



SECTION 08625 [08 62 23]

TUBULAR DAYLIGHTING DEVICES

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PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Tubular daylighting devices and accessories.

1.2 RELATED SECTIONS

- A. Section 06100 [06 10 00] - Wood Framing; Site built wood curbs and nailers.
- B. Section 07310 [07 31 00] - Roof Shingles and Shakes: Flashing of skylight base.
- C. Section 07320 [07 32 00] - Roof Tiles: Flashing of skylight base.
- D. Section 07510 [07 51 00] - Built-Up Bituminous Roofing: Flashing of skylight base.
- E. Section 07520 [07 52 00] - Modified Bituminous Membrane Roofing: Flashing of skylight base.
- F. Section 07530 [07 53 00] - Electrometric Membrane Roofing: Flashing of skylight base.
- G. Section 07540 [07 54 00] - Thermoplastic Membrane Roofing: Flashing of skylight base.
- H. Section 07600 [07 60 00] – Flashing and Sheet Metal: Metal curb flashings.
- I. Section 08620 [08 60 00] - Unit Skylights: Skylights without reflective tube.
- J. Section 08630 [08 63 00] - Metal Framed Skylights.
- K. Section 15810 [23 30 00] – HVAC Air Distribution: Fan vent duct and connections.
- L. Section 16570 [25 50 00] – Integrated Automation Facility Controls: Lighting controllers.
- M. Section 16150 [26 05 00] – Common Work Results Electrical: Power cable, power supply and electrical connections.
- N. Section 16500 [26 50 00] – Lighting Equipment and Controls: Control cable, dimming controls, light bulbs and lamps.

1.3 REFERENCES

- A. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- B. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- C. ASTM A 463/A 463M - Standard Specification for Steel Sheet, Aluminum Coated, by the Hot Dip Process.
- D. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc Coated (Galvanized), by the Hot Dip Process.
- E. ASTM A 792/A 792M – Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
- F. ASTM E 108 - Standard Test Methods for Fire Tests of Roof Coverings.
- G. ASTM E 283 - Test Method for Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
- H. ASTM E 308 - Standard Practice for Computing the Colors of Objects by Using the CIE System.
- I. ASTM E 330 - Structural Performance of Exterior Windows, Curtain Walls and Doors.
- J. ASTM E 547 - Test Method for Water Penetration of Exterior Windows, Skylights, Doors and Curtain walls by Cyclic Air Pressure Difference.
- K. ASTM E 1886 - Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials.
- L. ASTM E 1996 - Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricane.
- M. ASTM D 635 - Test Method for Rate of Burning and/or Extent of Time of Burning of Self-Supporting Plastics in a Horizontal Position.
- N. ASTM D 1929 - Test Method for Ignition Properties of Plastics.
- O. ASTM D 2843 – Standard Test Method for Density of Smoke from the Burning or Decomposition of Plastics.
- P. ASTM F 1642 – Standard Test Method for Glazing and Glazing Systems Subject to Airblast Loading.
- Q. ASTM F 2912 – Standard Specification for Glazing and Glazing Systems Subject to Airblast Loading.

- R. AAMA/WDMA/CSA 101/I.S.2/A440 - Standard/Specification for Windows, Doors, and Unit Skylights; 2011
- S. FM Standard 4431 - The Approval Standard for Skylights
- T. UL 2108 - Low Voltage Lighting Systems
- U. GSA-TS01-2003: Standard Test Method for Glazing and Window Systems Subject to Dynamic Overpressure Loadings
- V. Unified Facilities Criteria (UFC) 4-010-01, Change October 2013, DoD Minimum Antiterrorism Standards for Buildings,
- W. CSA C22.2 No. 250.0 – Luminaires.
- X. ICC-ES AC-16 - Acceptance Criteria for Plastic Skylights; 2008.
- Y. Florida Building Code TAS 201 – Impact Test Procedures.
- Z. Florida Building Code TAS 202 – Criteria for Testing Impact and Non Impact Resistant Building Envelope Components Using Uniform Static Air Pressure Loading.
- AA. Florida Building Code TAS 203 – Criteria for Testing Products Subject to Cyclic Wind Pressure Loading
- BB. IBC Section 1710 - Load Test Procedure for Wind Load Testing on Rooftop Daylight Collecting System - Structural Performance Testing - Devised by ATI PE); 2012
- CC. IBC Section 2606.7.2 – Installation – Diffuser Fall Out Test (Devised by PE); 2012
- DD. OSHA 29 CFR - 1910.23 (e)(8) (Guarding Requirements for Skylights); 1926 Subpart M (Fall Protection); 1926.501(b)(4)(i); 1926.501(i)(2); 1926.501(b)(4)(ii)
- EE. California State OSHA Fall Protection Code of Regulations, Title 8, Section 3212 (e)(1)

