herein.
 - c. Frit selection and color to be made by Architect. Provide double coat at light colored ceramic frit application.

8. Laminated Glass Edge offset
9. Laminated Glass Edge offset
 - a. Edge length less than 80" (1000mm): ± 0.04 " (1.0mm).
 - b. Edge length greater than 80" (2000mm): ± 0.08 " (2mm).
 - c. When edge of glass is visible the edges of the laminated glass plies shall be flush and level ± 0.04 " (1.0mm)..

1. SUSTAINABILITY CHARACTERISTICS

- a. Sustainability Characteristics for each Sustainability Focus Material in Accordance with Section 018113 Appendix A and Appendix B.

2.6 GLAZING GASKETS

- A. Dense Compression Gaskets: Molded or extruded gaskets of profile and hardness required to maintain watertight seal, made from one of the following:
 1. Neoprene complying with ASTM C 864.
 2. EPDM complying with ASTM C 864.
 3. Silicone complying with ASTM C 1115.
 4. Thermoplastic polyolefin rubber complying with ASTM C 1115.
- B. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned neoprene, EPDM silicone gaskets complying with ASTM C 509, Type II, (color to be selected by Architect, Grey as base); of profile and hardness required to maintain watertight seal.
 1. Application: Use where soft compression gaskets will be compressed by inserting dense compression gaskets on opposite side of glazing or pressure applied by means of pressure-glazing stops on opposite side of glazing.
- C. Lock-Strip Gaskets: Neoprene extrusions in size and shape indicated, fabricated into frames with molded corner units and zipper lock-strips, complying with ASTM C 542, black.

2.7 GLAZING SEALANTS

- A. General:
 1. Compatibility: Provide glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
 2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation
 3. VOC Content: For sealants used inside of the weatherproofing system, not more than 250 g/L when calculated according to 40 CFR 59, Subpart D.
 4. Colors of Exposed Glazing Sealants: Custom Color as Selected by Architect.
- B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 50, Use NT.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include but are not limited to, the following:

- a. BASF Building Systems; Omniseal 50.
 - b. Dow Corning Corporation; 756 SMS, 791, 795, 995.
 - c. GE Advanced Materials - Silicones; SilGlaze II SCS2800, SilPruf NB SCS9000, SilPruf SCS2000, UltraPruf II SCS2900.
 - d. May National Associates, Inc.; Bondaflex Sil 295.
 - e. Pecora Corporation; 864, 895, 898.
 - f. Polymeric Systems, Inc.; PSI-641
 - g. Sika Corporation, Construction Products Division; SikaSil- C995.
 - h. Tremco Incorporated; Spectrem 2, Spectrem 3.
2. Applications: All Cladding systems on this project.
 3. Provide two lines of weather seals:
 - a. Primary seal shall be both an air and water seal.
 - b. Secondary seal shall be water seal.

2.8 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
 1. AAMA 804.3 tape, where indicated.
 2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
 3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.
- B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:
 1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
 2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.9 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

- F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.
- G. Perimeter Insulation for Fire-Resistive Glazing: Product that is approved by testing agency that listed and labeled fire-resistant glazing product with which it is used for application and fire-protection rating indicated.

2.10 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
- B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.
- C. Grind smooth and polish exposed glass edges and corners.
 - 1. All glass edges shall conform to the following requirements:
 - a. Shark teeth shall not penetrate more than half the glass thickness.
 - b. Serration hackle shall not penetrate more than 10 percent of the glass thickness.
 - c. Flare shall not exceed 1/16 inch as measured perpendicular to the glass surface at edge.
 - d. Bevel shall not exceed 1/16 inch.
 - e. Flake chips shall not exceed 1/16 inch in length or 1/4 inch in diameter.
 - f. Rough chips exceeding the dimensions listed in Item e above shall not be permitted.
- D. Flatness Tolerances
 - 1. Roller-Wave or Ripple: The deviation from flatness at any peak shall be targeted not exceed 0.003" as measured per peak to valley for 1/4" (6mm) thick glass.
 - 2. a. Maximum Overall Bow: 0.2% of smallest edge length.
 - b. Local Bow in any direction:
 - 1) Heat strengthened glass: 0.1% over a length of 12".
 - 2) Fully tempered glass: 0.167% over a length of 12
- E. Ultraclear float glass, heat-strengthened float glass, fully tempered float glass.

