

# TECHNICAL SPECIFICATIONS

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## SECTION 08 63 00

### CABLE TRUSS METAL FRAMED SKYLIGHTS

#### PART 1 - GENERAL

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##### 1.01 SECTION INCLUDES:

- A. The Work specified in this Technical Specifications Section consists of providing cable truss metal framed skylights as required to complete work.

##### 1.02 RELATED SECTIONS

- A. Section 08 62 00 - Pyramidal Unit Skylights
- B. Section 08 80 00 - Glazing

##### 1.03 MEASUREMENT AND PAYMENT

- A. Separate measurement or payment will not be made for Work required under this Technical Specifications Section. All costs in connection with the Work specified in this Technical Specification Section will be considered to be included with the related item of Work in the Pricing Schedule or incidental to the Work.

##### 1.04 SUBMITTALS

- A. General: Refer to Technical Specifications Section 01 33 00, Submittal Procedures: Technical Specifications Section 01 33 23 Shop Drawings, Product Data, and Samples; and Technical Specifications Section 01 78 39. Project Record Documents, Submittals shall be presented in accordance with the requirements specified in this Technical Specifications Section.
- B. Product Data: For each type of component indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for cable truss metal-framed skylights.
  - 1. Provide manufacturer's standard catalog data for specified products demonstrating compliance with referenced standards. Provide list of fittings being provided with descriptions, load capacities, and either photographs or drawings for each type.
- C. Shop Drawings: For metal-framed skylights. Include plans, elevations, sections, details, and attachments to other work.
  - 1. Include details of provisions for assembly expansion and contraction and for draining moisture within the assembly to the exterior.

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2. Indicate materials, methods, finishes, fittings, fasteners, anchorages, and accessory items.
  3. Provide setting diagrams and templates for anchorages, sleeves, and bolts to be installed by others.
  4. Where materials or fabrications are indicated to comply with design loadings, include material and safety factor properties, and other information needed for structural analysis.
  5. Include full-size isometric details of each vertical-to-horizontal intersection of assembly, showing the following:
    - a. Joinery including concealed welds.
    - b. Anchorage.
    - c. Expansion provisions.
    - d. Glazing.
    - e. Flashing and drainage.
  6. Include laboratory mockup Shop Drawings, prepared by a qualified preconstruction testing agency, showing details of laboratory mockup.
    - a. Resubmit Shop Drawings with changes made to details of mockup to successfully complete preconstruction testing.
- D. Samples for Initial Selection: For units with factory-applied color finishes.
1. Submit sample of glass and glazing materials required for the Project. Samples of glass shall be 12" x 12", samples of sealant or gasket shall be 12" long.
  2. Submit sample of spring plate complete with glass, bolt and accessories.
- E. Fabrication Sample: Of each framing intersection of assemblies, made from 12-inch (305-mm) lengths of full-size components and showing details of the following:
1. Cables.
  2. Anchorage.
  3. Expansion provisions.
  4. Glazing.
  5. Flashing and drainage.
- F. Delegated-Design Submittal: The Contractor shall be responsible for cable truss metal-framed skylights design to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- G. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for metal-framed skylights.

H. Field quality-control reports.

## 1.05 QUALITY ASSURANCE

A. Sole Source Responsibility: Glazing Material and Cable System Design: Glass, glazing, cable system design and accessories are the sole responsibility of the manufacturer of the major components of the skylights.

B. Sole Source Responsibility: Provide installation by installer acceptable to ~~VTA~~ manufacturer. Provide a letter signed by representative of the skylight manufacturer with company's authorization stating that installer is acceptable and qualified to install system.

1. The ~~Contractor-installer~~ shall be responsible for supplying and erecting the complete structural support system, coordinating and maintaining tolerances between structure and glazing system with individual suppliers and manufacturers, and installation of the cable truss metal framed skylights

C. Where safety glass is indicated or required by authorities having jurisdiction, provide type of products which comply with ANSI Z97.1 and testing requirements of 16 CFR, Part 1201 for category II materials.

D. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated.

E. Product Options: Information on Drawings and in Specifications establishes requirements for skylights' 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 testing conducted by an independent testing agency and in-service performance.

1. Do not modify intended aesthetic effects, ~~as judged solely by VTA, except with Architect's approval~~. If modifications are proposed, submit comprehensive explanatory data to VTA for review.