1.4 PERFORMANCE REQUIREMENTS

- A. Daylight Reflective Tubes: Spectralight Infinity with Cool Tube Technology combines ultra-high Visible Light reflectance with Ultra-low Infrared (IR) reflectance. Patented spectrally-selective optical surface yields an average total- and specular-reflectance greater than 99.5% percent for the Visible Light spectrum (400 nm to 700 nm) providing maximized visible light transmission and less than 25% reflectance for Infrared (IR) heat wavelengths (750 nm to 2500 nm) for minimized heat transmission, resulting in a spectrally-selective Total Solar Spectrum (250 nm to 2500 nm) reflectance less than 37 percent, as measured using a Perkin Elmer Lambda 1050 spectrophotometer with a Universal Reflectance Accessory. Color: a* and b* (defined by CIE L*a*b* color model) shall not exceed plus 2 or be less than minus 2 as determined in accordance to ASTM E 308.
- B. SKYVAULT M74 DS / OPEN CEILING
 - 1. AAMA/WDMA/CSA 101/IS2/A440, Class CW-PG80, size tested 36 inches by 36 inches (914 mm by 914 mm), Type TDD and Type TDDOC.

- a. Air Infiltration Test: Single and Dual Glazed Dome (M74 DS Type DP & DPP):
 - 1) Passes Air infiltration; maximum of 0.05 cfm/ft² (0.3 L/s/m²) when tested according to ICC-ES AC-16, and ASTM E 283.
 - 2) Meets or exceeds the air leakage performance levels with a maximum 0.4 cfm/ft² when tested in accordance with ASTM E 283.
 - 3) Air exfiltration will not exceed 0.4 cfm/sf aperture with a pressure delta of 1.57 psf across the tube when tested in accordance with ASTM E 283.
 - b. Water Resistance Test
 - 1) Single and Dual Glazed Dome (M74 DS Type DP & DPP): Passes water resistance; no uncontrolled water leakage with a pressure differential of 12.11 psf (580 Pa) or 15 percent of design pressure and a water spray rate of 5 gallons/hour/sf for 24 minutes when tested in accordance with ICC-ES AC-16, ASTM E 547, ASTM E 331, and TAS 202.
 - c. Uniform Load Test: All units tested with a safety factor of (3) for positive pressure and (2) for negative pressure, acting normal to plane of roof in accordance with ASTM E 330.
 - 1) Single and Dual Glazed Dome (Type DP & DPP): Design Pressure ±80.20 psf (±3.84 kPa).
 - (a) Passes uniform load test: No breakage, permanent damage to fasteners, hardware parts, or damage to make daylighting system inoperable or cause excessive permanent deflection of any section when tested at a Positive Load of 240.6 psf (11.52 kPa) or Negative Load of 160 psf (7.66 kPa) when tested according to ICC-ES AC-16, and ASTM E 330
2. Hurricane Resistance:
- a. Large Missile Impact test:
 - 1) Single Glazed Dome (Type DP) Passes:
 - (a) A minimum of missile level D for Wind Zone 4. No signs of penetration, rupture, or opening when tested in accordance with ASTM E 1886 and ASTM E 1996.
 - (b) No signs of penetration, rupture, or opening when tested in accordance with TAS 201
 - 2) Dual Glazed Dome (Type DPP) Passes:
 - (a) No signs of penetration, rupture, or opening when tested in accordance with TAS 201
 - b. Uniform Static Air Pressure Test: Passes Design pressure rating a minimum of plus or minus 80.2 psf (3.84 kPa) when tested in accordance with ASTM E 1886, ASTM E 1996, and TAS 202
 - c. Air Infiltration Test:
 - 1) Single Glazed Dome (Type DP) Passes:
 - (a) Air Infiltration a maximum 0.05 cfm/ft² at 1.57 psf (25 mph) test pressure when tested in accordance to TAS 202
 - (b) Air Infiltration a maximum 0.05 cfm/ft² at 6.24 psf (50 mph) test pressure when tested in accordance to TAS 202
 - 2) Dual Glazed Dome (Type DPP) Passes:
 - (a) Air Infiltration a maximum 0.04 cfm/ft² at 1.57 psf (25 mph) test pressure when tested in accordance to TAS 202