2.11 GLASS TYPES

- A. See architectural drawings for location of glass types.
- B. All final glass thicknesses are to be determined by cladding contractor to resist all wind loads, which vary across the building on this project. Final structural and thermal calculations to be conducted by façade contractor.
- C. All final glass thicknesses are to be determined by cladding contractor, to provide the specified acoustic insulation in accordance with the Specification, when calculated or tested in a complete wall assembly system.
- D. All final glass build-ups are to be determined by cladding contractor to meet all glazing safety requirements for overhead and low level glazing. Overhead glazing shall always have a laminated lower skin.

E. GL 01-A: Typical Punch Window and Window Wall Glass
@1st Floor (build up from outside to inside)
6mm HS Glass (Low Iron)
UV-Bird protective coating on surface 2 (Pattern per Architect)
1.52 SGP interlayer
6mm HS Glass (Low Iron)
Solarban 72 Low E coating on surface 4
12 mm Argon Filled gap
6mm FT Glass (Low Iron)
U Value: 0.25 (Center of Glass)
SHGC: 0.32
OITC 31 (Assembly value)

F. GL 01-B: Typical Punch Window and Window Wall Glass
@ all Floor above 1st Floor (build up from outside to inside)
6mm HS Glass (Low Iron)
UV-Bird protective coating on surface 2 (Pattern per Architect)
1.52 PVB interlayer
6mm HS Glass (Low Iron)
Solarban 72 Low E coating on surface 4
12 mm Argon Filled gap
6mm FT Glass (Low Iron)
U Value: 0.25 (Center of Glass)
SHGC: 0.32
OITC 31 (Assembly value)

G. GL 02: Shadow Box Glass NOT USED

H. GL 03: Glazed Doors
(build up from outside to inside)

10mm Fully Tempered Glass (clear)
UV-Bird protective coating on surface 2 (Pattern per Architect)
1.52 SGP interlayer
10mm Fully Tempered Glass (clear)
Provide safety glazing labeling.

PART 3 EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.
- B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that will leave visible marks in the completed work.

3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. 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.
- C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- G. Provide spacers for glass lites where length plus width is larger than 50 inches.

1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
 2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
 - I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
 - J. Set glass lites with proper orientation so that coatings face exterior or interior as specified.
 - K. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
 - L. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 TAPE GLAZING

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

3.5 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

- D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

- E. Install gaskets so they protrude past face of glazing stops.

3.6 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.7 LOCK-STRIP GASKET GLAZING

- A. Comply with ASTM C 716 and gasket manufacturer's written instructions. Provide supplementary wet seal and weep system unless otherwise indicated.

3.8 CLEANING AND PROTECTION

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

END OF DOCUMENT

MARVEL

2. SITE LIGHTING CUTSHEETS



LED bollard - symmetric

BEGA

Application

LED bollard with fully shielded light distribution. The glare-free illumination of these luminaires is ideally suited for lighting entrances and footpaths as well as many areas of garden and landscape architecture.