2. Proposed substitutions that diminish the aesthetic or performance characteristics will not be acceptable.

F. Structural-Sealant Glazing: Comply with recommendations in ASTM C 1401, "Guide for Structural Sealant Glazing," for joint design and quality-control procedures.

1. Joint designs are reviewed and approved by structural-sealant manufacturer.

2. Quality-control program development and reporting comply with ASTM C 1401 recommendations for material qualification procedures, preconstruction sealant-testing program, and procedures and intervals for fabrication and installation reviews and checks.

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3. Perform manufacturer's standard tests for compatibility and adhesion of sealants with each material that will come in contact with sealants.
- G. Provide cable truss metal-framed skylights that comply with test-performance requirements indicated, as evidenced by reports of tests performed on manufacturer's standard assemblies or based on Project-specific preconstruction testing by a qualified independent testing agency.
1. Preconstruction Testing: ~~VTA will e~~ Engage a qualified testing agency to perform preconstruction testing on laboratory mockups of assemblies.
  2. Build laboratory mockups at testing agency facility using personnel, materials, and methods of construction that will be used at Project site.
  3. Before performing testing on structural-sealant-glazed assemblies, remove at least one of every type of glazing lite from each laboratory mockup and replace them using re-glazing procedures required for in-use skylight assembly.
  - ~~4. Notify VTA seven days in advance of the dates and times when laboratory mockups will be constructed.~~
  - 4.5. Preconstruction Testing Sequence: Test laboratory mockups according to AAMA 501, using the following sequence of tests:
    - a. Structural-performance preloading at one-half of the specified maximum test load (ASTM E 330).
    - b. Air infiltration (ASTM E 283).
    - c. Water penetration under static pressure (ASTM E 331).
    - d. Water penetration under dynamic pressure (AAMA 501.1).
    - e. Structural performance at design load (ASTM E 330).
    - f. Repeat air filtration (ASTM E 283).
    - g. Repeat water penetration under static pressure (ASTM E 331).
    - h. Structural performance at specified maximum test load (ASTM E 330).
- H. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
1. Build mockup of typical cable truss metal-framed skylights as shown on Drawings.
  2. Approval of mockups does not constitute approval of deviations from the Contract Documents, ~~contained in mockups unless Architect specifically approves such deviations in writing.~~

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3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

- I. Pre-installation Conference: Conduct conference at Project site.

### 1.06 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal-framed skylights that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

- a. Structural failures including, but not limited to, excessive deflection.
- b. Noise or vibration caused by thermal movements.
- c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
- d. Adhesive or cohesive sealant failures.
- e. Water leakage.

2. Warranty Period: ~~10 years (or greater) from date of Final Completion.~~

1. Manufacturer: 12 years

2. Installer: 5 years

## PART 2 - PRODUCTS

### 2.01 CABLE TRUSS METAL FRAMED SKYLIGHTS

- A. Subject to compliance with requirements, provide the following Product "or equal":

1. Manufacturer: "Pilkington Planar Cable Truss" by W&W Glass, LLC
2. System: A single company shall design, engineer and fabricate and install the skylight. Glass shall be manufacturer's highest quality glazing system suitable for configurations shown in plans. Glass thickness shall be determined by system manufacturer based on sizes, application, and performance criteria.

- B. Provide cable truss metal-framed skylights shall withstand the effects of the following without failure due to defective manufacture, fabrication, installation, or other defects in construction:

1. Structural loads.

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2. Thermal movements.
  3. Movements of supporting structure.
  4. Dimensional tolerances of support system and other adjacent construction.
  5. Failure includes, but is not limited to, the following:
    - a. Deflection exceeding specified limits.
    - b. Thermal stresses transferring to building structure.
    - c. Framing members transferring stresses, including those caused by thermal and structural movements to glazing.
    - d. Glazing-to-glazing contact.
    - e. Noise or vibration created by wind and by thermal and structural movements.
    - f. Loosening or weakening of fasteners, attachments, and other components.
    - g. Sealant failure.
- C. Structural Loads:
1. Wind Loads: As required by the California Building Code (CBC).
    - a. Basic Wind Speed: 90 mph (40 m/s).
  2. Seismic Loads: As required by CBC, Zone 4 essential facility.
- D. Deflection of Cable Trusses: At design wind pressure, as follows:
1. Deflection Normal to Glazing Plane: Limited to edge of glass in a direction perpendicular to glass plane not exceeding  $L/175$  of the glass edge length for each individual glazing lite.
  2. Deflection Parallel to Glazing Plane: Limited to  $L/360$  of clear span or 1/8 inch (3.2 mm), whichever is smaller.
- E. Structural-Test Performance: Provide metal-framed skylights tested according to ASTM E 330, as follows:
1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
  2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural

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distress, and permanent deformation of main framing members exceeding 0.2 percent of span.