- (b) Air Infiltration, a maximum 0.05 cfm/ft² at 6.24 psf (50 mph) test pressure when tested in accordance to TAS 202.
 - d. Water Penetration Test:
 - 1) Single Glazed Dome (Type DP) Passes: No sign of water penetration at 12.11 psf (0.580 kPa) or 15 percent of Design Load when tested in accordance with TAS 202.
 - 2) Dual Glazed Dome (Type DPP) Passes: No sign of water penetration at 12.11 psf (0.580 kPa) or 15 percent of Design Load when tested in accordance with TAS 202.
 - e. Cyclic Wind Pressure Loading:
 - 1) Single Glazed Dome (Type DP): Passes. No signs of failure during the cyclic load test when tested in accordance with ASTM E 1886, ASTM E 1996, and TAS 203.
 - 2) Dual Glazed Dome (Type DPP): Passes. No signs of failure during the cyclic load test when tested in accordance with ASTM E 1886, ASTM E 1996, and TAS 203.
- 3. Wind Load Test:
 - a. Daylight Collector System (Type C): Passes: No sign of failure or destruction when a maximum 2.5 times design load is applied laterally to the exposed cylindrical section when tested in accordance with IBC Section 1710 and Florida Building Code Section 1715.3 - Load Test Procedure for Wind Load Testing on Rooftop Daylight Collecting System - Structural Performance Testing - Devised by Architectural Testing Inc. PE.
 - b. Design Load: 69.7 psf.
 - c. Force Coefficients of Chimneys, Tanks, Rooftop Equipment, & Similar Structures according to ASCE/SEI 7-10 Figure 29.5-1
 - 1) Cross Section: Round
 - 2) Type of surface: Moderately smooth
 - 3) Ratio (h/D): 1.4
 - 4) Force coefficient: 0.6
- 4. Fire Testing:
 - a. Fire Rated Roof Assemblies: When used with the Dome Edge Protection Band and mounted on curbs 4 inches high or greater, all domes shall meet the prescriptive fire rating requirements for Class A, B, and C roof assemblies as described in the International Building Code
 - b. Self-Ignition Temperature Testing:
 - 1) Outer Dome Glazing (Type DP & DPP): Self-Ignition Temperature greater than 650 degrees F when tested in accordance with ASTM D 1929.
 - 2) Inner Dome Glazing (Type DPP): Self-Ignition Temperature greater than 650 degrees F when tested in accordance with ASTM D 1929.
 - 3) Cylinder Collector (Type C): Self-Ignition Temperature greater than 650 degrees F when tested in accordance with ASTM D 1929.
 - 4) Diffuser (Type – All M74 DS): Self-Ignition Temperature greater than 650 degrees F when tested in accordance with ASTM D 1929.
 - c. Smoke Density Rating:
 - 1) Outer Dome Glazing (Type DP & DPP):

- (a) Smoke Density Rating no greater than 450 per ASTM Standard E 84.
 - (b) Smoke Density Rating no greater than 75 per ASTM Standard D 2843
 - 2) Inner Dome Glazing (Type DPP): Smoke Density Rating no greater than 75 per ASTM Standard D 2843
 - 3) Cylinder Collector (Type C):
 - (a) Smoke Density Rating no greater than 450 per ASTM Standard E 84
 - (b) Smoke Density Rating no greater than 75 per ASTM Standard D 2843
 - 4) Light Transmitting Diffuser (Type – All M74 DS): Smoke Density Rating no greater than 75 per ASTM Standard D 2843
 - d. Rate of Burn and/or Extent of Burn:
 - 1) Outer Dome Glazing (Type DP & DPP): Minimum CC-1 Classification less than 1 inch (25 mm) extent of burn per ASTM D 635
 - 2) Inner Dome Glazing (Type DPP): Minimum CC-2 Classification less than 2.5 inches/min (62 mm/min) rate of burn per ASTM D 635.
 - 3) Cylinder Collector (Type C): S Minimum CC-1 Classification less than 1 inch (25 mm) extent of burn per ASTM D 635
 - (a) Raybender Daylight Lens (Type C): Minimum CC-2 Classification less than 2.5 inches/min (62 mm/min) rate of burn per ASTM D 635.
 - 4) Diffuser (Type – All M74 DS): Minimum CC-2 Classification less than 2.5 inches/min (62 mm/min) rate of burn per ASTM D 635.
5. FM Certification:
 - a. Spread of Flame: Passes: Class A at 5 in12. No flame spread when tested in accordance with FM modified version of ASTM E108 Fire Test of Roof Coverings.
 - b. Simulated Hail Resistance (Pre UV Exposure): Passes: No cracking or breaks when tested with nominal 2.0 in. (51 mm) diameter ice ball having a kinetic energy of 26.8 ft-lbs (36.4J)
 - c. Simulated Hail Resistance (Post UV Exposure): Passes: No cracking or breaks when tested with nominal 2.0 in. (51 mm) diameter ice ball having a kinetic energy of 26.8 ft-lbs (36.4J) after no less than 1000 hours of ultraviolet (UV) light exposure.
 - d. Simulated Impact: Passes: No breakage or through openings when a 100 lb (45.5 kg) weight dropped from 4 ft (1.2 m) above highest point of test sample.
 - e. Simulated Wind Uplift: Passes: 195 psf Wind Rating. No separation, breaking or cracking occurred when tested in accordance with FM 4431.
6. Interior Finish Classification (IBC Section 803):
 - a. Outer Dome Glazing (Type DP & DPP): Class B per ASTM E 84
 - b. Cylinder Collector (Type C): Class B per ASTM E 84
 - c. Diffuser (Type – All M74 DS): Comply with IBC Section 2606.7.2 (Diffuser Fall Out Test).
7. Fall Protection Performance
 - a. Passes fall protection test: No penetration of dome or curb cap shall occur when subject to 700 lb (318.2 Kg)/60 second static load test and 700 lb (318.2 Kg)/2-foot (610 mm) impact drop test when tested in