Materials

Luminaire housing and base constructed of die-cast and extruded marine grade, copper free ($\leq 0.3\%$ copper content) A360.0 aluminum alloy
Clear safety glass with optical texture
Reflector made of pure anodized aluminum
High temperature silicone gasket
Mechanically captive stainless steel fastener

NRTL listed to North American Standards, suitable for wet locations

Protection class IP 65

Weight: 11.0 lbs

Electrical

Operating voltage	120-277VAC
Minimum start temperature	-30° C
LED module wattage	20.6W
System wattage	25.0W
Controllability	0-10V dimmable
Color rendering index	Ra > 80
Luminaire lumens	1577 lumens (3000K)
Lifetime at Ta = 15° C	>500,000 h (L70)
Lifetime at Ta = 50° C	280,000 h (L70)

LED color temperature

☐ 4000K - Product number + **K4**

☐ 3500K - Product number + **K35**

☒ 3000K - Product number + **K3**

☐ 2700K - Product number + **K27**

BEGA can supply you with suitable LED replacement modules for up to 20 years after the purchase of LED luminaires - see website for details

Finish

All BEGA standard finishes are matte, textured polyester powder coat with minimum 3 mil thickness.

Available colors ☒ Black (BLK) ☐ White (WHT) ☐ RAL:
☐ Bronze (BRZ) ☐ Silver (SLV) ☐ CUS:

Type:

BEGA Product:

Project:

Modified:



LED bollard - symmetric

	LED	A	B	C	Anchorage
88261	20.6W	10	37 ³ / ₈	4 ³ / ₈	79824



BEGA 1000 BEGA Way, Carpinteria, CA 93013 (805) 684-0533 info@bega-us.com

Due to the dynamic nature of lighting products and the associated technologies, luminaire data on this sheet is subject to change at the discretion of BEGA North America. For the most current technical data, please refer to bega-us.com
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DENALI LED (INTEGRAL)

IP66 RATED

DATE:

PROJECT:

TYPE:

CATALOG NUMBER LOGIC:



*Accommodates up to 2 lens/shielding media.

**120V only

CATALOG NUMBER LOGIC

Example: DE - LED - TR - x98 - SP - BZW - 9 - 11 - A - ELV - 120

MATERIAL

Aluminum

SERIES

DE - Denali

SOURCE

LED - Chip on Board Technology

HOUSING

TR - Integral Driver

LED TYPE

x98 - 13W LED/2700K x99 - 13W LED/3000K x100 - 13W LED/4000K

OPTICS

SP - Spot (20°) FL - Flood (35°) WFL - Wide Flood (60°)

FINISH (See page 2 for full-color swatches)

Standard Finishes (BZP, BZW, BLP, BLW, WHP, WHW, SAP, VER)

Premium Finish (ABP, AMG, AQW, BCM, BGE, BPP, CAP, CMG, CRI, CRM, HUG, MDS, NBP, OCP, RMG, SDS, SMG, TXF, WCP, WIR)

Also available in RAL Finishes

LENS TYPE*

9 - Clear (Standard)

12 - Soft Focus 13 - Rectilinear

SHIELDING*

11 - Honeycomb Baffle

CAP STYLE

A - 45°

B - 90°

C - Flush

D - 45° Less Weephole (Interior use only)

E - 90° Less Weephole (Interior use only)

CONTROLS

ELV - 13W Dimming Driver (For use with Electronic Low Voltage Dimmer)**

INC - 13W Dimming Driver (For use with incandescent dimmer)**

INPUT VOLTAGE

120 - 120 VAC

B-K LIGHTING

MADE IN THE USA

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01/13/2020 SKU-1245
SUB-2783-00



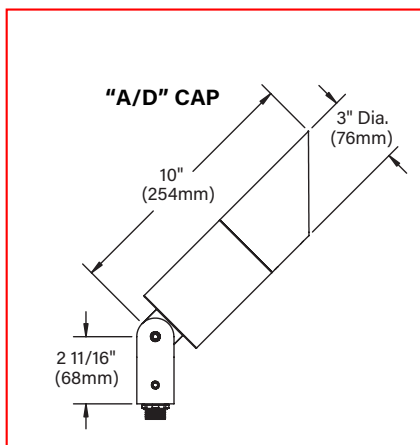
DENALI LED (INTEGRAL)