3. Test Durations: As required by design wind velocity, but not less than 10 seconds.
- F. Windborne-Debris-Impact-Resistance Performance: Provide metal-framed skylights that pass missile-impact and cyclic-pressure tests when tested according to ASTM E 1886 and testing information in ASTM E 1996 for Wind Zone 2.
1. Large-Missile Test: For glazed openings located within 30 feet (9.1 m) of grade.
  2. Small-Missile Test: For glazed openings located more than 30 feet (9.1 m) above grade.
- G. Air Infiltration: Provide metal-framed skylights with maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq. ft. (0.03 L/s per sq. m) of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure difference of 1.57 lbf/sq. ft. (75 Pa).
- H. Water Penetration under Static Pressure: Provide metal-framed skylights that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft. (300 Pa).
- I. Water Penetration under Dynamic Pressure: Provide metal-framed skylights that do not evidence water leakage through fixed glazing and framing areas when tested according to AAMA 501.1 under dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft. (300 Pa).
1. Maximum Water Leakage: According to AAMA 501.1. Water leakage does not include water controlled by flashing and gutters that is drained to exterior and water that cannot damage adjacent materials or finishes.
- J. Thermal Movements: Provide metal-framed skylights that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures. Base engineering calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- K. Condensation Resistance: Provide metal-framed skylights with fixed glazing and framing areas having condensation-resistance factor (CRF) of not less than 45 when tested according to AAMA 1503.
- L. Structural Sealant: Capable of withstanding tensile and shear stresses imposed without failing adhesively or cohesively. When tested for preconstruction adhesion and compatibility, cohesive failure of sealant shall occur before adhesive failure.

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- M. Energy Performance: Provide metal-framed skylights with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below and certified and labeled according to NFRC:
1. Thermal Transmittance (U-Factor): Fixed glazing and framing areas shall have U-factor of not more than 0.80 Btu/sq. ft. x h x deg F (4.54 W/sq. m x K) as determined according to NFRC 100.
  2. Solar Heat Gain Coefficient: Fixed glazing and framing areas shall have a solar heat gain coefficient of no greater than 0.6 as determined according to NFRC 200.

### 2.02 CABLE TRUSS SYSTEMS

- A. Provide stainless steel wire rope assembly components as specified and as indicated on the Drawings. Manufacturer shall engineer and fabricate components and assemblies for installation. Design requirements for individual components and wire rope shall be as indicated on the Drawings and required to meet design criteria.
- B. Stainless steel structural support wire rope assemblies including.
1. Braces and Trusses.
  2. Structural Ties.
  3. Suspension Cables.
  4. Tension Elements.
- C. Stainless steel structural support rod assemblies including.
1. Suspension Rods.
  2. Tension Elements.
  3. Structural Ties.
  4. Support rods.
- D. Provide wall mounting spacers, brackets and fittings required for attachment and connection to the structure and for support of stainless steel wire rope, and glass as indicated on the Drawings.
- E. Fabricate trusses from AISI Type 316 and 316L stainless steel complying with ASTM F 1145; INOX Line anchors as manufactured by Jakob, Inc. Provide sizes and types as required to meet project design conditions specified and indicated on Drawings.
- F. Sealants: As recommended in writing by manufacturer.

### 2.03 GLAZING

- A. Glazing: As specified in Section 08 80 00 "Glazing" and/or as required or recommended for type and thickness by Skylight manufacturer.
- B. Glazing Sealants: As recommended in writing by manufacturer.



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1. Sealants used inside the weatherproofing system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
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: 100 g/L or less.
  - b. Color: As selected by VTA from manufacturer's full range.
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: 250 g/L or less.
  - b. Color: Matching structural sealant.