- accordance with OSHA 29 CFR 1926 Subpart M (Fall Protection) 1926.501(b)(4)(i); 1926.501(i)(2); and 1926.501(b)(4)(ii).
- b. Passes fall protection test: California State OSHA Fall Protection Code of Regulations, Title 8, Section 3212 (e)(1)
8. Blast Resistance: ASTM F1642, ASTM F2912, GSA-TS01-2003, and UFC 4-010-01:
- a. Airblast Loading ASTM Hazard Rating: Passes: No Break Rating
 - b. Airblast Loading UFC Level of Protection: Passes High Level of Protection
 - c. Dynamic Overpressure Loading ASTM Hazard Rating: Passes: No Break Rating
 - d. Dynamic Overpressure Loading UFC Level of Protection: Passes High Level of Protection

1.5 SUBMITTALS

- A. Submit under provisions of Section 01 30 00.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Data sheets showing roof dome assembly, flashing base, reflective tubes, diffuser assembly, and accessories.
 - 4. Installation requirements.
- C. Shop Drawings. Submit shop drawings showing layout, profiles and product components, including rough opening and framing dimensions, anchorage, roof flashings and accessories.
- D. Electrical wiring diagrams and recommendations for power and control wiring.
- E. Verification Samples: As requested by Architect.
- F. Test Reports: Independent testing agency or evaluation service reports verifying compliance with specified performance requirements.
- G. LEED Submittals: Provide documentation of how the requirements of Credit will be met:
 - 1. List of Daylight Credits available for the products specified.
 - 2. Data on Energy Optimization Performance Credits for the products specified.
 - 3. Data on Perimeter and Non-Perimeter Controllability of Systems for use of Daylight Dimmer option with the products specified.
 - 4. Data on potential Innovation in Design Credits which may be available for the innovative use of the products specified.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Engaged in manufacture of tubular daylighting devices for minimum 20 years.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products in manufacturer's original containers, dry, undamaged, seals and labels intact.
- B. Store products in manufacturer's unopened packaging until ready for installation.

1.8 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.9 WARRANTY

- A. Daylighting Device: Manufacturer's standard warranty for 10 years.
- B. Electrical Parts: Manufacturer's standard warranty for 5 years, unless otherwise indicated.
- C. LED Emitters, Drivers and Controls: Manufacturer's standard warranty for 3 years against failure.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Solatube International, Inc.; 2210 Oak Ridge Way, Vista, CA 92081. Tel. Toll Free: 888-765-2882. Tel: (760) 477-1120. Fax: (760) 597-4488. Email: commsales@solatube.com. Web: www.solatube.com.
- B. Substitutions: Not permitted.
- C. Requests for substitutions will be considered in accordance with provisions of Section 01600.

2.2 TUBULAR DAYLIGHTING DEVICES

- A. Tubular Daylighting Devices General: Transparent roof-mounted skylight dome and self-flashing curb, reflective tube, and ceiling level diffuser assembly, transferring sunlight to interior spaces; complying with ICC AC-16.
- B. SkyVault Series: Solatube Model M74 DS, 28.5 inch (724 mm) Daylighting System:
 - 1. Model:
 - a. Solatube Model M74 DS - O Open Ceiling. AAMA Type TDDOC.
 - 2. Capture Zone:
 - a. Daylight Collector (Type C) with key components consisting of:
 - 1) Collector Dome: Polycarbonate 0.125 inch (3.2 mm) minimum thickness classified as CC1 material; UV inhibiting; (100 percent UVC, 100 percent UVB and 98.8 percent of the range of UVA transmission). Dimensions: 31.5 inches (800 mm) diameter by 6 inches (152 mm) high.
 - 2) Collector Cylinder: Polycarbonate 0.093 inch (2.4 mm) minimum thickness, classified as CC1 material; UV inhibiting, blocks all radiation <380nm: 100 percent UVC, 100 percent UVB and 76 percent of the range of UVA transmission). Dimensions:

Dimensions 35.88 inches (911 mm) high by 51.5 inches (1308 mm) arc length.