IP66 RATED

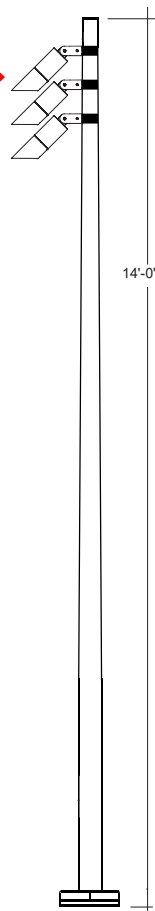
DATE:

PROJECT:

TYPE:



(3) AREA FLOODLIGHTS TO BE TILTED NO MORE THAN 20° FROM NADIR

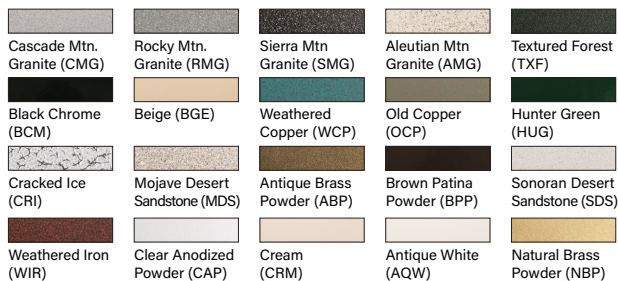


STANDARD FINISHES



[Click Here](#) to view larger, full-color swatches of all available finishes on our website.

PREMIUM FINISHES



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SUB-2783-00



Bol 8' – 24' Round Tapered and Straight Wood Poles

STRUCTURA

FIXTURE TYPE: _____

PROJECT NAME: _____



Glulam solid wood and aluminum pole available in 8' – 24' lengths. Tenon adapters, slip fitters and side bracket mounts are available for luminaire mounting.

FEATURES:

- Round extruded aluminum pole base with flush handhole cover held with countersunk stainless steel fasteners.
- Tapered, round, solid glulam wood pole

SPECIFICATIONS:

HOUSING: Solid wood pole is assembled through glulam construction and precision machined using CNC technology. An electrical raceway is provided in the pole's center for wiring. Laminations measure no more than 2" in thickness. Adhesive complies with ASTM D-2559 glulam construction specifications for extreme exposed weather conditions, is waterproof and rated for wet or dry use exposure.

Glulam wood shaft is fastened to aluminum pole base welded to a 3/4" thick aluminum anchor bolt base. Anchor bolt kit includes (4) 3/4" hot dip galvanized anchor bolts and fasteners and ridged concrete pour template.

FIXTURE MOUNTING: Fixtures mount either by 2 3/8", 2 7/8", 3 1/2", or 4" diameter by 4" tall tenon or drill mount for arm brackets. Consult factory for other tenon sizes. Luminaires shall be provided by others.

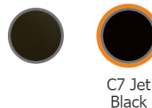
BODY - Accoya® Wood Finishes



S4 Ipe



ACCENT - Metal Finishes



C7 Jet
Black



ELECTRICAL: A 5/16" – 18 grounding point is provided on the aluminum pole base. Wireway access is provided through a NEC compliant handhole with a flush, gasketed cover plate.

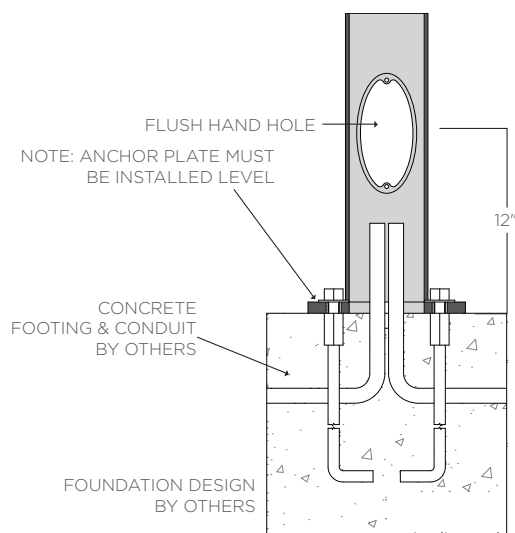
FINISHES AND MATERIALS: Woods are finished with a low VOC waterborne matte exterior finish containing UV and mildew inhibitors. All aluminum parts are polyester powder coat painted.

HARDWARE: Fasteners are stainless steel. Anchor bolt kits are hot dip galvanized.

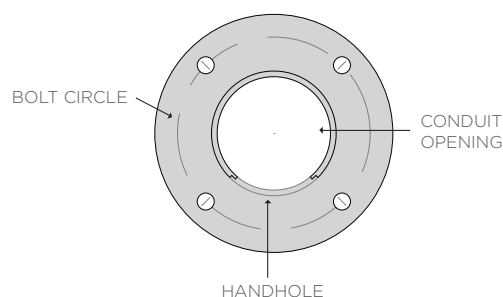




STRUCTURA



Pole Size	Bolt Circle	Conduit Opening
5.5"	8.5" dia.	5" dia.
7.0"	11" dia.	6.5" dia.



ORDERING GUIDE: EXAMPLE: BOL-S-12-55-55-S3-C6-T3124-STD

BOL								
1	2	3	4	5	6	7	8	9

1	Series	4	Base Diameter	8	Fixture Mounting
BOL	Bol	55 70	5.5" - 20' Maximum Height 7.0" - 24' Maximum Height	Tenon T2384 T2784 T3124 T4004 TXXX	2 3/8" x 4" Tenon 2 7/8" x 4" Tenon 3 1/2" x 4" Tenon 4" x 4" Tenon Specify diameter and height
2	Shaft Shape	5	Top Diameter	Drill	
T S	Round Tapered Round Straight	40 55 70	4.0" 5.5" 7.0"	D1 D2 D3 D4 D5	1 @ 90deg 2 @ 180deg 2 @ 90deg 3 @ 90deg 4 @ 90deg
3	Height	6	Wood Finish	9	Special
8 10 12 14 16 18 20 22 24	8' 10' 12' 14' 16' 18' 20' 22' 24'	S*	See color options on finishes technical sheet	STD MOD	Standard Modified
		7	Metal Finish		
		C*	See color options on finishes technical sheet		
		CSM	Custom Color		



DENALI LED (INTEGRAL)

IP66 RATED

DATE:

PROJECT:

TYPE:

CATALOG NUMBER LOGIC:



*Accommodates up to 2 lens/shielding media.

**120V only

CATALOG NUMBER LOGIC

Example: DE - LED - TR - x98 - SP - BZW - 9 - 11 - A - ELV - 120

MATERIAL

Aluminum

SERIES

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SOURCE

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HOUSING

TR - Integral Driver

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OPTICS

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Premium Finish (ABP, AMG, AQW, BCM, BGE, BPP, CAP, CMG, CRI, CRM, HUG, MDS, NBP, OCP, RMG, SDS, SMG, TXF, WCP, WIR)

Also available in RAL Finishes

LENS TYPE*

9 - Clear (Standard)

12 - Soft Focus 13 - Rectilinear

SHIELDING*

11 - Honeycomb Baffle

CAP STYLE

A - 45°

B - 90°

C - Flush

D - 45° Less Weephole (Interior use only)

E - 90° Less Weephole (Interior use only)

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INC - 13W Dimming Driver (For use with incandescent dimmer)**

INPUT VOLTAGE

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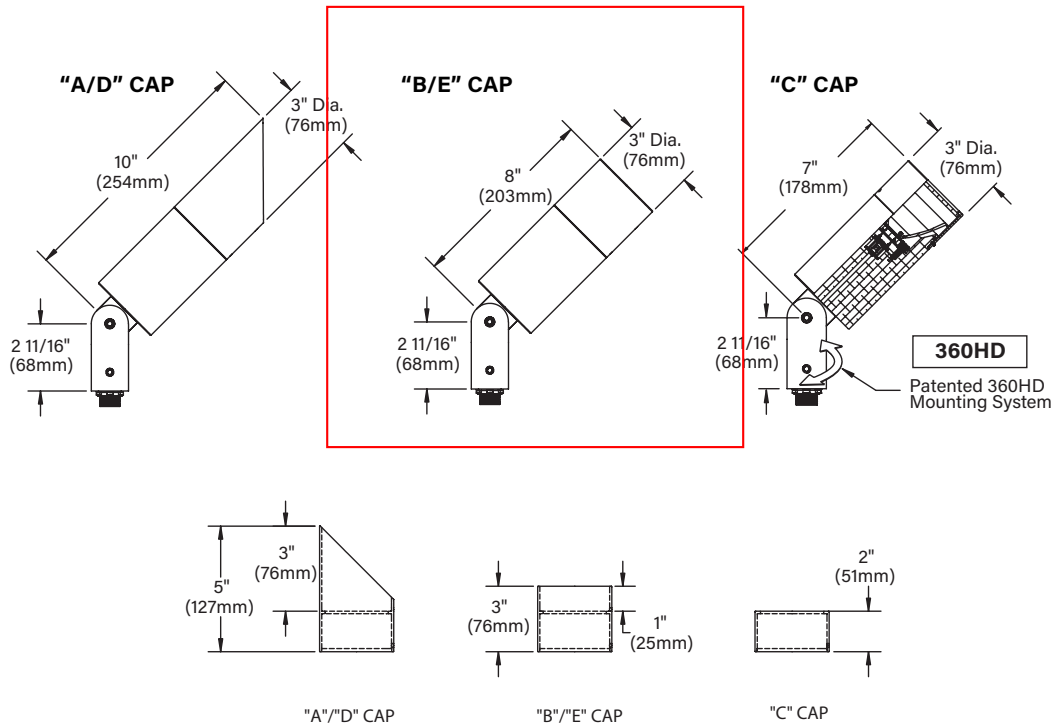
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SUB-2783-00



DENALI LED (INTEGRAL)

IP66 RATED

DATE:	PROJECT:	TYPE:
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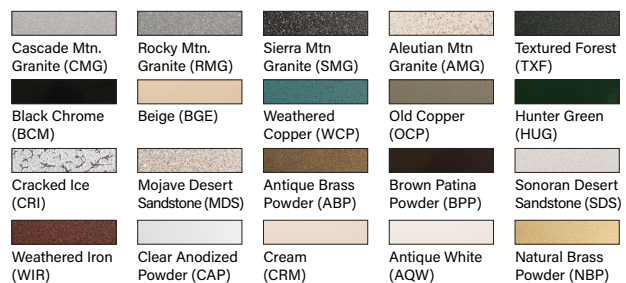


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01/13/2020 SKU-1245
SUB-2783-00



ALL DIMENSIONS INDICATED ON THIS SUBMITTAL ARE NOMINAL. CONTACT TECHNICAL SALES IF YOU REQUIRE MORE STRINGENT DIMENSIONAL SPECIFICATIONS.

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Specify Powder Coat Finish

Provide 12Volt A.C. Power from Remote Magnetic Transformer

TS-BZW-MOD

360SL Mounting System

5"

2 1/4" Dia

Machined Solid State Delta Star Fixture with Integral Dimming Driver

(Specify CCT):
e64 7W- 2.7K
e65 7W- 3K
e66 7W- 4K
e74 7W- Amber

(Specify Optics):
"NSP", "SP", "MFL" or "WFL"

(Specify Lens/Shielding Types):
#11 Honeycomb Baffle
#12 Soft Focus Lens
#13 Rectilinear Lens

(Specify Cap):
"A", "B", "D" or "E"

Snap Fitting with Fixed Nylon Strap

1" Wide Nylon Strap

Machined 1" Radius Canopy

3"

UL
LISTED

DELTA STAR SOLID STATE FIXTURE W/ RADIUS CANOPY

05/01/20 **B-K LIGHTING, INC.**

DRAWING NUMBER
CUS-1597-46

FRAXION®3 SLIM

FIXED

Lots of light in an under-the-radar profile, with multiple design and installation options, ideal for corporate offices and retail settings.

PROJECT NAME:

TYPE:



ORDERING INFORMATION - DOWNLIGHT / HOUSING



Quick Ship Product. All rough in components ship within 10 days up to quantities of 100.



JA8-2019 INDICATED BY SHADING

SHAPE	TRIM	RATING	TYPE	FLANGE FINISH	BAFFLE FINISH	LUMEN PACKAGE	CCT	OPTIC	INSTALL TYPE	CEILING THICKNESS	DRIVER	EFFECTS DEVICE
			F									
F3R Round	M Microflange	1 Dry/Damp	F Fixed	WH White	WH White	STATIC WHITE	22 2200K*	10 10°*	INTEGRAL DRIVER	1 0.50" - 1.375"	INTEGRAL	STANDARD EFFECTS DEVICE
F3S Square	T Trimless Drywall	2 Wet*		BK Black	BK Black	80C12A 80+ CRI Dvd. Lumens - 795	* (Only available with 90C10A and 90C14A)	* (Only available with 80C12A, 90C10A and 97C10A. Not available with 2200K)	X IC	2 1.375" - 2.125"	PH ELV/Trac, 2% 120V*	04 Soft Focus Lens
	W Trimless Wood*			PR Primer	PR Primer	80C16A 80+ CRI Dvd. Lumens - 1095	27 2700K		Y NIC	0.50" - 1.375"	* (Not available for 80C12A, 90C10A, and 97C10A unless 10° degree optic is specified)	00 No Lens*
				AU Cashmere Gold	AU Cashmere Gold	80C23A 80+ CRI Dvd. Lumens - 1506	30 3000K		C IC, Airtight*	* Includes adjustable housing height bracket, recommended for any 7-Grid or Furring Channel applications	SG 0-10V Analog, LOG 1% 120 or 277V	* (Standard and only available with 10° optic. Not available for Wet Location)
				AG Satin Silver	AG Satin Silver	90C10A 90+ CRI Dvd. Lumens - 683	35 3500K		* (Chicago Plenum, Airtight & Title 26 compliant housing)		SN 0-10V Analog, LIN 1% 120 or 277V	
				BB Burnt Bronze	BB Burnt Bronze	90C14A 90+ CRI Dvd. Lumens - 936	40 4000K		REMOTE DRIVER		LP Lutron, Hi-Lume Premier Ecosystem 0.1% Fade to Black, 120 or 277V*	ALTERNATE EFFECTS DEVICE
				00 Trimless*	CF Custom Finish*	90C19A 90+ CRI Dvd. Lumens - 1291		60 60°	V IC, Remote		* (Not available for 80C23A, 90C19A, or 97C17A in all IC install types)	02 Honeycomb Louver*
				CF Custom Finish*		97C10A 97+ CRI Dvd. Lumens - 608		85 85°*	W NIC, Remote			* (Not available for Wet Location or Warm Dim)
						97C12A 97+ CRI Dvd. Lumens - 833			D IC, Airtight, Remote		REMOTE (120V)	03 Clear Glass Lens*
						97C17A 97+ CRI Dvd. Lumens - 1151*			* (Chicago Plenum, Airtight & Title 26 compliant housing)		L2 Lutron, Hi-Lume 1% 2-wire	* (Not available for Warm Dim)
						WARM DIM		22 22°			REMOTE (120-277V)	08 Frosted Soft Focus Lens
						90W11A 90+ CRI Dvd. Lumens - 857 Incandescent Profile	WL 2700K - 1800K	40 40°			EG eldoLED, SOLOdrive 0.1% 0-10V, LOG	14 Wide Distribution Lens*
						90W13A 90+ CRI Dvd. Lumens - 902 Halogen Profile	WD 3200K - 1800K	60 60°			EN eldoLED, SOLOdrive 0.1% 0-10V, LIN	* (Required and only available for 85° beam spread)
						SEE PAGE 3 FOR DETAILED WARM DIM PROFILE COMPARISON.		85 85°			ED eldoLED, SOLOdrive 0.1% DALI, LOG	26 Frosted Linear Spread Lens
						TUNABLE WHITE		22 22°			TUNABLE WHITE REMOTE (120-277V)	
						90T12A 90+ CRI Dvd. Lumens - 950*	TW 5000K - 2700K	40 40°			DG eldoLED, DUALdrive 0.1% 0-10V, LOG	
						* (Only available for remote housings)		60 60°			DN eldoLED, DUALdrive 0.1% 0-10V, LIN	
						ALL DELIVERED LUMEN OUTPUTS AND T24 COMPLIANCE REFLECT 3000K PAIRED WITH 40° OPTIC AND SOFT FOCUS LENS. REFERENCE PAGE 3 FOR ADDITIONAL T24 COMPLIANT CONFIGURATIONS.		85 85°			DD eldoLED, DUALdrive 0.1% DALI, LOG	