### 2.04 FABRICATION

- A. Where practical, fit and assemble metal-framed skylights in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Factory-Glazed, Metal-Framed Skylights:
  1. Factory install glazing to comply with requirements in Section 08 80 00 "Glazing."
  2. Prepare surfaces that will contact structural sealant according to structural-sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.
- C. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.
- D. Planar Glazing System:
  1. Fittings are designed to give flush appearance to outward surface of glazing system. No exterior fittings or plates will be permitted.
  2. Spring plate members are designed to prevent high stress concentration at the hole positions and must cope with:

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- a. Negative and positive wind loading
  - b. Seismic loads
  - c. Thermal movement
  - d. Construction tolerances
  - e. Live load and dead load movements
3. Movement diaphragms of stainless steel and durable flexible discs must be incorporated in connections to accommodate oversize holes in spring plate members which allow for thermal movement and glass manufacturing tolerances.
  4. The system shall provide for unitized pre-fixing of all items to glass prior to erection.
- E. Spring plates shall provide a tolerance capability which will cope with the full range of movements shown below:
1. Thermal movements occurring as a result of differential coefficient of thermal expansion within the range specified. The components used within the system shall withstand noiselessly all thermal movement without any buckling, distortion, cracking, failure of joint seals or undue stress on the glass or fixing assemblies.
  2. Deflection of edge trusses due to loading applied after erection of the cladding to magnitude specified.
  3. Maximum side sway of structure due to wind load to the magnitude specified or seismic movement to the degree specified.
  4. Deflection due to self weight of the Planar system.
  5. Inward and outward movements due to the design wind loads specified.
- F. Countersunk planar bolts will be bright machine finished, socket head bolt diameter 1-1/8" with hexagonal shank, stainless steel Series 300.
- G. No exterior plates, caps, disks or buttons will be permitted.
- H. Bushings will be Nylation Polyimide.
- I. Gaskets will be fully vulcanized fiber, neoprene or precured silicone.

### **2.05 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.

## **PART 3 - EXECUTION**

### **3.01 EXAMINATION**

## Cable Truss Metal Framed Skylights

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

### 3.01 INSTALLATION

- A. General:
  - 1. Comply with manufacturer's written instructions.
  - 2. Do not install damaged components.
  - 3. Rigidly secure non-movement joints.
  - 4. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
  - 5. Seal joints watertight unless otherwise indicated.
- B. Install components to drain water passing joints, condensation occurring within supporting members, and moisture migrating within skylight to exterior.
- C. Install components plumb and true in alignment with established lines and elevations.
- D. Install glazing as specified in Section 08 80 00 "Glazing."
  - 1. Structural-Sealant Glazing:
    - a. Prepare surfaces that will contact structural sealant according to structural-sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.
    - b. Install weatherseal sealant according to weatherseal-sealant manufacturer's written instructions to produce weatherproof joints. Install joint filler behind weatherseal sealant as recommended in writing by weatherseal-sealant manufacturer.
- E. Erection Tolerances: Install metal-framed skylights to comply with the following maximum tolerances:
  - 1. Alignment: Limit offset from true alignment to 1/32 inch (0.8 mm) where surfaces abut in line, edge to edge, at corners, or where a reveal or protruding element separates aligned surfaces by less than 3 inches (76 mm); otherwise, limit offset to 1/8 inch (3.2 mm).
  - 2. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet (3.2 mm in 3.7 m) but no greater than 1/2 inch (13 mm) over total length.

### 3.03 FIELD QUALITY CONTROL

- A. Testing Agency: ~~VTA will~~ eEngage a qualified testing agency to perform tests and inspections.
1. Water-Spray Test: Before installation of interior finishes has begun, skylights shall be tested according to AAMA 501.2 and shall not evidence water penetration.
  2. Water Penetration under Static Pressure: Before installation of interior finishes has begun, areas shall be tested according to ASTM E 1105.
    - a. Test Procedures: Test under uniform static-air pressure.
    - b. Water Penetration: None.
  3. Structural-Sealant Compatibility and Adhesion: Structural sealant shall be tested according to recommendations in ASTM C 1401.
    - a. Destructive test method, Method A, Hand Pull Tab (Destructive) in ASTM C 1401, Appendix X2, shall be used.
      - 1) A minimum of one area on each skylight face shall be tested.
      - 2) Repair installation areas damaged by testing.
  4. Structural-Sealant Glazing Inspection: After installation of metal-framed skylights is complete, structural-sealant glazing shall be inspected and evaluated according to ASTM C 1401 recommendations for quality-control procedures.
- B. Repair or remove work where test results and inspections indicate that it does not comply with specified requirements.
- C. Additional testing and inspecting, ~~at Contractor's expense, will~~ shall be performed to determine compliance of replaced or additional work with specified requirements.
- D. Prepare test and inspection reports.

**END OF SECTION 08 63 00**