- 3) Collector Cylinder Back Panel: Support for collector assembly. Fabricated of corrosion resistant zincaluminum steel sheet CS-B AZ50, conforming to ASTM A792/A 792M, with a thickness of 0.0276 inch (0.7 mm). Dimensions: 36 inches (914 mm) high by 48 inches (1219 mm) arc length.
 - 4) Collector Cylinder LightTracker Reflector: Daylight reflector. Aluminum sheet, thickness 0.018 inch (0.5 mm). Interior Finish: Spectralight Infinity with Cool Tube Technology combining ultra-high Visible Light reflectance with Ultra-low Infrared (IR) reflectance. Dimensions: 36 inches (914 mm) high by 48 inches (1219 mm) arc length.
 - 5) Micro-replicated Raybender HD Fresnel Lens: Daylight collecting lens. Impact resistant acrylic, 0.020 inch (0.51 mm) thick film with linear prism lens structure, classified as CC2 material. Dimension: 16 inch (406 mm) high by 51.75 inch (1314 mm) arc length.
 - 6) Cylinder Collector Stanchion: "U" shaped support connecting the dome ring to the base cone assembly; (2) each. Fabricated of corrosion resistant galvanized steel sheet (G90), conforming to ASTM A 653/A 653M, with a thickness of 0.052 inch (1.3 mm). Dimensions: 36 inches (914) high by 0.50 inches (12.7 mm) wide by 0.375 inches (9.5 mm) deep.
 - 7) Base Cone Assembly: Conical shaped support connecting the daylight collection system to the curb-cap of associated TDD unit. Fabricated of corrosion resistant stainless steel (302/304), conforming to ASTM A 463/A 463M, with a thickness of 0.034 inch (0.86 mm). Dimensions: 35.9 inches (912 mm) major diameter by 30.385 inches (772 mm) minor diameter by 2.28 inches (58 mm) high.
 - 8) Upper seal (M74 DS Type C): Outer Dome, Cylinder Dome, and Back Panel interface. Adhesive backed PU foam "D" profile with water resistant polymeric skin. Dimension: 0.375 inch (9.5 mm) wide by 0.25 inch (6.35 mm) high.
 - 9) Lower seal (M74 DS Type C): Outer Dome and Support Cone interface. Adhesive backed 45 degree angle pile weather-strip. Dimension: 0.670 inch (17 mm) high by 0.27 inch (6.85mm) wide.
- b. Domes:
- 1) Roof Dome Assembly: Transparent, UV and impact resistant dome with flashing base supporting dome and top of tube.
 - (a) Fasteners: Non-corrosive metal fasteners including: non-magnetic stainless steel, zinc plated steel, aluminum, or injection molded nylon.
 - (b) Dome Edge Protection Band: For Classified Roof Assemblies. For approved assemblies, curb height (by others or built on site) must be more than 8 inches (203 mm). Galvanized steel. Nominal thickness of 0.039 inch (1 mm).
 - 2) Single Dome Glazing: Type DP.
 - (a) Outer Dome Glazing: 0.125 inch (3.2 mm) minimum thickness, vacuum formed polycarbonate classified as

- CC1 material; UV inhibiting (100 percent UVC, 100 percent UVB and 98.8 percent of the range of UVA transmission).
- (b) Outer Dome Seals: Adhesive Back Closed Cell Foam Seal 0.25 inch (6.3 mm) tall by 0.75 inch (19 mm) wide.
- 3) Dual Dome Glazing: Type DPP.
- (a) Outer Dome Glazing: 0.125 inch (3.2 mm) minimum thickness, vacuum formed polycarbonate classified as CC1 material; UV inhibiting; (100 percent UVC, 100 percent UVB and 98.8 percent of the range of UVA transmission).
- (b) Inner Dome Glazing: 0.040 inch (1 mm) minimum thickness, copolyester (PETG) polyethylene terephthalate with glycol classified as CC2 material.
- (c) Seals:
- (1) Inner Dome Seal: Adhesive back closed cell foam seal 0.125 inch (3.2 mm) or 0.188 inch (4.8 mm) tall by 0.375 inch (9.5 mm) wide.
- (2) Dome Assembly Seal: Adhesive backed pile weather-strip, 0.350 inch (8.9 mm) tall by 0.187 inch (4.8 mm) wide.
- c. Dome Options:
- 1) Security Guard: Type SG, welded powder coated steel or stainless steel rods 1/8 inch diameter mounted with an 8 inch maximum cross section. Assembly fastened with 1/8 inch diameter blind rivets in 6 locations to Curb-Cap assembly.
- 2) Security Kit: Type SK Dome Security Kit, rivets with nylon spacers to replace dome screws
- d. Flashings:
- 1) Curb Cap Flashing Base: Type FC one piece, seamless, leak-proof flashing and base support for dome and top of tube and cap flashing. Fabricated of galvanized steel, conforming to ASTM A 653/A 653M or ASTM A 463/A 463M or ASTM A792/A 792M, with a thickness of 0.0276 inch (0.7 mm) plus or minus .004 inch (.01 mm).
- (a) Base Style: Curb-cap, with inside dimensions of 35.5 inches by 35.5 inches (905 mm by 905 mm) to cover curb specified in Section 07600.
- (b) Insulation: Nominal 1 inch thick thermal isolation pad to reduce thermal conduction between curb-cap and tubing and thermal convection between room air and curb-cap. Rated R-6 ($^{\circ}\text{F}\cdot\text{ft}^2\cdot\text{hr}/\text{Btu}$) Insulation is Polyisocyanurate foam utilizing CFC, HCFC, & HFC free blowing agent. Type-1 Class-1 per ASTM C 1289; Passes UL 1715 (15-minute thermal barrier per IBC 2603.4); Attic ventilation may be required per IBC 1203.2.
- (c) Curb Seal: Includes a double bead of adhesive backed closed cell foam seal 0.188 inch (4.8mm) tall by 0.375 inch (9.5mm) wide to reduce air infiltration.
- (d) Tube Collar: Attached to top of curb-cap section; 0.018 inch (0.45 mm) nominal thickness aluminum conforming to ASTM B 209.