(WH) White Powder Coat	(BK) Black Powder Coat	(AU) Cashmere Gold Powder Coat	(AG) Satin Silver Powder Coat	(BB) Burnt Bronze Powder Coat
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PART NUMBER NOTES

- Housing and trim ship as e.g., F3RM1F-WHWH-90C10A2-3X1-PH*
- Remote driver ships with fixture as e.g., PSF3-RMT-90C-10A-1L2*

LUCIFER®
LIGHTING COMPANY

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As part of its policy of continuous research and product development, the company reserves the right to change or withdraw specifications without prior notice.

[PH] +1-210-227-7329 pg. 1
[FAX] +1-210-227-4967

[DATE OF REV: 01122021]



FRAXION3SLIM FIXED

DOWNLIGHT / HOUSING

- A LED**
Integral LED module design enables field service / replacement through housing aperture.
 - B OPTIC**
Proprietary optic integrates Reflection, Refraction and TIR offering 10°, 15°, 22°, 40° & 60° beams.
 - C TRIMLESS WOOD SPACERS**
Provided for Trimless Wood installations; includes (1) 1/16" spacer and (5) 1/8" spacers.
 - D TRIM EXTENSION**
Provided for ~2 ceiling thickness; accommodates 2.125" max ceiling thickness.
 - E MICROFLANGE PROFILE**
Features 0.30" flange. Thickness measures 0.06". Installed after ceiling is complete. Requires 3.375" diameter cutout. Wet location features integral silicone gasket.
 - F TRIMLESS DRYWALL PROFILE**
Installs totally flush with the ceiling with no visible trim. Appliqué includes screws for mounting and has 0.06" plaster stop. Not recommended for stucco applications.
 - G EFFECTS DEVICES / LENS RETAINER**
Fixture is limited to 1 effects device. Wet location effects device is sealed in place. Suction tool provided for removal of baffle with wet location. Lens retainer allows effects devices to be changed in Dry /Damp locations.
 - H ROUND BAFFLE**
Die-cast removable baffle provides easy access to tilting mechanism and features 62° glare cutoff. Minimizes aperture glare and conceals view into housing; includes gasket.
- SQUARE TRANSITIONAL BAFFLE**
Die-cast removable baffle provides easy access to tilting mechanism and features 62° glare cutoff. Transitions from square aperture at ceiling plane to round aperture at light source. Minimizes aperture glare and conceals view into housing; includes gasket.

DIMENSIONS / DRAWINGS