- (1) Interior Finish: Spectralight Infinity with Cool Tube Technology combining ultra-high Visible Light reflectance with Ultra-low Infrared (IR) reflectance.
3. Transfer Zone:
 - a. Extension Tubes: Aluminum sheet, thickness 0.018 inch (0.5 mm) conforming to ASTM B 209 with Tab-Lock tube joint structural connection system.
 - 1) Reflective Tubes:
 - (a) Reflective 24 inch (610mm) extension tube, Type EXX with total length of run as indicated on the Drawings.
 - (b) Belt Alignment Tab aligns Tube Belt on to tube in the correct location.
 - (c) Interior Finish: Spectralight Infinity with Cool Tube Technology combining ultra-high Visible Light reflectance with Ultra-low Infrared (IR) reflectance.
 - 2) Tab-Lock
 - (a) Tab-Lock captures adjoining tube or tube connector using periodic opposing hooks integrated in the tube perimeter with mating retention detents.
 - (b) Hook system allows ease of tube engagement or disengagement for single operator from man-lift or rooftop.
 - (c) System intertwines the ends of the adjoining tubes and tube connectors between each Tab-Lock station.
 - (d) Intertwining function accepts tubes and connectors of common diameters that reduces light loss up to 2 percent per tube joint relative to tubes with 0.3 inch (7.6 mm) diameter difference.
 - 3) Tube Belt:
 - (a) Sheet-metal belt 2 inch (50.8 mm) wide by 28.5 inch (724 mm) nominal diameter by 0.022 inch (0.5 mm) thick CS-B AZ-50 ASTM A 792 with 0.10 inch (2.5mm) diameter stainless steel type 302 ASTM A 313 torsion spring actuated toggle clamp.
 - (b) Retains Tab-Lock tube joint structural connection system; stiffens linear tube assembly; and prevents tube rotation or disengagement under normal use.
 - (c) Includes locking tab to prevent unintentional Tube Belt Latch opening due to handling, service, vibration, or normal operation or use.
 - 4) Extension Tube Options
 - (a) Reflective 48 inch extension tube, Type EL 48 inches (1220 mm) long. Use to replace two standard 24-inch (610 mm) extension tubes when long tube runs are required.
 - (b) Trim Ring: Type R. Provides a finished appearance to the installation, covering the cut edge of the roof deck penetration in an open ceiling application.
 - (c) Thermal Insulation Panel with Integral 24 inches (610 mm) Extension Tube: Type TIP, high-performance dual-glazed, thermally-broken tube insulation system consisting of two acrylic panels, spaced 1.0 inch (25.4 mm) apart, classified CC2 Class C material, 0.110 inch (2.8 mm) thick, housed in a polyethylene terephthalate glycol-modified (PETG) or acrylonitrile butadiene styrene (ABS) band classified as CC2 material 0.060 inch (1.5 mm) thick by 1.75 inch (44.5

mm) high with Spectralight Infinity high reflectance specular finish interior surface, and assembled with stainless steel disk spacers 0.0197 inch (0.5 mm) thick and aluminum rivets 0.13 inch (3.2 mm) fastened periodically around the perimeter. Dual-glazed Panel assembly integrated with a 12 inch Upper and a 12 inch Lower Transition Tube made of Spectralight Infinity with Cool Tube Technology combining ultra-high Visible Light reflectance with Ultra-low Infrared (IR) reflectance to form a nominal 24.9 inch (633mm) tube assembly with integrated Tab-Lock connections.

4. Delivery Zone:

a. Daylight Dimmer - 0 to 10 V Dimmer Control: Provide electrical actuator controller, auxiliary switch(s), and cable as specified in Section 25 50 00; Common Work Results Electrical Section 26 05 00; and Lighting Equipment and Controls Section 26 50 00.

1) Low Voltage Daylight Dimmer, Type D1, is an Electro-mechanically actuated daylight valve; 0-10 V Control, Class-2, UL Listed. Low voltage Daylight Dimmer, an electrical actuator provides for programmable (0 to 10VDC) scene-based dimming control for daylight output between 0.5 and 100 percent, auxiliary 12VDC dimming control for daylight output between 2 and 100 percent, or auxiliary ON/OFF control. Input voltage: 24VAC at 50 or 60 Hz. Daylight Dimmer assembly integrated with a 12 inch Upper and a 12 inch Lower Transition Tube made of Spectralight Infinity with Cool Tube Technology combining ultra-high Visible Light reflectance with Ultra-low Infrared (IR) reflectance to form a nominal 24.9 inch (633mm) tube assembly with integrated Tab-Lock connections.

(a) Programmable (0 to 10VDC) Control: requires an electrical actuator lighting controller or building automation controller capable of producing a signal between 0 and +10 VDC (Min 50mA) to incrementally modulate up to 50 daisy chained Daylight Dimmers (Current Sinking) between fully closed at 0 to 1 volts to fully open at 9 to 10 volts.

(b) Requires CL-2 (Min), 18 AWG, stranded copper, two conductor, twisted cable from lighting controller to first dimmer and interconnecting between subsequent dimmers.

(c) Auxiliary 12VDC Dimming Control: requires 12VDC Dimming Switch (Current Sourcing; 12VDC power supply not required).

(1) 12VDC dimming control requires CL-2 (Min), 22 AWG, stranded, three conductor, twisted cable from switch to first dimmer and CL-2 (Min), 18 AWG, stranded copper, two conductor, twisted cable; interconnecting subsequent dimmers.

(d) Auxiliary ON/OFF Control: requires commercial or residential single pole electric light switch.

(1) ON/OFF control requires CL-2 (Min), 22 AWG, stranded, three conductor, twisted cable from switch to first dimmer and CL-2 (Min), 18 AWG,

stranded copper, two conductor, twisted cable;
interconnecting subsequent dimmers.

- 2) Power can be transformed from line voltage through use of a UL Listed Class-2, 24VAC Transformer.
- b. Bottom Assembly:
- 1) Base Diffuser Assemblies for Tubes Not Penetrating Ceilings (Open Ceiling): Type B, Solatube Model M74 DS-O. 28.5 inch (724 mm) diameter diffuser attached directly to bottom of tube.
 - (a) Diffuser Collar: Attached to diffuser lens; 0.018 inch (0.45 mm) nominal thickness aluminum.
 - (1) Interior Finish: Spectralight Infinity with Cool Tube Technology combining ultra-high Visible Light reflectance with Ultra-low Infrared (IR) reflectance.
 - (2) Color: a^* and b^* (defined by CIE $L^*a^*b^*$ color model) shall not exceed plus 2 or be less than minus 2 as determined in accordance to ASTM E 308.
 - (b) Diffuser Belt:
 - (1) Sheet-metal belt 2 inch (50.8 mm) wide by 28.5 inch (724 mm) nominal diameter by 0.022 inch (0.5 mm) thick CS-B AZ-50 ASTM A792 with 0.10 inch (2.5 mm) diameter stainless steel Type 302 ASTM A 313 torsion spring actuated toggle clamp.
 - (2) Retains Tab-Lock tube joint structural connection system; stiffens linear tube assembly; and prevents tube rotation or disengagement under normal use.
 - (3) Includes locking tab to prevent unintentional Latch opening due to handling, service, vibration, or normal operation or use.
 - 2) Amplifier Assembly for Tubes Not Penetrating Ceilings (Open Ceiling): Type A, 36 inch (914 mm) diameter amplifier diffuser assembly attached directly to bottom of tube.
 - (a) Amplifier: Conical shaped assembly 23.7 inches (602 mm) tall, 28.5 inches (724 mm) upper diameter, and 36 inches (914 mm) lower diameter.
 - (1) Amplifier collimates incident light. Light reflects off 2 successively angled facets designed to mix the light to reduce glare and to correct the incident angle by 15 degrees and 25 degrees successively thereby improving the transmission efficiency through the diffuser lens by reducing retro-reflection due to first surface refraction and concentrating the distribution of light by reducing the cone of illumination relative to the incident angle correction.
 - (2) Assembly comprised of 3 multifaceted segments to be joined together with 15 - 0.125 Inch (3 mm) rivets.
 - (3) Tube Connect Slots at upper perimeter receive 6 Tab-Lock Hook features from adjoining tube for mechanical tube engagement.
 - (4) Interior Finish: Spectralight Infinity with Cool Tube Technology combining ultra-high Visible Light reflectance with Ultra-low Infrared (IR) reflectance.

- (5) Color: a* and b* (defined by CIE L*a*b* color model) shall not exceed plus 2 or be less than minus 2 as determined in accordance to ASTM E 308.
- (b) Amplifier Diffuser Belt:
 - (1) Sheet-metal belt 2 inch (50.8 mm) wide by 36 inch (914mm) nominal diameter by 0.022 inch (0.5 mm) thick CS-B AZ-50 ASTM A792 with 0.10 inch (2.5 mm) diameter stainless steel Type 302 ASTM A 313 torsion spring actuated toggle clamp.
 - (2) Retains Tab-Lock tube joint structural connection system; stiffens linear tube assembly; and prevents tube rotation or disengagement under normal use.
 - (3) Includes locking tab to prevent unintentional Latch opening due to handling, service, vibration, or normal operation or use.
- 3) Diffuser Lens:
 - (a) Lens: Type L2, Prismatic lens designed to maximize light output and diffusion. Visible Light Transmission shall be greater than 90 percent at 0.100 inch (2.5 mm) thick. Classified as CC2.
 - (b) Diffuser Collar: Attached to diffuser lens; 0.018 inch (0.45 mm) nominal thickness aluminum.
 - (1) Interior Finish: Spectralight Infinity with Cool Tube Technology combining ultra-high Visible Light reflectance with Ultra-low Infrared (IR) reflectance.
 - (c) Diffuser Seal: "L" shaped EPDM closed cell foam, , 0.86 inch (21.8 mm) wide by 1.37 inch (34.8mm) tall by 0.16 inch (4.1 mm) thick to minimize condensation and bug, dirt and air infiltration per ASTM E 283.
 - (d) Diffuser Band: Stainless steel diffuser band, 0.25 inch (6.4 mm) wide by 0.020 inch (0.5 mm) thick stainless steel Type 201 ASTM A 666, for enhanced seal performance and protection.
- 4) Options/Accessories
 - (a) Optional Low-voltage Transformer: Solatube Remote Transformer, Type T20, is a 20VA, 24VAC, 50/60HZ, UL Listed, UL Category XOKV7, CE Marked, Class-2 Transformer with cover plate mounting system configured for easy field assembly onto standard 4.06 inch by 4.06 inch (103 mm by 103 mm) square junction box: Inherently Limited, Primary: 120VAC, 208VAC, 240VAC, and 277VAC.
 - (b) Optional Low-voltage Transformer: Solatube Remote Transformer, Type TR96, is a 96VA, 24VAC, 50/60HZ, UL Listed, UL Category XOKV7, CE Marked, Class-2 Transformer with cover plate mounting system configured for easy field assembly onto standard 4.06 inch by 4.06 inch (103 mm by 103 mm) square junction box: Inherently Limited, Primary: 120VAC, 240VAC, 277VAC and 480VAC.

2.3 ACCESSORIES

- A. Fasteners: Same material as metals being fastened, non-magnetic steel, non-corrosive metal of type recommended by manufacturer, or injection molded nylon.
- B. Suspension Wire: Steel, annealed, galvanized finish, size and type for application and ceiling system requirement.
- C. Sealant: Polyurethane or copolymer based elastomeric sealant as provided or recommended by manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. Examine openings, substrates, structural support, anchorage, and conditions for compliance with requirements for installation tolerances and other conditions.
- C. If substrate and rough opening preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Coordinate requirements for power supply, conduit and wiring.
- C. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's printed instructions.
- B. Coordinate installation with substrates, air and vapor retarders, roof insulation, roofing membrane, and flashing to ensure that each element of the Work performs properly and that finished installation is weather tight.
 1. Install flashing to produce weatherproof seal with curb and overlap with roofing system termination at top of curb.
 2. Provide thermal isolation when components penetrate or disrupt building insulation. Pack fibrous insulation in rough opening to maintain continuity of thermal barriers.
 3. Coordinate attachment and seal of perimeter air and vapor barrier material.
- C. Where metal surfaces of tubular unit skylights will contact incompatible metal or corrosive substrates, including preservative-treated wood, provide permanent separation as recommended by manufacturer
- D. Align device free of warp or twist, maintain dimensional tolerances.
- E. After installation of first unit, field test to determine adequacy of installation. Conduct water test in presence of Owner, Architect, or Contractor, or their designated

representative. Correct if needed before proceeding with installation of subsequent units.

- F. Inspect installation to verify secure and proper mounting. Test each fixture to verify operation, control functions, and performance. Correct deficiencies.

3.4 CLEANING

- A. Clean exposed surfaces according to manufacturer's written instructions. Touch up damaged metal coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.

3.5 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION