SECTION 08 62 23

TUBULAR DAYLIGHTING DEVICES

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\*\* NOTE TO SPECIFIER \*\* Solatube International, Inc.; residential and commercial tubular daylighting devices.  
This section is based on the products of Solatube International, Inc., which is located at:  
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Web: [www.solatube.com](http://www.solatube.com)   
 [ [Click Here](http://www.arcat.com/arcatcos/cos35/arc35591.html) ] for additional information.  
Solatube Daylighting Systems (DS) use advanced optics to significantly improve the way daylight is harnessed. Solatube International has added breakthrough technology throughout the system to capture more sunlight on the roof, transfer more sunlight through the tubing and effectively diffuse the light in the building interior. Solatube Daylighting Systems set performance standards never seen before. Highly effective and simple to install, these models can transform dark interior rooms and light more expansive spaces when used in multiples, creating a unique architectural effect.  
Solatube Daylighting Systems can accommodate virtually any ceiling configuration including suspended ceilings, finished drywall ceilings, and open ceilings making them appropriate for a wide variety of commercial and residential applications, including office, retail, warehouse, industrial, education, healthcare facilities, multifamily housing, and custom homes. These Daylighting Systems provide significant energy savings, improved environments, and high-quality lighting.

1. GENERAL
   1. SECTION INCLUDES

\*\* NOTE TO SPECIFIER \*\* Delete items below not required for project.

* + 1. Tubular daylighting devices and accessories.
  1. RELATED SECTIONS

\*\* NOTE TO SPECIFIER \*\* Delete any sections below not relevant to this project; add others as required.

* + 1. Section 06 10 00 - Wood Framing; Site built wood curbs and nailers.
    2. Section 07 31 13 - Roof Shingles and Shakes: Flashing of skylight base.
    3. Section 07 32 13 - Roof Tiles: Flashing of skylight base.
    4. Section 07 51 13 - Built-Up Bituminous Roofing: Flashing of skylight base.
    5. Section 07 51 00 - Modified Bituminous Membrane Roofing: Flashing of skylight base.
    6. Section 07 53 13 - Electrometric Membrane Roofing: Flashing of skylight base.
    7. Section 07 54 16 - Thermoplastic Membrane Roofing: Flashing of skylight base.
    8. Section 07 60 00 - Flashing and Sheet Metal: Metal curb flashings.
    9. Section 08 62 13 - Unit Skylights: Skylights without reflective tube.
    10. Section 08 63 13 - Metal Framed Skylights.
    11. Section 23 31 00 - HVAC Air Distribution: Fan vent duct and connections.
    12. Section 26 09 43 - Integrated Automation Facility Controls: Lighting controllers.
    13. Section 26 05 00 - Common Work Results Electrical: Power cable, power supply and electrical connections.
    14. Section 26 50 00 - Lighting Equipment and Controls: Control cable, dimming controls, light bulbs and lamps.
  1. REFERENCES

\*\* NOTE TO SPECIFIER \*\* Delete references from the list below that are not actually required by the text of the edited section.

* + 1. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
    2. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
    3. ASTM A 463/A 463M - Standard Specification for Steel Sheet, Aluminum Coated, by the Hot Dip Process.
    4. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc Coated (Galvanized), by the Hot Dip Process.
    5. ASTM A 792/A 792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
    6. ASTM E 108 - Standard Test Methods for Fire Tests of Roof Coverings.
    7. ASTM E 283 - Test Method for Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
    8. ASTM E 308 - Standard Practice for Computing the Colors of Objects by Using the CIE System.
    9. ASTM E 330 - Structural Performance of Exterior Windows, Curtain Walls and Doors.
    10. ASTM E 547 - Test Method for Water Penetration of Exterior Windows, Skylights, Doors and Curtain walls by Cyclic Air Pressure Difference.
    11. 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.
    12. ASTM E 1996 - Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricane.
    13. ASTM D 635 - Test Method for Rate of Burning and/or Extent of Time of Burning of Self-Supporting Plastics in a Horizontal Position.
    14. ASTM D 1929 - Test Method for Ignition Properties of Plastics.
    15. ASTM D 2843 - Standard Test Method for Density of Smoke from the Burning or Decomposition of Plastics.
    16. ASTM F 1642 - Standard Test Method for Glazing and Glazing Systems Subject to Airblast Loading.
    17. ASTM F 2912 - Standard Specification for Glazing and Glazing Systems Subject to Airblast Loading.
    18. AAMA/WDMA/CSA 101/I.S.2/A440 - Standard/Specification for Windows, Doors, and Unit Skylights; 2011
    19. FM Standard 4431 - The Approval Standard for Skylights
    20. UL 2108 - Low Voltage Lighting Systems
    21. GSA-TS01-2003: Standard Test Method for Glazing and Window Systems Subject to Dynamic Overpressure Loadings
    22. Unified Facilities Criteria (UFC) 4-010-01, Change October 2013, DoD Minimum Antiterrorism Standards for Buildings,
    23. CSA C22.2 No. 250.0 - Luminaires.
    24. ICC-ES AC-16 - Acceptance Criteria for Plastic Skylights; 2008.
    25. Florida Building Code TAS 201 - Impact Test Procedures.
    26. Florida Building Code TAS 202 - Criteria for Testing Impact and Non Impact Resistant Building Envelope Components Using Uniform Static Air Pressure Loading.
    27. Florida Building Code TAS 203 - Criteria for Testing Products Subject to Cyclic Wind Pressure Loading
    28. IBC Section 1710 - Load Test Procedure for Wind Load Testing on Rooftop Daylight Collecting System - Structural Performance Testing - Devised by ATI PE); 2012
    29. IBC Section 2606.7.2 - Installation - Diffuser Fall Out Test (Devised by PE); 2012
    30. 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)
    31. California State OSHA Fall Protection Code of Regulations, Title 8, Section 3212 (e)(1)
  1. PERFORMANCE REQUIREMENTS
     1. Daylight Reflective Tubes: Spectralight Infinity with INFRAREDuction 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.
     2. 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.
           1. Air Infiltration Test: Single and Dual Glazed Dome (M74 DS Type DP & DPP):

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.

Meets or exceeds the air leakage performance levels with a maximum 0.4 cfm/ft2 when tested in accordance with ASTM E 283.

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.

* + - * 1. Water Resistance Test

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.

* + - * 1. 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.

Single and Dual Glazed Dome (Type DP & DPP): Design Pressure &#177;80.20 psf (&#177;3.84 kPa).

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

* + - 1. Hurricane Resistance:
         1. Large Missile Impact test:

Single Glazed Dome (Type DP) Passes:

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.

No signs of penetration, rupture, or opening when tested in accordance with TAS 201

Dual Glazed Dome (Type DPP) Passes:

No signs of penetration, rupture, or opening when tested in accordance with TAS 201

* + - * 1. 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
        2. Air Infiltration Test:

Single Glazed Dome (Type DP) Passes:

Air Infiltration a maximum 0.05 cfm/ft2 at 1.57 psf (25 mph) test pressure when tested in accordance to TAS 202

Air Infiltration a maximum 0.05 cfm/ft2 at 6.24 psf (50 mph) test pressure when tested in accordance to TAS 202

Dual Glazed Dome (Type DPP) Passes:

Air Infiltration a maximum 0.04 cfm/ft2 at 1.57 psf (25 mph) test pressure when tested in accordance to TAS 202

Air Infiltration, a maximum 0.05 cfm/ft2 at 6.24 psf (50 mph) test pressure when tested in accordance to TAS 202.

* + - * 1. Water Penetration Test:

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.

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.

* + - * 1. Cyclic Wind Pressure Loading:

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.

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.

\*\* NOTE TO SPECIFIER \*\* Select the following Wind Load Test paragraph for use with Solatube Model M74 DS with Type C Daylight Collector System only. Delete if not applicable

* + - 1. Wind Load Test:
         1. 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.
         2. Design Load: 69.7 psf.
         3. Force Coefficients of Chimneys, Tanks, Rooftop Equipment, & Similar Structures according to ASCE/SEI 7-10 Figure 29.5-1

Cross Section: Round

Type of surface: Moderately smooth

Ratio (h/D): 1.4

Force coefficient: 0.6

* + - 1. Fire Testing:
         1. 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
         2. Self-Ignition Temperature Testing:

Outer Dome Glazing (Type DP & DPP): Self-Ignition Temperature greater than 650 degrees F when tested in accordance with ASTM D 1929.

Inner Dome Glazing (Type DPP): Self-Ignition Temperature greater than 650 degrees F when tested in accordance with ASTM D 1929.

Cylinder Collector (Type C): Self-Ignition Temperature greater than 650 degrees F when tested in accordance with ASTM D 1929.

Diffuser (Type - All M74 DS): Self-Ignition Temperature greater than 650 degrees F when tested in accordance with ASTM D 1929.

* + - * 1. Smoke Density Rating:

Outer Dome Glazing (Type DP & DPP):

Smoke Density Rating no greater than 450 per ASTM E 84.

Smoke Density Rating no greater than 75 per ASTM D 2843

Inner Dome Glazing (Type DPP): Smoke Density Rating no greater than 75 per ASTM D 2843

Cylinder Collector (Type C):

Smoke Density Rating no greater than 450 per ASTM E 84

Smoke Density Rating no greater than 75 per ASTM D 2843

Light Transmitting Diffuser (Type - All M74 DS): Smoke Density Rating no greater than 75 per ASTM D 2843

* + - * 1. Rate of Burn and/or Extent of Burn:

Outer Dome Glazing (Type DP & DPP): Minimum CC-1 Classification less than 1 inch (25 mm) extent of burn per ASTM D 635

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.

Cylinder Collector (Type C): S Minimum CC-1 Classification less than 1 inch (25 mm) extent of burn per ASTM D 635

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.

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.

\*\* NOTE TO SPECIFIER \*\* Include the following Paragraphs if FM Certification is required. Delete if not applicable

* + - 1. FM Certification:
         1. 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.
         2. 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)
         3. 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.
         4. 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.
         5. Simulated Wind Uplift: Passes: 195 psf Wind Rating. No separation, breaking or cracking occurred when tested in accordance with FM 4431.
      2. Interior Finish Classification (IBC Section 803):
         1. Outer Dome Glazing (Type DP & DPP): Class B per ASTM E 84
         2. Cylinder Collector (Type C): Class B per ASTM E 84
         3. Diffuser (Type - All M74 DS): Comply with IBC Section 2606.7.2 (Diffuser Fall Out Test).
      3. Fall Protection Performance
         1. 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).
         2. Passes fall protection test: California State OSHA Fall Protection Code of Regulations, Title 8, Section 3212 (e)(1)
      4. Blast Resistance: ASTM F1642, ASTM F2912, GSA-TS01-2003, and UFC 4-010-01:
         1. Airblast Loading ASTM Hazard Rating: Passes: No Break Rating
         2. Airblast Loading UFC Level of Protection: Passes High Level of Protection
         3. Dynamic Overpressure Loading ASTM Hazard Rating: Passes: No Break Rating
         4. Dynamic Overpressure Loading UFC Level of Protection: Passes High Level of Protection
    1. SOLAMASTER 750 DS-O / 750 DS-C (OPEN/CLOSED CEILING)
       1. AAMA/WDMA/CSA 101/IS2/A440, Class CW-PG70, size tested 21 inch (533 mm) diameter, Type TDDOC and Type TDDCC.
          1. Air Infiltration Test:

Air infiltration will not exceed 0.30 cfm/sf aperture with a pressure delta of 1.57 psf across the tube when tested in accordance with ASTM E 283.

* + - * 1. Water Resistance Test:

Passes water resistance; no uncontrolled water leakage with a pressure differential of 10.7 psf (512 Pa) or 15 percent of the design load (whichever is greater) and a water spray rate of 5 gallons/hour/sf for 24 minutes when tested in accordance with ASTM E 547 and ASTM E 331.

* + - * 1. 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.

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 150 psf (7.18 kPa) or Negative Load of 70 psf (3.35 kPa).

* + - 1. Hurricane Resistance:
         1. Meets Florida Building Code TAS, 201, TAS, 202 and TAS 203 for Impact and non-impact components for HVHZ and non-HVHZ applications.
         2. Meets ASTM E 1886 and ASTM E1996 for missile and cyclic pressure differential testing for TDI Windstorm zones.
      2. Fire Testing:
         1. Fire Rated Roof Assemblies:

When used with the Dome Edge Protection Band, all domes meet fire rating requirements as described in the International Building Code for Class A, B, and C roof assemblies.

* + - * 1. When used with the Dome Edge Protection Band, all domes meet fire rating requirements as described in the International Building Code.
        2. Self-Ignition Temperature - Greater than 650 degrees F per ASTM D-1929.
        3. Smoke Density: Rating no greater than 450 per ASTM E 84 in way intended for use. Classification C.
        4. Rate of Burn and/or Extent: Maximum Burning Rate: 2.5 inches/min (62 mm/min) Classification CC-2 per ASTM D 635.
        5. Rate of Burn and/or Extent: Maximum Burn Extent: 1 inch (25 mm) Classification CC-1 per ASTM D 635.

\*\* NOTE TO SPECIFIER \*\* Include the following Paragraphs if FM Certification is required. Delete if not applicable

* + - 1. FM Certification:
         1. 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.
         2. 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)
         3. 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.
         4. 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.
         5. Simulated Wind Uplift: Passes: 195 psf Wind Rating. No separation, breaking or cracking occurred when tested in accordance with FM 4431.
      2. Fall Protection Performance:
         1. Passes fall protection test: No penetration of dome or curb cap when subject to 400 lb (160 Kg)/42 inch (1066 mm) impact drop test when tested in accordance with OSHA 29 CFR 1926.506(c) Safety Net Systems.
         2. Passes fall protection test: California State OSHA Fall Protection Code of Regulations, Title 8, Section 3212 (e)(1) Skylight Screens.
      3. Blast Resistance: ASTM F1642, ASTM F2912, GSA-TS01-2003, and UFC 4-010-01:
         1. Airblast Loading ASTM Hazard Rating: Passes: No Hazard Rating
         2. Airblast Loading UFC Level of Protection: Passes Medium Level of Protection
         3. Dynamic Overpressure Loading ASTM Hazard Rating: Passes: No Hazard Rating
         4. Dynamic Overpressure Loading UFC Level of Protection: Passes Medium Level of Protection
    1. SOLAMASTER 330 DS-O / 330 DS-C (OPEN/CLOSED CEILING)
       1. AAMA/WDMA/CSA 101/IS2/A440, Class CW-PG80, size tested 21 inch (533 mm) diameter, Type TDDOC and Type TDDCC.
          1. Air Infiltration Test:

Air infiltration will not exceed 0.30 cfm/sf aperture with a pressure delta of 1.57 psf across the tube when tested in accordance with ASTM E 283.

* + - * 1. Water Resistance Test:

Passes water resistance; no uncontrolled water leakage with a pressure differential of 10.7 psf (512 Pa) or 15 percent of the design load (whichever is greater) 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 and ASTM E 331.

* + - * 1. 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.

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 150 psf (7.18 kPa) or Negative Load of 70 psf (3.35 kPa).

* + - 1. Hurricane Resistance:
         1. Meets Florida Building Code TAS, 201, TAS, 202 and TAS 203 for Impact and non-impact components or HVHZ and non-HVHZ applications.
         2. Meets ASTM E 1886 and ASTM E1996 for missile and cyclic pressure differential testing for TDI Windstorm zones.
      2. Fire Testing:
         1. Fire Rated Roof Assemblies:

When used with the Dome Edge Protection Band, all domes meet fire rating requirements as described in the International Building Code for Class A, B, and C roof assemblies.

* + - * 1. Self-Ignition Temperature - Greater than 650 degrees F per ASTM D-1929.
        2. Smoke Density: Rating no greater than 450 per ASTM E 84 in way intended for use. Classification C.
        3. Rate of Burn and/or Extent: Maximum Burning Rate: 2.5 inches/min (62 mm/min) Classification CC-2 per ASTM D 635.
        4. Rate of Burn and/or Extent: Maximum Burn Extent: 1 inch (25 mm) Classification CC-1 per ASTM D 635.

\*\* NOTE TO SPECIFIER \*\* Include the following Paragraphs if FM Certification is required. Delete if not applicable

* + - 1. FM Certification:
         1. 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.
         2. 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)
         3. 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.
         4. 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.
         5. Simulated Wind Uplift: Passes: 195 psf Wind Rating. No separation, breaking or cracking occurred when tested in accordance with FM 4431.
      2. Fall Protection Performance:
         1. Passes fall protection test: No penetration of dome or curb cap when subject to 400 lb (160 Kg)/42 inch (1066 mm) impact drop test when tested in accordance with OSHA 29 CFR 1926.506(c) Safety Net Systems.
         2. Passes fall protection test: California State OSHA Fall Protection Code of Regulations, Title 8, Section 3212 (e)(1) Skylight Screens.
      3. Blast Resistance: ASTM F1642, ASTM F2912, GSA-TS01-2003, and UFC 4-010-01:
         1. Airblast Loading ASTM Hazard Rating: Passes: No Hazard Rating
         2. Airblast Loading UFC Level of Protection: Passes Medium Level of Protection
         3. Dynamic Overpressure Loading ASTM Hazard Rating: Passes: No Hazard Rating
         4. Dynamic Overpressure Loading UFC Level of Protection: Passes Medium Level of Protection
    1. SOLAMASTER 300 DS Daylighting System: (Suspended or Open Ceilings)
       1. AAMA/WDMA/CSA 101/IS2/A440, Class CW-PG70 size tested 14 inch (356 mm), Type TDDCC.
          1. Air Infiltration Test: Air infiltration will not exceed 0.30 cfm/sf aperture with a pressure delta of 1.57 psf across the tube when tested in accordance with ASTM E 283.
          2. Water Resistance Test:

Passes water resistance; no uncontrolled water leakage with a pressure differential of 10.7 psf (512 Pa) or 15 percent of the design load (whichever is greater) 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 and ASTM E 331.

* + - * 1. 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.

No breakage, permanent damage to fasteners, hardware parts, or damage to make system inoperable or cause excessive permanent deflection of any section when tested at a Positive Load of 150 psf (7.18 kPa) or Negative Load of 60 psf (2.87 kPa) in accordance with ICC AC-16 Section A, or Negative Load of 70 psf (3.35 kPA) if tested per ICC AC-16 Section B.

* + - * 1. Hurricane Resistance:

Meets Florida Building Code TAS, 201, TAS, 202 and TAS 203 for Impact and non-impact components.

Meets ASTM E 1886 and ASTM E1996 for missile and cyclic pressure differential testing.

* + - * 1. Fire Testing:

When used with the Dome Edge Protection Band, all domes meet fire rating requirements as described in the International Building Code.

Self-Ignition Temperature - Greater than 650 degrees F per ASTM D-1929.

Smoke Density: Rating no greater than 450 per ASTM E 84 in way intended for use. Classification C.

Rate of Burn and/or Extent: Maximum Burning Rate: 2.5 inches/min (62 mm/min) Classification CC-2 per ASTM D 635.

Rate of Burn and/or Extent: Maximum Burn Extent: 1 inch (25 mm) Classification CC-1 per ASTM D 635.

* + 1. BRIGHTEN UP 290 DS (Suspended or Open Ceilings)
       1. AAMA/WDMA/CSA 101/IS2/A440, Class CW-PG70 size tested 14 inch (356 mm), Type TDDCC.
          1. Air Infiltration Test: Air infiltration will not exceed 0.30 cfm/sf aperture with a pressure delta of 1.57 psf across the tube when tested in accordance with ASTM E 283.
          2. Water Resistance Test:

Passes water resistance; no uncontrolled water leakage with a pressure differential of 10.7 psf (512 Pa) or 15 percent of the design load (whichever is greater) 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 and ASTM E 331.

* + - * 1. 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.

No breakage, permanent damage to fasteners, hardware parts, or damage to make system inoperable or cause excessive permanent deflection of any section when tested at a Positive Load of 150 psf (7.18 kPa) or Negative Load of 60 psf (2.87 kPa) in accordance with ICC AC-16 Section A, or Negative Load of 70 psf (3.35 kPA) if tested per ICC AC-16 Section B.

* + - * 1. Hurricane Resistance:

Meets Florida Building Code TAS, 201, TAS, 202 and TAS 203 for Impact and non-impact components.

Meets ASTM E 1886 and ASTM E1996 for missile and cyclic pressure differential testing.

* + - * 1. Fire Testing:

When used with the Dome Edge Protection Band, all domes meet fire rating requirements as described in the International Building Code.

Self-Ignition Temperature - Greater than 650 degrees F per ASTM D-1929.

Smoke Density: Rating no greater than 450 per ASTM E 84 in way intended for use. Classification C.

Rate of Burn and/or Extent: Maximum Burning Rate: 2.5 inches/min (62 mm/min) Classification CC-2 per ASTM D 635.

Rate of Burn and/or Extent: Maximum Burn Extent: 1 inch (25 mm) Classification CC-1 per ASTM D 635.

* + 1. BRIGHTEN UP 160 DS (Suspended or Open Ceilings)
       1. AAMA/WDMA/CSA 101/IS2/A440, Class CW-PG70 size tested 14 inch (356 mm), Type TDDCC.
          1. Air Infiltration Test: Air infiltration will not exceed 0.30 cfm/sf aperture with a pressure delta of 1.57 psf across the tube when tested in accordance with ASTM E 283.
          2. Water Resistance Test:

Passes water resistance; no uncontrolled water leakage with a pressure differential of 10.7 psf (512 Pa) or 15 percent of the design load (whichever is greater) 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 and ASTM E 331.

* + - * 1. 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.

No breakage, permanent damage to fasteners, hardware parts, or damage to make system inoperable or cause excessive permanent deflection of any section when tested at a Positive Load of 150 psf (7.18 kPa) or Negative Load of 60 psf (2.87 kPa) in accordance with ICC AC-16 Section A, or Negative Load of 70 psf (3.35 kPA) if tested per ICC AC-16 Section B.

* + - * 1. Hurricane Resistance:

Meets Florida Building Code TAS, 201, TAS, 202 and TAS 203 for Impact and non-impact components.

Meets ASTM E 1886 and ASTM E1996 for missile and cyclic pressure differential testing.

* + - * 1. Fire Testing:

When used with the Dome Edge Protection Band, all domes meet fire rating requirements as described in the International Building Code.

Self-Ignition Temperature - Greater than 650 degrees F per ASTM D-1929.

Smoke Density: Rating no greater than 450 per ASTM E 84 in way intended for use. Classification C.

Rate of Burn and/or Extent: Maximum Burning Rate: 2.5 inches/min (62 mm/min) Classification CC-2 per ASTM D 635.

Rate of Burn and/or Extent: Maximum Burn Extent: 1 inch (25 mm) Classification CC-1 per ASTM D 635.

* + 1. Smart LED S160 SL (Suspended or Open Ceilings)
       1. AAMA/WDMA/CSA 101/IS2/A440, Class CW-PG70 size tested 14 inch (356 mm), Type TDDCC.
          1. Air Infiltration Test: Air infiltration will not exceed 0.30 cfm/sf aperture with a pressure delta of 1.57 psf across the tube when tested in accordance with ASTM E 283.
          2. Water Resistance Test:

Passes water resistance; no uncontrolled water leakage with a pressure differential of 10.7 psf (512 Pa) or 15 percent of the design load (whichever is greater) 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 and ASTM E 331.

* + - * 1. 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.

No breakage, permanent damage to fasteners, hardware parts, or damage to make system inoperable or cause excessive permanent deflection of any section when tested at a Positive Load of 150 psf (7.18 kPa) or Negative Load of 60 psf (2.87 kPa) in accordance with ICC AC-16 Section A, or Negative Load of 70 psf (3.35 kPA) if tested per ICC AC-16 Section B.

* + - * 1. Hurricane Resistance:

Meets Florida Building Code TAS, 201, TAS, 202 and TAS 203 for Impact and non-impact components.

Meets ASTM E 1886 and ASTM E1996 for missile and cyclic pressure differential testing.

* + - * 1. Fire Testing:

When used with the Dome Edge Protection Band, all domes meet fire rating requirements as described in the International Building Code for Class A, B, and C roof assemblies.

Self-Ignition Temperature - Greater than 650 degrees F per ASTM D-1929.

Smoke Density: Rating no greater than 450 per ASTM E 84 in way intended for use. Classification C.

Rate of Burn and/or Extent: Maximum Burning Rate: 2.5 inches/min (62 mm/min) Classification CC-2 per ASTM D 635.

Rate of Burn and/or Extent: Maximum Burn Extent: 1 inch (25 mm) Classification CC-1 per ASTM D 635.

* 1. SUBMITTALS
     1. Submit under provisions of Section 01 30 00 - Administrative Requirements [01 30 00].
     2. 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.
     3. Shop Drawings. Submit shop drawings showing layout, profiles and product components, including rough opening and framing dimensions, anchorage, roof flashings and accessories.
     4. Electrical wiring diagrams and recommendations for power and control wiring.
     5. Verification Samples: As requested by Architect.
     6. Test Reports: Independent testing agency or evaluation service reports verifying compliance with specified performance requirements.

\*\* NOTE TO SPECIFIER \*\* Delete the following paragraphs if LEED is not applicable. Several opportunities exist for LEED credits when using daylighting systems specified. Contact Solatube International, Inc. for additional information.

* + 1. 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. QUALITY ASSURANCE
     1. Manufacturer Qualifications: Engaged in manufacture of tubular daylighting devices for minimum 20 years.

\*\* NOTE TO SPECIFIER \*\* Delete the following paragraph if LED device is not applicable.

* + 1. LED equipment certified and labeled by UL and CSA labels.
  1. DELIVERY, STORAGE, AND HANDLING
     1. Deliver products in manufacturer's original containers, dry, undamaged, seals and labels intact.
     2. Store products in manufacturer's unopened packaging until ready for installation.
  2. PROJECT CONDITIONS
     1. 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.
  3. WARRANTY
     1. Daylighting Device: Manufacturer's standard warranty for 10 years.

\*\* NOTE TO SPECIFIER \*\* Delete if optional electric components are not required.

* + 1. Electrical Parts: Manufacturer's standard warranty for 5 years, unless otherwise indicated.
    2. LED Emitters, Drivers and Controls: Manufacturer's standard warranty for 3 years against failure.

1. PRODUCTS
   1. MANUFACTURERS
      1. Acceptable Manufacturer: Solatube International, Inc., which is located at: Solatube International 2210 Oak Ridge Way; Vista, CA 92081-8341; Toll Free Tel: 888-765-2882; Tel: 760-477-1120; Fax: 760-597-4488; Email: [request info (commsales@solatube.com)](http://admin.arcat.com/users.pl?action=UserEmail&company=Solatube+International,+Inc.&coid=35591&rep=&fax=760-597-4488&message=RE:%20Spec%20Question%20(08625slt):%20%20&mf=); Web: [www.solatube.com](http://www.solatube.com)

\*\* NOTE TO SPECIFIER \*\* Delete one of the following two paragraphs; coordinate with requirements of Division 1 section on product options and substitutions.

* + 1. Substitutions: Not permitted.
    2. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.
  1. TUBULAR DAYLIGHTING DEVICES
     1. 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.

\*\* NOTE TO SPECIFIER \*\* SkyVault (M74 DS) Tubular daylighting device, consists of roof dome, optional daylight collection system, reflective tube, and diffuser assembly; in a configuration as indicated on the Drawings.

* + 1. SkyVault Series: Solatube Model M74 DS, 28.5 inch (724 mm) Daylighting System:
       1. Model:
          1. Solatube Model M74 DS - O Open Ceiling. AAMA Type TDDOC.
       2. Capture Zone:

\*\* NOTE TO SPECIFIER \*\* Select the following Paragraphs for Solatube Model M74 DS Collector only (Type: C). Delete if not applicable. Type C collector is used together with Domes.

* + - * 1. Daylight Collector (Type C) with key components consisting of:

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.

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.

Collector Cylinder Back Panel: Support for collector assembly. Fabricated of corrosion resistant zincalum 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.

Collector Cylinder LightTracker Reflector: Daylight reflector. Aluminum sheet, thickness 0.018 inch (0.5 mm). Interior Finish: Spectralight Infinity with INFRAREDuction 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.

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.

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.

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.

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.

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.

* + - * 1. Domes:

Roof Dome Assembly: Transparent, UV and impact resistant dome with flashing base supporting dome and top of tube.

Fasteners: Non-corrosive metal fasteners including: non-magnetic stainless steel, zinc plated steel, aluminum, or injection molded nylon.

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).

\*\* NOTE TO SPECIFIER \*\* Select one of the following two paragraphs for Outer Dome Glazing or Dual Glazing with outer dome and inner dome glazing and delete the one not required. Dual glazing improves the assembly U-Factor.

Single Dome Glazing: Type DP.

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).

Outer Dome Seals: Adhesive Back Closed Cell Foam Seal 0.25 inch (6.3 mm) tall by 0.75 inch (19 mm) wide.

Dual Dome Glazing: Type DPP.

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).

Inner Dome Glazing: 0.040 inch (1 mm) minimum thickness, copolyester (PETG) polyethylene terephthalate with glycol classified as CC2 material.

Seals:

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.

Dome Assembly Seal: Adhesive backed pile weather-strip, 0.350 inch (8.9 mm) tall by 0.187 inch (4.8 mm) wide.

* + - * 1. Dome Options:

\*\* NOTE TO SPECIFIER \*\* Select the following optional security guard if required and delete if not required.

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.

* + - * 1. Flashings:

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 corrosion resistant sheet 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).

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 07 60 00 - Flashing and Sheet Metal.

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 (OFxft2xhr/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.

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.

Tube Collar: Attached to top of curb-cap section; 0.018 inch (0.45 mm) nominal thickness aluminum conforming to ASTM B 209.

Interior Finish: Spectralight Infinity with INFRAREDuction Technology combining ultra-high Visible Light reflectance with Ultra-low Infrared (IR) reflectance.

* + - 1. Transfer Zone:
         1. Extension Tubes: Aluminum sheet, thickness 0.018 inch (0.5 mm) conforming to ASTM B 209 with Tab-Lock tube joint structural connection system.

\*\* NOTE TO SPECIFIER \*\* Indicate the total length of run on the Drawings. Note that at least one extension tube is required for diffuser mounting. Standard Type EXX field verified overall lengths of run required using reflective extension tubes of 24 inches (610 mm) long lengths. Optional Type EL reflective extension tubes are 48 inches (1220 mm) long and may replace two normal 24 inch (610mm) extension tubes for long tube runs when required.

Reflective Tubes:

Reflective 24 inch (610mm) extension tube, Type EXX or Type EL with total length of run as indicated on the Drawings.

Belt Alignment Tab aligns Tube Belt on to tube in the correct location.

Interior Finish: Spectralight Infinity with INFRAREDuction Technology combining ultra-high Visible Light reflectance with Ultra-low Infrared (IR) reflectance.

Tab-Lock

Tab-Lock captures adjoining tube or tube connector using periodic opposing hooks integrated in the tube perimeter with mating retention detents.

Hook system allows ease of tube engagement or disengagement for single operator from man-lift or rooftop.

System intertwines the ends of the adjoining tubes and tube connectors between each Tab-Lock station.

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.

Tube Belt:

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.

Retains Tab-Lock tube joint structural connection system; stiffens linear tube assembly; and prevents tube rotation or disengagement under normal use.

Includes locking tab to prevent unintentional Tube Belt Latch opening due to handling, service, vibration, or normal operation or use.

Extension Tube Options

\*\* NOTE TO SPECIFIER \*\* Select the following Extension Tube Option paragraph for use with Solatube Model M74 DS-O only. Delete if not applicable.

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.

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.

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 INFRAREDuction 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.

* + - 1. Delivery Zone:

\*\* NOTE TO SPECIFIER \*\* The following Daylight Dimmer is Optional, include if required and delete if not required. Coordinate with Lighting Control System specified in Section 26 50 00 - Lighting or Building Automation Controller specified in Section 41 67 19 - Plant Safety Equipment. Contact Solatube for additional information on pre-approved lighting control manufacturers. Using a Solatube pre-approved lighting control manufacturer, the 0-10 V Daylight Dimmer system, an electrical actuator is capable of supporting the following operating scenarios: Program the preset buttons on the lighting control system to signal the 0-10 V Daylight Dimmer to provide a scene-based control and automatically adjust the daylight to desired levels; and program the astronomical clock on the lighting control system to execute time based control commands.

* + - * 1. 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.

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 INFRAREDuction 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.

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.

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

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

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.

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

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.

Power can be transformed from line voltage through use of a UL Listed Class-2, 24VAC Transformer.

* + - * 1. Bottom Assembly:

\*\* NOTE TO SPECIFIER \*\* Select one of the following two paragraphs for Base Diffuser or Amplifier bottom assembly as required for the project. Delete the paragraph not required.

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.

Diffuser Collar: Attached to diffuser lens; 0.018 inch (0.45 mm) nominal thickness aluminum.

Interior Finish: Spectralight Infinity with INFRAREDuction Technology combining ultra-high Visible Light reflectance with Ultra-low Infrared (IR) reflectance.

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.

Diffuser Belt:

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.

Retains Tab-Lock tube joint structural connection system; stiffens linear tube assembly; and prevents tube rotation or disengagement under normal use.

Includes locking tab to prevent unintentional Latch opening due to handling, service, vibration, or normal operation or use.

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.

Amplifier: Conical shaped assembly 23.7 inches (602 mm) tall, 28.5 inches (724 mm) upper diameter, and 36 inches (914 mm) lower diameter.

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.

Assembly comprised of 3 multifaceted segments to be joined together with 15 - 0.125 Inch (3 mm) rivets.

Tube Connect Slots at upper perimeter receive 6 Tab-Lock Hook features from adjoining tube for mechanical tube engagement.

Interior Finish: Spectralight Infinity with INFRAREDuction Technology combining ultra-high Visible Light reflectance with Ultra-low Infrared (IR) reflectance.

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.

Amplifier Diffuser Belt:

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.

Retains Tab-Lock tube joint structural connection system; stiffens linear tube assembly; and prevents tube rotation or disengagement under normal use.

Includes locking tab to prevent unintentional Latch opening due to handling, service, vibration, or normal operation or use.

\*\* NOTE TO SPECIFIER \*\* The following paragraphs are standard with all diffusers (L2).

Diffuser Lens:

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.

Diffuser Collar: Attached to diffuser lens; 0.018 inch (0.45 mm) nominal thickness aluminum.

Interior Finish: Spectralight Infinity with INFRAREDuction Technology combining ultra-high Visible Light reflectance with Ultra-low Infrared (IR) reflectance.

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.

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.

\*\* NOTE TO SPECIFIER \*\* The following Options/Accessories are optional. Select those required and delete those not required.

Options/Accessories

\*\* NOTE TO SPECIFIER \*\* Select one of the following Low Voltage Transformer paragraphs for use with Solatube Model M74 DS-O 0-10V Daylight Dimmer (Type D1) only. Delete if not applicable.

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.

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.

\*\* NOTE TO SPECIFIER \*\* Select from the following Paragraphs for use with Solatube Model M750 DS Collector only. Delete if not applicable. SolaMaster Series (750 DS) Tubular daylighting device, consists of roof dome, optional daylight collection system, reflective tube, and diffuser assembly; in a configuration as indicated on the Drawings.

* + 1. SolaMaster Series: Solatube Model 750 DS, 21 inch (530 mm) Daylighting System:
       1. Model:

\*\* NOTE TO SPECIFIER \*\* Select one of the following paragraphs as required. Delete the one not required.

* + - * 1. Solatube Model 750 DS-O Open Ceiling. AAMA Type TDDOC.
        2. Solatube Model 750 DS-C Closed (Penetrating) Ceiling. AAMA Type TDDCC.
      1. Capture Zone:
         1. Roof Dome Assembly: Transparent, UV and impact resistant dome with flashing base supporting dome and top of tube.

Outer Dome Glazing: Type DA, 0.125 inch (3.2 mm) minimum thickness injection molded acrylic classified as CC2 material; UV inhibiting (100 percent UV C, 100 percent UV B and 98.5 percent UV A), impact modified acrylic blend.

Raybender 3000: Variable prism optic molded into outer dome to capture low angle sunlight and limit high angle sunlight.

\*\* NOTE TO SPECIFIER \*\* Select one of the following optional supplemental inner dome glazing paragraphs as required. Delete the one not required.   
An Acrylic Inner Roof Dome Dual Glazing (DAI) is required for UFC-ATFP Antiterrorism Standards approval.  
Polycarbonate inner dome (Type DPI) meets Florida Building Code High Velocity Wind Zone and Texas Department of Insurance Impact Resistant zone requirements, and is required for applications requiring FM 4431 approval.

Acrylic Dome plus Inner Dome Glazing: Type DAI, Inner Dome is 0.115 inch (3 mm) minimum thickness acrylic classified as CC2 material.

Acrylic Dome Plus Inner Dome Glazing: Type DPI, Inner Dome is 0.115 inch (3 mm) minimum thickness polycarbonate classified as CC1 material.

* + - * 1. Tube Ring: 0.090 inch (2.3 mm) nominal thickness injection molded high impact PVC. Prevents thermal bridging between base flashing and tubing and channel condensed moisture. Attached to base of dome ring with butyl glazing rope 0.24 inch (6 mm) diameter; to minimize air infiltration.
        2. Dome Seal: Adhesive backed weatherstrip, 0.63 inch (16 mm) tall by 0.28 inch (7 mm) wide.
      1. Dome Options:

\*\* NOTE TO SPECIFIER \*\* Select the dome options required from the following paragraphs and delete those not required. Note that Security Kit requires inner dome DAI or DPI.

* + - * 1. Security Bar: Type B Security Bar 0.375 inch (95 mm) stainless steel bar across flashing diameter opening.
        2. Security Kit: Type SK Dome Security Kit, rivets with nylon spacers to replace dome screws.

\*\* NOTE TO SPECIFIER \*\* Select one of the following dome edge protection band paragraph when roof is fire rated Class A, B or C, and/or when FM 4431 Approval is required. Delete if not required.

* + - * 1. Dome Edge Protection Band: Type PB, for fire rated Class A, B or C roof applications. Galvanized steel. Nominal thickness of 0.039 inch (1 mm). For use with Self Mount Flashing Types F4, F8, and F11 Flashings, only.
        2. Dome Edge Protection Band for Curb Cap: Type PBC, for fire rated Class A, B or C roof applications with 750 DS Domes on Curb Cap Flashing installations. Galvanized steel. Nominal thickness of 0.039 inch (1 mm). For use with Curb Cap Flashing (Type FC), only.
      1. Flashings:
         1. Roof Flashing Base:

\*\* NOTE TO SPECIFIER \*\* Select one of the following required one piece or two piece flashing paragraphs and delete the one not required. Two piece is used on Standing Seam Rib metal roof profiles.

One Piece: One piece, seamless, leak-proof flashing functioning as base support for dome and top of tube. Sheet steel, corrosion resistant conforming to ASTM A 653/A 653M or ASTM A 463/A 463M or ASTM A792/A 792M, 0.028 inch (0.7 mm) plus or minus .006 inch (.015 mm) thick.

\*\* NOTE TO SPECIFIER \*\* Select one of the following flashing paragraphs and delete those not required. 8 inch or 11 inch bases are recommended for flat commercial roofs. Curb cap is normally used only on metal roofs or other roofs where curb is preferred and provided by others. Note that Type F8 or Type F11 is required for FM 4431 Approval.

Base Style: Type F4, Self Mounted, 4 inches (102 mm) high.

Base Style: Type F8, Self Mounted, 8 inches (203 mm) high.

Base Style: Type F11, Self Mounted, 11 inches (279 mm) high.

Base Style: Type FC, Curb cap, with inside dimensions of 27 inches by 27 inches (685 mm by 685 mm) to cover curb as specified in Section 07 60 00 - Flashing and Sheet Metal.

Two Piece: Type FSM, two-piece, inverted flange Metal Roof Flashing for Standing Seam Rib roof profile with greater than 14-3/8 inch (365 mm) minimum distance between ribs permitting a required greater than 2 inch (51 mm) clearance between flashing and rib. Aluminum 1060 Alloy, corrosion resistant conforming to ASTM B 209, 0.059 inch (1.5 mm) thick.

\*\* NOTE TO SPECIFIER \*\* The following flashing components are optional. Select those required and delete those not required. Flashing insulator is intended to seal the roof opening and prevent condensation forming on the flashing interior from exposure to humid air in unventilated spaces.

* + - * 1. Flashing Options:

Flashing Insulator: Type FI, Thermal isolation material is for use under the following flashing types: Type F4, F8, or F11.

Curb Insulator: Curb Insulator, Type CI, Thermal isolation material is for use under flashing Type FC.

Curb Cap Insulation: Type CCI, Nominal 1 inch thick thermal insulation pad to reduce thermal conduction between curb-cap and tubing and thermal convection between room air and curb-cap. Rated R-6 (OFxft2xhr/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(OFxft2xhr/Btu). For use with Flashing Type FC.

\*\* NOTE TO SPECIFIER \*\* The following turret extension components are optional. Select those required and delete those not required. If more than one size is required indicate locations on the Drawings. Roof Flashing Turret Extension are used to raise the height of the dome above roof level. This extends the height of the turret found on the curb cap or self flashing. Must order additional tubing to include the added height of turret.

Roof Flashing Turret Extensions: Provide manufacturer's standard extension tubes for applications as requiring:

Type T12: Additional lengths of 12 inches (300 mm) extension.

Type T24: Additional lengths of 24 inches (600 mm) extension.

Type T36: Additional lengths of 36 inches (900 mm) extension.

Type T48: Additional lengths of 48 inches (1200 mm) extension.

\*\* NOTE TO SPECIFIER \*\* Select the following paragraph for Optional Membrane Counter Flashing component for use with Self Mounted flashing Types: F8 or F11. Delete if not applicable.

Membrane Counter Flashing: Type MCF, one piece, seamless, spun Aluminum Alloy 1100, functioning as a counter flashing for use with F8 or F11 Flashings, only, when applied to membrane roofs. Corrosion resistant conforming to ASTM B 209, 0.059 inch (1.5 mm) thick.

* + - 1. Transfer Zone:
         1. Extension Tubes: Aluminum sheet, thickness 0.018 inch (0.5 mm) conforming to ASTM B 209.

NOTE TO SPECIFIER \*\* Indicate the total length of run on the Drawings. Note that at least one extension tube is required for diffuser mounting. Standard Type EXX reflective extension tubes are 24 inches (610 mm) in overall length. Optional Type EL reflective extension tubes are 48 inches (1220 mm) long and replaces two normal 24-inch (610mm) extension tubes when long tube runs are required.

Reflective Tubes:

Reflective extension tube, Type EXX and Type EL with total length of run as indicated on the Drawings.

Interior Finish: Spectralight Infinity with INFRAREDuction Technology combining ultra-high Visible Light reflectance with Ultra-low Infrared (IR) reflectance.

Tube Options

\*\* NOTE TO SPECIFIER \*\* Select the following optional Extension Tube and Angle Adapters as required. Delete options not required. Note that at least one 24 inch extension tube is required for diffuser.

Extension Tube Angle Adapter: Provide manufacturer's standard adapters for applications requiring:

Type A1 one 0 to 90 degree extension tube angle adapter.

Type A2 two 0 to 90 degree extension tube angle adapters.

Top Tube Angle Adapter, Type TA: Reflective 45 degree adjustable Top Tube Angle Adapter, 16 inches (406 mm) long.

\*\* NOTE TO SPECIFIER \*\* The following paragraph is required for closed ceiling applications and optional for open ceiling applications. Delete if not required.

Top Tube Angle Adapter and Bottom Tube Angle Adapter Kit: Type AK, Reflective 45 degree adjustable top and bottom angle adapters (one each), 16 inches (406 mm) long

Bottom Tube Angle Adapter, Type BA: Reflective 45 degree adjustable Bottom Tube Angle Adapter, 16 inches (406 mm) long.

Reflective extension tube, Type EL: 48 inches (1220 mm) long, replaces two normal 24-inch (610mm) extension tubes when long tube runs are required.

\*\* NOTE TO SPECIFIER \*\* Select the following Spectralight Infinity SoftLight Extension Tube (ES) paragraph for use with Solatube Model 750 DS-C configurations with Metal Transition Box (TM) only. Delete if not applicable.

Spectralight Infinity SoftLight Extension Tube: Type ES, 24 inch (610 mm) Super-reflective extension tube with structured surface providing precise light spread for enhanced visual comfort. Replaces one standard 24 inch (610 mm) extension tube in the tube assembly.

\*\* NOTE TO SPECIFIER \*\* Select the following Thermal Insulation Panel (TIP) paragraph for use with Solatube Model 750 DS-O and 750 DS-C configurations only. Delete if not applicable.

Thermal Insulation Panel: Type TIP, high-performance dual-glazed, thermally-broken tube insulation system.

Open ceiling trim ring: Type R, ABS Plastic, White; nominal thickness of 0.04 inch (1 mm).

Wire Suspension Kit: Type E, Use the wire suspension kit when additional bracing to the structure is required.

* + - 1. Delivery Zone:

\*\* NOTE TO SPECIFIER \*\* Select one of the following two Diffuser Assemblies for Open or Closed Ceilings paragraphs and delete the paragraph not required.

* + - * 1. Diffuser Assemblies for Tubes Not Penetrating Ceilings (Open Ceiling): Solatube Model 750 DS-O. 21 inch (530 mm) diameter diffuser attached directly to bottom of tube.

\*\* NOTE TO SPECIFIER \*\* Select one of the following lens paragraphs and delete paragraphs not required.

Lens: Type L1, OptiView Fresnel lens design to maximize light output and diffusion. Visible Light Transmission shall be greater than 90 percent at 0.022 inch (0.6 mm) thick. Classified as CC2.

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.

\*\* NOTE TO SPECIFIER \*\* The following paragraphs are standard with all diffusers (L1 and L2).

Diffuser Seal: Open cell foam, acrylic adhesive backed, 0.75 in (19 mm) wide by 0.125 in (3.2 mm) thick to minimize condensation and bug, dirt and air infiltration per ASTM E 283.

Diffuser Trim Ring: Injection molded acrylic. Nominal wall thickness 0.172 inches (4.4 mm).

* + - * 1. Diffuser Assemblies for Tubes Penetrating Ceilings: Solatube Model 750 DS-C. Ceiling mounted box transitioning from round tube to square ceiling assembly, supporting light transmitting surface at bottom termination of tube; 23.8 inches by 23.8 inches (605 mm by 605 mm) square frame to fit standard suspended ceiling grids or hard ceilings.

\*\* NOTE TO SPECIFIER \*\* Select one of the following Transition Box paragraphs and delete the one not required. Use Type TM for use with Spectralight Infinity SoftLight extension tubes (ES

Polymeric Transition Box: Type TP, round-to-square transition box made of opaque polymeric material, classified as CC2, Class C, 0.110 inch (2.8 mm) thick.

Metal Transition Box: Type TM, Metal Round to Square transition box comprised of Spectralight Infinity SoftLight material with structured finish on exposed reflective surface, .015 in (0.4 mm) thick. 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.

\*\* NOTE TO SPECIFIER \*\* Select one of the following lens paragraphs and delete the one not required.

Lens: Type L1, OptiView Fresnel lens design to maximize light output and diffusion with extruded aluminum frame and EPDM foam seal to minimize condensation and bug, dirt and air infiltration per ASTM E 283. Visible Light Transmission shall be greater than 90 percent at 0.022 inch (0.6 mm) thick. Classified as CC2.

Lens: Type L2, Prismatic lens design to maximize light output and diffusion with extruded aluminum frame and EPDM foam seal to minimize condensation and bug, dirt and air infiltration per ASTM E 283. Visible Light Transmission shall be greater than 90 percent at 0.100 inches (2.5 mm) thick. Classified as CC2.

\*\* NOTE TO SPECIFIER \*\* Select the following optional lens paragraphs and delete if not required. Required for Energy Star rating. Supplemental Natural Effect Lens is also required to meet Florida Building Code High Velocity Wind Zone and Texas Department of Insurance Impact Resistant zone requirements.

Supplemental Natural Effect Lens Type LN, Lens made of acrylic, classified as CC2, Class C, 0.060 inch (1.5 mm) thick, with open cell foam seal to minimize condensation and bug, dirt and air infiltration per ASTM E 283.

* + - * 1. Delivery Zone Options:

\*\* NOTE TO SPECIFIER \*\* Select from the following Delivery Zone Options for Local Dimmer Control or Lighting Control System as required. Delete entirely if not required.

Local Dimmer Control utilizing a butterfly baffle design of Spectralight Infinity reflective material to minimize shadowing when in use: Provided with dimmer switch and cable.

Daylight Dimmer: Type D, Electro-mechanically actuated daylight valve; for universal input voltages ranging between 90 and 277 V at 50 or 60 Hz; maximum current draw of 50 ma per unit; controlled by low voltage, series Type T02. Provided with dimmer switch and cable. Cable circuited, 4 conductor, size 22 AWG when total aggregate circuit runs are under 200 feet (60.96 m) or size 18 AWG when total aggregate circuit runs are under 500 feet (152.4 m); providing daylight output between 2 and 100 percent.

\*\* NOTE TO SPECIFIER \*\* Coordinate with work specified in Automation Facility Controls Section 25 50 00; Common Work Results Electrical Section 26 05 00; and Lighting Equipment and Controls Section 26 50 00. Contact Solatube for additional information on pre-approved lighting control manufacturers. Using a Solatube pre-approved lighting control manufacturer, the 0-10 V Daylight Dimmer system an electrical actuator is capable of supporting the following operating scenarios: Program the preset buttons on the lighting control system to signal the 0-10 V Daylight Dimmer to provide a scene-based control and automatically adjust the daylight to desired levels; and program the astronomical clock on the lighting control system to execute time based control commands. Contact Solatube for information regarding the Maximum length of control cable and maximum number of Daylight Dimmer Units and Unit Spacing (Power Cable Lengths) per transformer.

Lighting Control System: Provide an 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.

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 electrical actuator provides for programmable (0 to 10VDC) scene-based dimming control for daylight output between 2 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.

Programmable (0 to 10VDC) Control: requires an electrical actuator 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.

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

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

Power can be transformed from line voltage through use of a UL Listed Class-2, 24VAC Transformer.

\*\* NOTE TO SPECIFIER \*\* The following Options/Accessories are optional. Select those required and delete those not required.

* + - 1. Accessories

\*\* NOTE TO SPECIFIER \*\* Select one or more of the following Accessory paragraphs for use with Solatube Model 750 DS Local Daylight Dimmer (Type D) only. Delete those not applicable.

* + - * 1. Switch: Type SW, Manufacturer-specific low voltage DC DP/DT switch (white) required to operate Daylight Dimmer. Note: only one switch is required per set of synchronously controlled dimmers. For use with Daylight Dimmer, Type D, only. Pre-wired with 30 feet (9.14 m) of 22 AWG, 4 conductor, low-voltage cable.
        2. Cable: Type CA, Optional Two conductor, size 22 AWG, low voltage cable (500 foot) for multiple unit DC connection. For use with Daylight Dimmer, Type D, only, and when aggregate circuit runs do not exceed 200 feet (60.96 m).

\*\* NOTE TO SPECIFIER \*\* Select between the following Optional Low Voltage Transfer paragraphs for use with Solatube Model 750 DS 0-10V Daylight Dimmer Type D1 only. Delete if not applicable.

* + - * 1. Optional Low-voltage Transformer: Solatube Remote Transformer, Type TR20, 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. For use with Daylight Dimmer Type D1 only.
        2. 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-in x 4.06-in (103mm x 103mm) square junction box: Inherently Limited, Primary: 120VAC, 240VAC, 277VAC and 480VAC. For use with Daylight Dimmer Type D1 only.

\*\* NOTE TO SPECIFIER \*\* Select from the following Paragraphs for use with SolaMaster Model 330 DS Collector only. Delete if not applicable. SolaMaster (330 DS) Tubular daylighting device, consists of roof dome, optional daylight collection system, reflective tube, and diffuser assembly; in a configuration as indicated on the Drawings.

* + 1. SolaMaster Series: Solatube Model 330 DS, 21 inch (530 mm) Daylighting System:
       1. Model:

\*\* NOTE TO SPECIFIER \*\* Select one of the following paragraphs as required. Delete the one not required.

* + - * 1. Solatube Model 330 DS-O Open Ceiling. AAMA Type TDDOC.
        2. Solatube Model 330 DS-C Closed (Penetrating) Ceiling. AAMA Type TDDCC.
      1. Capture Zone:
         1. Roof Dome Assembly: Transparent, UV and impact resistant dome with flashing base supporting dome and top of tube.

\*\* NOTE TO SPECIFIER \*\* Select one of the following two dome glazing paragraphs as required. CC1 Polycarbonate dome (Type DP) is required for FM 4431 approval. Delete the paragraph not required.

Dome Glazing: Type DA, 0.143 inch (3.7 mm) minimum thickness injection molded acrylic classified as CC2 material; UV inhibiting (100 percent UV C, 100 percent UV B and 98.5 percent UV A), impact modified acrylic blend.

Dome Glazing: Type DP, 0.115 inch (3 mm) minimum thickness polycarbonate classified as CC1 material.

Tube Ring: Attached to top of base section; 0.090 inch (2.3 mm) nominal thickness injection molded high impact PVC; to prevent thermal bridging between base flashing and tubing and channel condensed moisture out of tubing. Attached to the base of the dome ring using butyl glazing rope 0.24 inch (6 mm) diameter; to minimize air infiltration.

Dome Seal: Adhesive backed weatherstrip, 0.63 inch (16 mm) tall by 0.28 inch (7 mm) wide.

LightTracker Reflector, made of aluminum sheet, thickness 0.015 inch (0.4 mm) with Spectralight Infinity. Positioned in the dome to capture low angle sunlight.

* + - * 1. Dome Options:

\*\* NOTE TO SPECIFIER \*\* Select the dome options required from the following paragraphs and delete those not required.

Security Bar: Type B Security Bar 0.375 inch (95 mm) stainless steel bar across flashing diameter opening.

Security Kit: Type SK Dome Security Kit, rivets with nylon spacers to replace dome screws.

\*\* NOTE TO SPECIFIER \*\* Select the one of the following dome edge protection band paragraph when roof is fire rated Class A, B or C, and/or when FM 4431 Approval is required. Delete if not required.

Dome Edge Protection Band: Type PB, for fire rated Class A, B or C roof applications. Galvanized steel. Nominal thickness of 0.039 inch (1 mm). For use with Self Mount Flashing Types F4, F8, and F11 Flashings, only.

Dome Edge Protection Band for Curb Cap: Type PBC, for fire rated Class A, B or C roof applications with 330 DS Domes on Curb Cap Flashing installations. Galvanized steel. Nominal thickness of 0.039 inch (1 mm). For use with Curb Cap Flashing (Type FC), only.

Secondary Diffuser: Type SS, Acrylic plastic classified as CC2 material. Thickness shall not be less than 0.100 inches.

* + - * 1. Flashings:

Roof Flashing Base:

\*\* NOTE TO SPECIFIER \*\* Select one of the following required one piece or two piece flashing paragraphs and delete the one not required. Two piece is used on Standing Seam Rib metal roof profiles.

One Piece: One piece, seamless, leak-proof flashing functioning as base support for dome and top of tube. Sheet steel, corrosion resistant conforming to ASTM A 653/A 653M or ASTM A 463/A 463M or ASTM A792/A 792M, 0.028 inch (0.7 mm) plus or minus .006 inch (.015 mm) thick.

\*\* NOTE TO SPECIFIER \*\* Select one of the following flashing paragraphs and delete those not required. 8 inch or 11 inch bases are recommended for flat commercial roofs. Curb cap is normally used only on metal roofs or other roofs where curb is preferred and provided by others. Note that Type F8 or Type F11 is required for FM 4431 Approval.

Base Style: Type F4, Self Mounted, 4 inches (102 mm) high.

Base Style: Type F8, Self Mounted, 8 inches (203 mm) high.

Base Style: Type F11, Self Mounted, 11 inches (279 mm) high.

Base Style: Type FC, Curb cap, with inside dimensions of 27 inches by 27 inches (685 mm by 685 mm) to cover curb as specified in Section 07 60 00 - Flashing and Sheet Metal.

Two Piece: Type FSM, two-piece, inverted flange Metal Roof Flashing for Standing Seam Rib roof profile with greater than 14-3/8 inch (365 mm) minimum distance between ribs permitting a required greater than 2 inch (51 mm) clearance between flashing and rib: Aluminum 1060 Alloy, corrosion resistant conforming to ASTM B 209, 0.059 inch (1.5 mm) thick.

\*\* NOTE TO SPECIFIER \*\* The following flashing components are optional. Select those required and delete those not required. Flashing insulator is intended to seal the roof opening and prevent condensation forming on the flashing interior from exposure to humid air in unventilated spaces.

Flashing Options:

Flashing Insulator: Type FI, Thermal isolation material is for use under the following flashing types: Type F4, F8, or F11.

Curb Insulator: Curb Insulator, Type CI, Thermal isolation material is for use under flashing Type FC.

Curb Cap Insulation: Type CCI, Nominal 1 inch thick thermal insulation pad to reduce thermal conduction between curb-cap and tubing and thermal convection between room air and curb-cap. Rated R-6 (OFxft2xhr/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(OFxft2xhr/Btu) . For use with Curb Cap Flashing Type FC, only.

\*\* NOTE TO SPECIFIER \*\* The following turret extension components are optional. Select those required and delete those not required. If more than one size is required indicate locations on the Drawings. Roof Flashing Turret Extension are used to raise the height of the dome above roof level. This extends the height of the turret found on the curb cap or self flashing. Must order additional tubing to include the added height of turret.

Roof Flashing Turret Extensions: Provide manufacturer's standard extension tubes for applications as requiring:

Type T12: Additional lengths of 12 inches (300 mm) extension.

Type T24: Additional lengths of 24 inches (600 mm) extension.

Type T36: Additional lengths of 36 inches (900 mm) extension.

Type T48: Additional lengths of 48 inches (1200 mm) extension.

\*\* NOTE TO SPECIFIER \*\* Select the following paragraph for Optional Membrane Counter Flashing component for use with Self Mounted flashing Types: F8 or F11. Delete if not applicable.

Membrane Counter Flashing: Type MCF, one piece, seamless, spun Aluminum Alloy 1100, functioning as a counter flashing for use with F8 or F11 Flashings, only, when applied to membrane roofs. Corrosion resistant conforming to ASTM B 209, 0.059 inch (1.5 mm) thick.

* + - 1. Transfer Zone:
         1. Extension Tubes: Aluminum sheet, thickness 0.018 inch (0.5 mm).

\*\* NOTE TO SPECIFIER \*\* Indicate the total length of run on the Drawings. Note that at least one extension tube is required for diffuser mounting. Standard Type EXX reflective extension tubes are 24 inches (610 mm) in overall length. Optional Type EL reflective extension tubes are 48 inches (1220 mm) long and replaces two normal 24-inch (610mm) extension tubes when long tube runs are required.

Reflective Tubes:

Reflective extension tube, Type EXX and Type EL with total length of run as indicated on the Drawings.

Interior Finish: Spectralight Infinity with INFRAREDuction Technology combining ultra-high Visible Light reflectance with Ultra-low Infrared (IR) reflectance.

Tube Options

\*\* NOTE TO SPECIFIER \*\* Select the following optional Extension Tube and Angle Adapters as required. Delete options not required. Note that at least one 24 inch extension tube is required for diffuser.

Extension Tube Angle Adapter: Provide manufacturer's standard adapters for applications requiring:

Type A1 one 0 to 90 degree extension tube angle adapter.

Type A2 two 0 to 90 degree extension tube angle adapters.

Top Tube Angle Adapter: Type TA, reflective 45 degree adjustable Top Tube Angle Adapter, 16 inches (406 mm) long.

\*\* NOTE TO SPECIFIER \*\* The following paragraph is required for closed ceiling applications and optional for open ceiling applications. Delete if not required.

Top Tube Angle Adapter and Bottom Tube Angle Adapter Kit: Type AK, reflective 45 degree adjustable top and bottom angle adapters (one each), 16 inches (406 mm) long

Bottom Tube Angle Adapter: Type BA, reflective 45 degree adjustable Bottom Tube Angle Adapter, 16 inches (406 mm) long.

Reflective Extension Tube: Type EL, 48 inches (1220 mm) long, replaces two normal 24-inch (610mm) extension tubes when long tube runs are required.

\*\* NOTE TO SPECIFIER \*\* Select the following Thermal Insulation Panel (TIP) paragraph for use with Solatube Model 330 DS only. Delete if not applicable.

Thermal Insulation Panel: Type TIP, high-performance dual-glazed, thermally-broken tube insulation system.

\*\* NOTE TO SPECIFIER \*\* Select the following open ceiling trim ring if applicable.

Open ceiling trim ring: Type R, ABS Plastic, White; nominal thickness of 0.04 inch (1 mm).

Wire Suspension Kit: Type E, Use the wire suspension kit when additional bracing to the structure is required.

\*\* NOTE TO SPECIFIER \*\* Select the following Spectralight Infinity SoftLight Extension Tube (ES) paragraph for use with Solatube Model 330 DS-C configurations with Metal Transition Box (TM) only. Delete if not applicable.

Spectralight Infinity SoftLight Extension Tube: Type ES, 24 inch (610mm) Super-reflective extension tube with structured surface providing precise light spread for enhanced visual comfort. Replaces one standard 24-inch (610mm) extension tube in the tube assembly.

* + - 1. Delivery Zone:

\*\* NOTE TO SPECIFIER \*\* Select one of the following two Diffuser Assembly for Open or Closed Ceilings paragraphs and delete the paragraph not required.

* + - * 1. Diffuser Assemblies for Tubes Not Penetrating Ceilings (Open Ceiling): Solatube Model 330 DS-O. 21 inch (530 mm) diameter diffuser attached directly to bottom of tube.

\*\* NOTE TO SPECIFIER \*\* Select one of the following lens paragraphs and delete paragraphs not required.

Lens: Type L1 OptiView Fresnel lens design to maximize light output and diffusion. Visible Light Transmission shall be greater than 90 percent at 0.022 inch (0.6 mm) thick. Classified as CC2.

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.

\*\* NOTE TO SPECIFIER \*\* The following paragraphs are standard with all diffusers (L1 and L2).

Diffuser Seal: Open cell foam, acrylic adhesive backed, 0.75 inch (19 mm) wide by 0.125 inch (3.2 mm) thick to minimize condensation and bug, dirt and air infiltration per ASTM E 283.

Diffuser Trim Ring: Injection molded acrylic. Nominal wall thickness 0.172 inches (4.4 mm).

* + - * 1. Diffuser Assemblies for Tubes Penetrating Ceilings: Ceiling mounted box transitioning from round tube to square ceiling assembly, supporting light transmitting surface at bottom termination of tube 23.8 inches by 23.8 inches (605 mm by 605 mm) square frame to fit standard suspended ceiling grids or hard ceilings.

\*\* NOTE TO SPECIFIER \*\* Select one of the following Transition Box paragraphs and delete the one not required. Use Type TM for use with Spectralight with SoftLight extension tubes (ES).

Polymeric Transition Box: Type TP, round-to-square transition box made of opaque polymeric material, classified as CC2, Class C, 0.110 inch (2.8 mm) thick.

Metal Transition Box: Type TM, Metal 2 Round to Square transition box comprised of Spectralight Infinity SoftLight material with structured finish on exposed reflective surface, .015in (0.4mm) thick. 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.

\*\* NOTE TO SPECIFIER \*\* Select one of the following lens paragraphs and delete the one not required.

Lens: Type L1 OptiView Fresnel lens design to maximize light output and diffusion with extruded aluminum frame and EPDM foam seal to minimize condensation and bug, dirt and air infiltration per ASTM E 283. Visible Light Transmission shall be greater than 90 percent at 0.022 inch (0.6 mm) thick. Classified as CC2.

Lens: Type L2 Prismatic lens design to maximize light output and diffusion with extruded aluminum frame and EPDM foam seal to minimize condensation and bug, dirt and air infiltration per ASTM E 283. Visible Light Transmission shall be greater than 90 percent at 0.100 inches (2.5 mm) thick. Classified as CC2.

\*\* NOTE TO SPECIFIER \*\* Select the following optional lens paragraphs and delete if not required. Required for energy star rating. Supplemental Natural Effect Lens is also required to meet Florida Building Code High Velocity Wind Zone and Texas Department of Insurance Impact Resistant zone requirements.

Supplemental Natural Effect Lens: Type LN made of acrylic, classified as CC2, Class C, 0.060 inch (1.5 mm) thick, with open cell foam seal to minimize condensation and bug, dirt and air infiltration per ASTM E 283.

* + - * 1. Delivery Zone Options

\*\* NOTE TO SPECIFIER \*\* Select one of the following Delivery Zone Options if required. Delete entirely if not required.

Local Dimmer Control utilizing a butterfly baffle design of Spectralight Infinity reflective material to minimize shadowing when in use: Provided with dimmer switch and cable.

Daylight Dimmer: Type D, Electro-mechanically actuated daylight valve; for universal input voltages ranging between 90 and 277 V at 50 or 60 Hz; maximum current draw of 50 ma per unit; controlled by low voltage, series Type T02. Provided with dimmer switch and cable. Cable circuited, 4 conductor, size 22 AWG when total aggregate circuit runs are under 200 feet (60.96 m) or size 18 AWG when total aggregate circuit runs are under 500 feet (152.4 m); providing daylight output between 2 and 100 percent.

\*\* NOTE TO SPECIFIER \*\* Coordinate with work specified in Automation Facility Controls Section 25 50 00; Common Work Results Electrical Section 26 05 00; and Lighting Equipment and Controls Section 26 50 00. Contact Solatube for additional information on pre-approved lighting control manufacturers. Using a Solatube pre-approved lighting control manufacturer, the 0-10 V Daylight Dimmer (Type D1) system, an electrical actuator is capable of supporting the following operating scenarios: Program the preset buttons on the lighting control system to signal the 0-10 V Daylight Dimmer to provide a scene-based control and automatically adjust the daylight to desired levels; and program the astronomical clock on the lighting control system to execute time based control commands. Contact Solatube for information regarding the Maximum length of control cable and maximum number of Daylight Dimmer Units and Unit Spacing (Power Cable Lengths) per transformer.

Lighting Control System: Provide an electrical actuator dimmer 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.

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 2 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.

Programmable (0 to 10VDC) Control: requires electrical actuator 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.

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

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

Power can be transformed from line voltage through use of a UL Listed Class-2, 24VAC Transformer.

\*\* NOTE TO SPECIFIER \*\* The following Options/Accessories are optional. Select those required and delete those not required.

* + - 1. Accessories

\*\* NOTE TO SPECIFIER \*\* Select one or both of the following Accessories paragraphs for use with Solatube Model 330 DS Local Daylight Dimmer (Type D) only. Delete if not applicable.

* + - * 1. Switch: Type SW, Manufacturer-specific low voltage DC DP/DT switch (white) required to operate Daylight Dimmer. Note: only one switch is required per set of synchronously controlled dimmers. For use with Daylight Dimmer, Type D, only. Pre-wired with 30 feet (9.14 m) of 22 AWG, 4 conductor, low voltage cable.
        2. Cable: Type CA, Optional Two conductor, size 22 AWG, low voltage cable (500 foot) for multiple unit DC connection. For use with Daylight Dimmer, Type D, only when aggregate circuit runs do not exceed 200 feet (60.96 m).

\*\* NOTE TO SPECIFIER \*\* Select between the following Accessory Low Voltage Transformer paragraphs for use with Solatube Model 330 DS-C 0-10V Daylight Dimmer (Type D1) only. Delete if not applicable.

* + - * 1. Optional Low-voltage Transformer: Solatube Remote Transformer, Type TR20, 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. For use with Daylight Dimmer Type D1 only.
        2. 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-in x 4.06-in (103mm x 103mm) square junction box: Inherently Limited, Primary: 120VAC, 240VAC, 277VAC and 480VAC. For use with Daylight Dimmer Type D1 only.

\*\* NOTE TO SPECIFIER \*\* SolaMaster Series Solatube Model 300 DS used for daylighting systems with suspended or hard ceilings. SolaMaster Series (300 DS) Tubular daylighting device, consisting of roof dome, reflective tube, and diffuser assembly; in a configuration as indicated on the Drawings.

* + 1. SolaMaster Series: Solatube Model 300 DS: 14 Inch (350 mm) Daylighting System:
       1. Model:
          1. Solatube Model 300 DS-C Closed (Penetrating) Ceiling, AAMA Type TDDCC.
       2. Capture Zone:

\*\* NOTE TO SPECIFIER \*\* Select one of the following two dome paragraphs as required. Delete the paragraph not required. Acrylic Shock Inner Dome meets Florida Building Code High Velocity Wind Zone and Texas Department of Insurance Impact Resistant zone requirements. Use Shock Inner Domes only in high velocity wind zones.

* + - * 1. Roof Dome Assembly: Transparent, UV and impact resistant dome with flashing base supporting dome and top of tube.

Outer Dome Glazing: Type DA, 0.125 inch (3.25 mm) minimum thickness impact resistant injection molded acrylic classified as CC2 material; UV inhibiting (100 percent UV C, 100 percent UV B and 98.5 percent UV A), impact modified acrylic blend.

Raybender 3000: Variable prism optic molded into outer dome to capture low angle sunlight and limit high angle sunlight.

Acrylic Dome Plus Shock Inner Dome Glazing: Type DAI, Inner Dome is 0.115 inch (2.9 mm) minimum thickness classified as CC1 material. High impact resistant injection molded acrylic required for high velocity wind zones.

Tube Ring: Attached to top of base section; 0.090 inch (2.3 mm) nominal thickness injection molded high impact acrylic; to prevent thermal bridging between base flashing and tubing and channel condensed moisture out of tubing.

Dome Seal: Polyethylene foam seal, black, 0.13 inch (3.2 mm) thick by 14.62 (371 mm) diameter, 2 PCF polyethylene foam.

LightTracker Reflector, made of aluminum sheet, thickness 0.015 inch (0.4 mm) with Spectralight Infinity. Positioned in the dome to capture low angle sunlight.

* + - * 1. Dome Options:

\*\* NOTE TO SPECIFIER \*\* Select the dome option required from the following paragraph and delete if not required.

Dome Edge Protection Band: Type PB, for fire rated Class A, B or C roof applications. Aluminized steel nominal thickness of 0.028 inches (0.7 mm).

* + - * 1. Flashings:

Roof Flashing Base:

One Piece: One piece, seamless, leak-proof flashing functioning as base support for dome and top of tube. Sheet steel, corrosion resistant conforming to ASTM A 653/A 653M or ASTM A 463/A 463M or ASTM A792/A 792M, 0.028 inch (0.7 mm) plus or minus .006 inch (.015 mm) thick.

\*\* NOTE TO SPECIFIER \*\* Select one of the following flashing paragraphs and delete those not required. Steel bases are available both flat and pitched. For a different roof slope use the base that is the closest fit but be aware that the skylight dome will not be mounted precisely level. Curb cap is normally used only on metal roofs or other roofs where curb is preferred and provided by others.

Base Flat: Flat Type F6, no pitch 6 inches (152 mm) high.

Base Style: Type FC, Curb Cap, with inside dimensions of 27 inches by 27 inches (685 mm by 685 mm) to cover curb as specified in Section 07 60 00 - Flashing and Sheet Metal.

\*\* NOTE TO SPECIFIER \*\* The following flashing components are optional. Select those required and delete those not required. Flashing insulator is intended to seal the roof opening and prevent condensation forming on the flashing interior from exposure to humid air in unventilated spaces. Metal roof flashing kit is available for sealing base flat or pitched flashing specified above.

Flashing Options:

Flashing Insulator: Type FI, thermal isolation material for use under flashing. For use with Type F6 Flashing.

Metal Roof Flashing Kit: Type MR, includes Butyl tape, flashing screws, speed nuts, corner washers and polyurethane sealant. For use with Type F6 Flashing.

Curb Cap Insulation: Type CCI, 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 (OFxft2xhr/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(OFxft2xhr/Btu). For use with Type FC flashing.

\*\* NOTE TO SPECIFIER \*\* Select one of the following turret extension paragraphs and delete those not required. If more than one size is required indicate requirements on the Drawings. Roof Flashing Turret Extension used to raise the height of the dome above roof level. This extends the height of the turret found on the curb cap or self flashing. Must order additional tubing to include the added height of turret.

Roof Flashing Turret Extensions: Provide manufacturer's standard extension tubes for applications requiring:

Type T12: Additional lengths of 12 inches (300 mm) extension.

Type T24: Additional lengths of 24 inches (600 mm) extension.

Type T36: Additional lengths of 36 inches (900 mm) extension.

Type T48: Additional lengths of 48 inches (1200 mm) extension.

* + - 1. Transfer Zone:
         1. Extension Tubes: Aluminum sheet, thickness 0.015 inch (0.4 mm).

\*\* NOTE TO SPECIFIER \*\* Indicate the total length of run on the Drawings. Note that at least one extension tube is required for diffuser mounting. Extension tubes are nominally 24 inches (610 mm) long in overall length.

Reflective Tubes:

Reflective Extension Tubes: Type EXX, extension tubes with total length of run as indicated on the Drawings.

Reflective angle adapter tube (standard top and bottom tubes), providing up to a 30-degree angle adjustment.

Interior Finish: Spectralight Infinity with INFRAREDuction Technology combining ultra-high Visible Light reflectance with Ultra-low Infrared (IR) reflectance.

Tube Options

\*\* NOTE TO SPECIFIER \*\* Select the following optional Extension Tube and Angle Adapters as required. Delete options not required. Note that at least one 16 inch bottom tube is required for each diffuser.

Extension Tube Angle Adapter: Provide manufacturer's standard adapters for applications requiring:

Type A1 one 0 to 90 degree extension tube angle adapter.

Type A2 two 0 to 90 degree extension tube angle adapters.

Severe Climate Glazing Type SCG: PET GAG plastic glazing to minimize potential for condensation and heat loss. Nominal thickness is 0.039 inches (0.99 mm).

Wire Suspension Kit: Type E, Use the wire suspension kit when additional bracing to the structure is required.

Spectralight Infinity SoftLight Extension Tube: Type ES, 24-inch (610mm) Super-reflective extension tube with structured surface providing precise light spread for enhanced visual comfort. Replaces one standard 24-inch (610mm) extension tube in the tube assembly.

* + - 1. Delivery Zone:
         1. Ceiling Ring: Injection molded impact resistant acrylic. Nominal thickness is 0.110 inches (2.8 mm).
         2. Ceiling Ring Seal: Polyethylene foam seal, white, 0.25 inch (6.4 mm) wide by 0.19 inch (4.8 mm) high, 2 PCF polyethylene foam with low-tack pressure sensitive adhesive. Upper glazing: PET GAG plastic with EPDM low density sponge seal to minimize condensation and bug, dirt, and air infiltration per ASTM E283. The nominal thickness is 0.039 inches (0.99 mm).

\*\* NOTE TO SPECIFIER \*\* Select one of the following effect lens and delete those not required. The Natural Effect Lens provides brilliant white natural daylight. The Softening Effect Lens creates a subtle, softer natural lighting effect.

Natural Effect Lens: Type LN.

Softening Effect Lens: Type LS.

* + - * 1. Diffuser Assemblies for Tubes Penetrating Ceilings: Ceiling mounted box transitioning from round tube to square ceiling assembly, supporting light transmitting surface at bottom termination of tube 23.8 inches by 23.8 inches (605 mm by 605 mm) square frame to fit standard suspended ceiling grids or hard ceilings.

Metal Transition Box: Type TM, Round to Square transition box comprised of Spectralight Infinity SoftLight material with structured finish on exposed reflective surface, .015in (0.4mm) thick. 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.

\*\* NOTE TO SPECIFIER \*\* Select one of the following lens paragraphs and delete the one not required.

Lens: Type L1 OptiView Fresnel lens design to maximize light output and diffusion with extruded aluminum frame and EPDM foam seal to minimize condensation and bug, dirt and air infiltration per ASTM E 283. Visible Light Transmission shall be greater than 90 percent at 0.022 inch (0.6 mm) thick. Classified as CC2.

Lens: Type L2 Prismatic lens design to maximize light output and diffusion with extruded aluminum frame and EPDM foam seal to minimize condensation and bug, dirt and air infiltration per ASTM E 283. Visible Light Transmission shall be greater than 90 percent at 0.100 inches (2.5 mm) thick. Classified as CC2.

* + - * 1. Delivery Zone Options:

\*\* NOTE TO SPECIFIER \*\* Select one of the following Delivery Zone Options if required. Delete entirely if not required.

Local Dimmer Control utilizing a butterfly baffle design of Spectralight Infinity reflective material to minimize shadowing when in use: Provided with dimmer switch and cable.

Daylight Dimmer: Type D Electro-mechanically actuated daylight valve; for universal input voltages ranging between 90 and 277 V at 50 or 60 Hz; maximum current draw of 50 ma per unit; controlled by low voltage, series Type T02. Provided with dimmer switch and cable.

Lighting Fixture: Bracket mounted inside system just above diffuser; UL and CSA Listed.

\*\* NOTE TO SPECIFIER \*\* Delete one of the following two paragraphs. Note that lamps are not provided with fixture.

Universal: Type INC, for two 23 W maximum CFL, maximum total length 4-3/4 inch, ceramic screw-in lamp holder, medium base, two lamps.

Compact Fluorescent: Type CFL, dedicated compact fluorescent fixture, for one 26 W, 4-pin lamp.

Electrical Requirements: 110 V, 15 amp GFCI circuit for damp and wet conditions.

\*\* NOTE TO SPECIFIER \*\* The following Options/Accessories are optional. Select those required and delete those not required.

* + - 1. Accessories
         1. Switch: Type SW, Manufacturer-specific low voltage DC DP/DT switch (white) required to operate Daylight Dimmer. Note that a maximum of 10 units can be connected to one switch. For use with Daylight Dimmer, Type D, only.
         2. Cable: Type CA, Two conductor, 22 gauge, low voltage cable (500 ft.) for multiple unit DC connections. For use with Daylight Dimmer, Type D, only when aggregate circuit runs do not exceed 200 feet (60.96 m).

\*\* NOTE TO SPECIFIER \*\* Brighten Up Series Solatube Model 290 DS used for daylighting systems with suspended or hard ceilings. Brighten Up Series (290 DS) Tubular daylighting device, consisting of roof dome, reflective tube, and diffuser assembly; in a configuration as indicated on the Drawings.

* + 1. Brighten Up Series: Solatube Model 290 DS: 14 Inch (350 mm) Daylighting System:
       1. Model:
          1. Solatube Model 290 DS used for daylighting systems with suspended or hard ceilings. AAMA Type TDDCC.
       2. Capture Zone:

\*\* NOTE TO SPECIFIER \*\* Select one of the following two dome paragraphs as required. Delete the paragraph not required. Acrylic Shock Inner Dome meets Florida Building Code High Velocity Wind Zone and Texas Department of Insurance Impact Resistant zone requirements. Use Shock Inner Domes only in high velocity wind zones.

* + - * 1. Roof Dome Assembly: Transparent, UV and impact resistant dome with flashing base supporting dome and top of tube.

Outer Dome Glazing: Type DA, 0.125 inch (3.25 mm) minimum thickness impact resistant injection molded acrylic classified as CC2 material; UV inhibiting (100 percent UV C, 100 percent UV B and 98.5 percent UV A), impact modified acrylic blend.

Raybender 3000: Variable prism optic molded into outer dome to capture low angle sunlight and limit high angle sunlight.

Acrylic Dome Plus Shock Inner Dome Glazing: Type DAI, Inner Dome is 0.115 inch (2.9 mm) minimum thickness classified as CC1 material. High impact resistant injection molded acrylic required for high velocity wind zones.

Tube Ring: Attached to top of base section; 0.090 inch (2.3 mm) nominal thickness injection molded high impact acrylic; to prevent thermal bridging between base flashing and tubing and channel condensed moisture out of tubing.

Dome Seal: Polyethylene foam seal, black, 0.13 inch (3.2 mm) thick by 14.62 (371 mm) diameter, 2 PCF polyethylene foam.

LightTracker Reflector, made of aluminum sheet, thickness 0.015 inch (0.4 mm) with Spectralight Infinity. Positioned in the dome to capture low angle sunlight.

* + - * 1. Dome Options:

\*\* NOTE TO SPECIFIER \*\* Select the dome options required from the following paragraphs and delete those not required.

Dome Edge Protection Band: Type PB, for fire rated Class A, B or C roof applications. Aluminized steel nominal thickness of 0.028 inches (0.7 mm).

* + - * 1. Flashings:

Roof Flashing Base:

One Piece: One piece, seamless, leak-proof flashing functioning as base support for dome and top of tube. Sheet steel, corrosion resistant conforming to ASTM A 653/A 653M or ASTM A 463/A 463M or ASTM A792/A 792M, 0.028 inch (0.7 mm) plus or minus .006 inch (.015 mm) thick.

\*\* NOTE TO SPECIFIER \*\* Select one of the following flashing paragraphs and delete those not required. Steel bases are available both flat and pitched. For a different roof slope use the base that is the closest fit but be aware that the skylight dome will not be mounted precisely level. Curb cap is normally used only on metal roofs or other roofs where curb is preferred and provided by others.

Base Flat: Flat Type F4, no pitch 4 inches (102 mm) high.

Base Flat: Flat Type F6, no pitch 6 inches (152 mm) high.

Base Pitched: Pitched Type FP, 22.5 degrees slope from horizontal, 4 inches (102 mm) high.

Base Style: Type FC, Curb Cap, with inside dimensions of 27 inches by 27 inches (685 mm by 685 mm) to cover curb as specified in Section 07 60 00 - Flashing and Sheet Metal.

Tile Roof No Pitch: No Pitch Type FT, 4 inches (102 mm) high. Tile Roof Counter-Flashing: corrugated aluminum 1100-0, 0.020 inch (.508 mm).

Tile Roof Pitched: Pitched Type FPT, 22.5 degrees slope from horizontal, 4 inches (102 mm) high. Tile Roof Counter-Flashing: corrugated aluminum 1100-0, 0.020 inch (.508 mm).

\*\* NOTE TO SPECIFIER \*\* The following flashing components are optional. Select those required and delete those not required. Flashing insulator is intended to seal the roof opening and prevent condensation forming on the flashing interior from exposure to humid air in unventilated spaces. Metal roof flashing kit is available for sealing base flat or pitched flashing specified above.

Flashing Options:

Flashing Insulator: Type FI thermal isolation material for use under flashing.

Metal Roof Flashing Kit: Type MR, includes Butyl tape, flashing screws, speed nuts, corner washers and polyurethane sealant.

Curb Cap Insulation: Type CCI, 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 (OFxft2xhr/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(OFxft2xhr/Btu)

\*\* NOTE TO SPECIFIER \*\* Select one of the following turret extension paragraphs and delete those not required. If more than one size is required indicate requirements on the Drawings. Roof Flashing Turret Extension used to raise the height of the dome above roof level. This extends the height of the turret found on the curb cap or self flashing. Must order additional tubing to include the added height of turret.

Roof Flashing Turret Extensions: Provide manufacturer's standard extension tubes for applications requiring:

Type T2 Additional lengths of 2 inches (50 mm) extension.

Type T4 Additional lengths of 4 inches (100 mm) extension.

Type T12 Additional lengths of 12 inches (300 mm) extension.

Type T24 Additional lengths of 24 inches (600 mm) extension.

Type T36 Additional lengths of 36 inches (900 mm) extension.

Type T48 Additional lengths of 48 inches (1200 mm) extension.

* + - 1. Transfer Zone:
         1. Extension Tubes: Aluminum sheet, thickness 0.015 inch (0.4 mm).

\*\* NOTE TO SPECIFIER \*\* Indicate the total length of run on the Drawings. Note that at least one extension tube is required for diffuser mounting. Top and Bottom 30-degree Angle Tubes are provided standard with Brighten Up Series.

Reflective Tubes:

Reflective Extension Tube: Type EXX with total length of run as indicated on the Drawings.

Interior Finish: Spectralight Infinity with INFRAREDuction Technology combining ultra-high Visible Light reflectance with Ultra-low Infrared (IR) reflectance.

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.

Tube Options

\*\* NOTE TO SPECIFIER \*\* Select the following optional Extension Tube and Angle Adapters as required. Delete options not required. Note that at least one 16 inch bottom tube is required for each diffuser.

Extension Tube Angle Adapter: Provide manufacturer's standard adapters for applications requiring:

Type A1 one 0 to 90 degree extension tube angle adapter.

Type A2 two 0 to 90 degree extension tube angle adapters.

Severe Climate Glazing: Type SCG, PET GAG plastic glazing to minimize potential for condensation and heat loss. Nominal thickness is 0.039 inches (0.99 mm).

Wire Suspension Kit: Type E, use the wire suspension kit when additional bracing to the structure is required.

Thermal Insulation Panel: Type TIP, high-performance dual-glazed, tube insulation system.

* + - 1. Delivery Zone:
         1. Ceiling Ring: Injection molded impact resistant acrylic. Nominal thickness is 0.110 inches (2.8 mm).
         2. Ceiling Ring Seal: Polyethylene foam seal, white, 0.25 inch (6.4 mm) wide by 0.19 inch (4.8 mm) high, 2 PCF polyethylene foam with low-tack pressure sensitive adhesive.
         3. Upper glazing: PET GAG plastic with EPDM low density sponge seal to minimize condensation and bug, dirt, and air infiltration per ASTM E283. The nominal thickness is 0.039 inches (0.99 mm).

\*\* NOTE TO SPECIFIER \*\* Select one of the following effect lens and delete those not required. The Natural Effect Lens provides brilliant white natural daylight. The Softening Effect Lens creates a subtle, softer natural lighting effect.

Natural Effect Lens: Type LN.

Softening Effect Lens: Type LS.

Warm Effect Lens: Type LW.

Warm Softening Effect Lens: Type LWS.

\*\* NOTE TO SPECIFIER \*\* Select one of the following two Diffuser Assembly paragraphs and delete the paragraphs not required.

* + - * 1. Round Diffusers/Decorative Fixtures: Dual Glazed Diffuser Assembly.

Lower glazing with integral injection molded acrylic Dress Ring classified as CC2 material. Nominal thickness is 0.110 inches (2.8 mm)

\*\* NOTE TO SPECIFIER \*\* Select one of the following lower glazing diffuser or decorative fixture lens paragraphs and delete those not required.

Classic Vusion Diffuser: Type L4, molded acrylic plastic classified as CC2 material (nominal thickness 0.090 inches (2.29 mm) with injection molded acrylic Diffuser Trim Ring.

Classic OptiView (Fresnel Lens) Diffuser: Type L1, molded polycarbonate plastic classified as CC1 material, nominal thickness 0.022 inches (0.61 mm) with injection molded acrylic Diffuser Trim Ring.

JustFrost Decorative Fixture: Type L9, frosted acrylic plastic lens classified as CC2 material (nominal thickness is 0.16 inches (4 mm)), and decorative metal fasteners.

TierDrop Decorative Fixture: Type L10, three layers of frosted acrylic plastic lens classified as CC2 material (nominal thickness is 0.16 inches (4 mm)). Bottom layer is continuous with two stepped full-tempered glass rings on top and decorative metal fasteners.

OptiView Decorative Fixture: Type L11, molded polycarbonate plastic Fresnel Lens classified as CC1 material (nominal thickness is 0.022 inches (0.61 mm)) with full-tempered frosted glass bezel (nominal thickness is 0.16 inches (4 mm)), and decorative metal fasteners.

VividShade Decorative Fixture: Type L12, frosted acrylic plastic lens classified as CC2 material (nominal thickness is 0.16 inches (4 mm)), integral flame retardant linen shade with translucent frosted PVC inner liner, nominal thickness 0.16 inches (0.4mm); decorative zinc plated steel (concealed) and stainless steel (exposed) fasteners.

Lower decorative glazing with integral 2-piece aluminum/zinc alloy coated steel Fixture Mounting Ring, 23 gauge; nominal thickness 0.031inches (0.787 mm):

AuroraGlo Decorative Fixture: Type L16, Glass Bowl acid etched lens, with two-tone black/bronze painted decorative metal trim ring. Low profile.

AuroraGlo Decorative Fixture: Type L15, Glass Bowl acid etched lens, with white painted decorative metal trim ring. Low profile.

* + - * 1. Square Diffuser Assemblies for Tubes Penetrating Ceilings: Ceiling mounted box transitioning from round tube to square ceiling assembly, supporting light transmitting surface at bottom termination of tube 14 inches by 14 inches (356 mm by 356 mm) square diffuser opening.

\*\* NOTE TO SPECIFIER \*\* Select one of the following lower glazing diffuser or decorative fixture lens paragraphs and delete those not required.

Square JustFrost Decorative Fixture: Type L9, frosted acrylic plastic lens classified as a CC2 material lens (nominal thickness is 0.16 inches (4 mm)), and decorative metal fasteners.

Square OptiView Decorative Fixture: Type L11, molded polycarbonate plastic Fresnel Lens classified as CC1 material (nominal thickness is 0.022 inches (0.61 mm)) with white metal bezel (nominal thickness is 0.16 inches (4 mm)), and decorative metal fasteners.

* + - * 1. Delivery Zone Options:

\*\* NOTE TO SPECIFIER \*\* Select one of the following Delivery Zone Options if required. Delete entirely if not required.

Local Dimmer Control utilizing a butterfly baffle design of Spectralight Infinity reflective material to minimize shadowing when in use: Provided with dimmer switch and cable.

Daylight Dimmer: Type D, electro-mechanically actuated daylight valve; for universal input voltages ranging between 90 and 277 V at 50 or 60 Hz; maximum current draw of 50 ma per unit; controlled by low voltage, series Type T02. Provided with dimmer switch and cable.

Lighting Fixture: Bracket mounted inside system just above diffuser; UL and CSA Listed.

\*\* NOTE TO SPECIFIER \*\* Delete one of the following two paragraphs. Note that lamps are not provided with fixture.

Universal: Type INC, for two 23 W maximum CFL, maximum total length 4-3/4 inch, ceramic screw-in lamp holder, medium base, two lamps.

Compact Fluorescent: Type CFL, dedicated compact fluorescent fixture, for one 26 W, 4-pin lamp.

Electrical Requirements: 110 V, 15 amp GFCI circuit for damp and wet conditions.

\*\* NOTE TO SPECIFIER \*\* The following Options/Accessories are optional. Select those required and delete those not required.

* + - 1. Accessories
         1. Switch: Type SW, Manufacturer-specific low voltage DC DP/DT switch (white) required to operate Daylight Dimmer. Note: A maximum of 10 units can be connected to one switch. For use with Daylight Dimmer, Type D, only.
         2. Cable: Type CA, Two conductor, 22 gauge, low voltage cable (500 ft.) for multiple unit DC connections. For use with Daylight Dimmer, Type D, only when aggregate circuit runs do not exceed 200 feet (60.96 m).

\*\* NOTE TO SPECIFIER \*\* Brighten Up Series Solatube Model 160 DS used for daylighting systems with suspended or hard ceilings. Brighten Up Series (160 DS) Tubular daylighting device, consisting of roof dome, reflective tube, and diffuser assembly; in a configuration as indicated on the Drawings.

* + 1. Brighten Up Series: Solatube Model 160 DS, 10 Inch (250 mm) Daylighting System.
       1. Model:
          1. Solatube Model 160 DS used for daylighting systems with suspended or hard ceilings. AAMA Type TDDCC.
       2. Capture Zone:
          1. Domes:

\*\* NOTE TO SPECIFIER \*\* Select one of the following two dome paragraphs as required. Delete the paragraph not required. Acrylic Shock Inner Dome meets Florida Building Code High Velocity Wind Zone and Texas Department of Insurance Impact Resistant zone requirements. Use Shock Inner Domes only in high velocity wind zones.

Roof Dome Assembly: Transparent, UV and impact resistant dome with flashing base supporting dome and top of tube.

Outer Dome Glazing: Type DA, 0.125 inch (3 mm) minimum thickness injection molded acrylic classified as CC2 material; UV inhibiting (100 percent UV C, 100 percent UV B and 98.5 percent UV A), impact modified acrylic blend.

Raybender 3000: Variable prism optic molded into outer dome to capture low angle sunlight and limit high angle sunlight.

Acrylic Dome Plus Shock Inner Dome Glazing: Type DAI, Inner Dome is 0.115 inch (2.9 mm) minimum thickness classified as CC1 material. High impact injection molded acrylic required for high velocity wind zones.

Tube Ring: Attached to top of base section; 0.090 inch (2.3 mm) nominal thickness injection molded high impact acrylic; to prevent thermal bridging between base flashing and tubing and channel condensed moisture out of tubing.

Dome Seal: Polyethylene foam seal, black, 0.13 inch (3.2 mm) thick by 10.73 (272.5 mm) diameter, 2 PCF polyethylene foam.

LightTracker Reflector, made of aluminum sheet, thickness 0.015 inch (0.4 mm) with Spectralight Infinity. Positioned in the dome to capture low angle sunlight.

* + - * 1. Dome Options:

\*\* NOTE TO SPECIFIER \*\* Select the dome options required from the following paragraphs and delete those not required.

Dome Edge Protection Band: Type PB, for fire rated Class A, B or C roof applications. Aluminized steel nominal thickness of 0.028 inches (0.7 mm).

* + - * 1. Flashings:

Roof Flashing Base:

One Piece: One piece, seamless, leak-proof flashing functioning as base support for dome and top of tube. Sheet steel, corrosion resistant conforming to ASTM A 653/A 653M or ASTM A 463/A 463M or ASTM A792/A 792M, 0.028 inch (0.7 mm) plus or minus .006 inch (.015 mm) thick.

\*\* NOTE TO SPECIFIER \*\* Select one of the following flashing paragraphs and delete those not required. Steel bases are available both flat and pitched. For a different roof slope use the base that is the closest fit but be aware that the skylight dome will not be mounted precisely level.

Base Flat: Flat Type F4, no pitch 4 inches (102 mm) high.

Base Flat: Flat Type F6, no pitch 6 inches (152 mm) high.

Base Pitched: Pitched Type FP, 22.5 degrees slope from horizontal, 4 inches (102 mm) high.

Tile Roof No Pitch: No Pitch Type FT, 4 inches (102 mm) high. Tile Roof Counter-Flashing: corrugated aluminum 1100-0, 0.020 inch (.508 mm).

Tile Roof Pitched: Pitched Type FPT, 22.5 degrees slope from horizontal, 4 inches (102 mm) high. Tile Roof Counter-Flashing: corrugated aluminum 1100-0, 0.020 inch (.508 mm).

\*\* NOTE TO SPECIFIER \*\* The following flashing components are optional. Select those required and delete those not required. Flashing insulator is intended to seal the roof opening and prevent condensation forming on the flashing interior from exposure to humid air in unventilated spaces. Metal roof flashing kit is available for sealing base flat or pitched flashing specified above.

Flashing Options:

Flashing Insulator: Type FI, thermal isolation material for use under flashing.

Metal Roof Flashing Kit: Type MR, includes Butyl tape, flashing screws, speed nuts, corner washers and polyurethane sealant.

\*\* NOTE TO SPECIFIER \*\* Select one of the following turret extension paragraphs and delete those not required. If more than one size is required indicate requirements on the Drawings. Roof Flashing Turret Extension used to raise the height of the dome above roof level. This extends the height of the turret found on the self flashing. Must order additional tubing to include the added height of turret.

Roof Flashing Turret Extensions: Provide manufacturer's standard extension tubes for applications requiring:

Type T2, Additional lengths of 2 inches (50 mm) extension.

Type T4, Additional lengths of 4 inches (100 mm) extension.

Type T12, Additional lengths of 12 inches (300 mm) extension.

Type T24, Additional lengths of 24 inches (600 mm) extension.

Type T36, Additional lengths of 36 inches (900 mm) extension.

Type T48, Additional lengths of 48 inches (1200 mm) extension.

* + - 1. Transfer Zone:
         1. Extension Tubes: Aluminum sheet, thickness 0.015 inch (0.4 mm).

\*\* NOTE TO SPECIFIER \*\* Indicate the total length of run on the Drawings. Note that at least one extension tube is required for diffuser mounting. Top and Bottom 30-degree Angle Tubes are provided standard with Brighten Up Series. Standard Type EXX reflective extension tubes are 24 inches (610 mm) in overall length.

Reflective Tubes:

Reflective angle adapter tube (standard Top and Bottom Tubes), providing up to a 30-degree angle adjustment.

Reflective extension tube, Type EXX and Type EL with total length of run as indicated on the Drawings.

Interior Finish: Spectralight Infinity with INFRAREDuction Technology combining ultra-high Visible Light reflectance with Ultra-low Infrared (IR) reflectance.

Extension Tube Options

\*\* NOTE TO SPECIFIER \*\* Select the following optional Extension Tube and Angle Adapters as required. Delete options not required. Note that at least one 16 inch bottom tube is required for diffuser.

Extension Tube Angle Adapter: Provide manufacturer's standard adapters for applications requiring:

Type A1 one 0 to 90 degree extension tube angle adapter.

Type A2 two 0 to 90 degree extension tube angle adapters.

Severe Climate Glazing: Type SCG PET GAG plastic glazing to minimize potential for condensation and heat loss. Nominal thickness 0.039 inches (0.99 mm).

Wire Suspension Kit: Type E, Use the wire suspension kit when additional bracing to the structure is required.

Thermal Insulation Panel: Type TIP, high-performance dual-glazed, tube insulation system.

* + - 1. Delivery Zone:
         1. Ceiling Ring: Injection molded impact resistant acrylic. Nominal thickness is 0.110 inches (2.8 mm).
         2. Ceiling Ring Seal: Polyethylene foam seal, white, 0.25 inch (6.4 mm) wide by 0.19 inch (4.8 mm) high, 2 PCF polyethylene foam with low-tack pressure sensitive adhesive.
         3. Upper glazing: PET GAG plastic with EPDM low density sponge seal to minimize condensation and bug, dirt, and air infiltration per ASTM E283. The nominal thickness is 0.039 inches (0.99 mm).

\*\* NOTE TO SPECIFIER \*\* Select one of the following effect lens and delete those not required. The Natural Effect Lens provides brilliant white natural daylight. The Softening Effect Lens creates a subtle, softer natural lighting effect.

Natural Effect Lens: Type LN.

Softening Effect Lens: Type LS.

Warm Effect Lens: Type LW.

Warm Softening Effect Lens: Type LWS.

\*\* NOTE TO SPECIFIER \*\* Select one of the following Round or Square Diffuser Assembly paragraphs and delete the paragraphs not required.

* + - * 1. Round Diffusers/Decorative Fixtures: Dual Glazed Diffuser Assembly.

Lower glazing with integral injection molded acrylic Dress Ring classified as CC2 material. Nominal thickness is 0.110 inches (2.8 mm)

\*\* NOTE TO SPECIFIER \*\* Select one of the following lower glazing diffuser or decorative fixture lens paragraphs and delete those not required.

Classic Vusion Diffuser: Type L4, molded acrylic plastic classified as CC2 material (nominal thickness 0.090 inches (2.29 mm) with injection molded acrylic Diffuser Trim Ring.

Classic OptiView (Fresnel Lens) Diffuser: Type L1, molded polycarbonate plastic classified as CC1 material, nominal thickness 0.022 inches (0.61 mm) with injection molded acrylic Diffuser Trim Ring.

JustFrost Decorative Fixture: Type L9, frosted acrylic plastic lens classified as CC2 material (nominal thickness is 0.16 inches (4 mm)), and decorative metal fasteners.

TierDrop Decorative Fixture: Type L10, three layers of frosted acrylic plastic lens classified as CC2 material (nominal thickness is 0.16 inches (4 mm)). Bottom layer is continuous with two stepped full-tempered glass rings on top and decorative metal fasteners.

OptiView Decorative Fixture: Type L11, molded polycarbonate plastic Fresnel Lens classified as CC1 material (nominal thickness is 0.022 inches (0.61 mm)) with full-tempered frosted glass bezel (nominal thickness is 0.16 inches (4 mm)), and decorative metal fasteners.

* + - * 1. Square Diffuser Assemblies for Tubes Penetrating Ceilings: Ceiling mounted box transitioning from round tube to square ceiling assembly, supporting light transmitting surface at bottom termination of tube 10 inches by 10 inches (254 mm by 254 mm) square diffuser opening.

\*\* NOTE TO SPECIFIER \*\* Select one of the following lower glazing diffuser or decorative fixture lens paragraphs and delete those not required.

Square JustFrost Decorative Fixture: Type L9, frosted acrylic plastic lens classified as CC2 material (nominal thickness is 0.16 inches (4 mm)), and decorative metal fasteners.

Square OptiView Decorative Fixture: Type L11, molded polycarbonate plastic Fresnel Lens classified as CC1 material (nominal thickness is 0.022 inches (0.61 mm)) with white metal bezel (nominal thickness is 0.16 inches (4 mm)), and decorative metal fasteners.

* + - 1. Delivery Zone Options

\*\* NOTE TO SPECIFIER \*\* Select from the following Delivery Zone Options if required. Delete those not required.

* + - * 1. Local Dimmer Control utilizing a butterfly baffle design of Spectralight Infinity reflective material to minimize shadowing when in use: Provided with dimmer switch and cable.

Daylight Dimmer: Type D Electro-mechanically actuated daylight valve; for universal input voltages ranging between 90 and 277 V at 50 or 60 Hz; maximum current draw of 50 ma per unit; controlled by low voltage, series Type T02. Provided with dimmer switch and cable.

* + - * 1. Lighting Fixture: Bracket mounted inside system just above diffuser; UL and CSA Listed.

\*\* NOTE TO SPECIFIER \*\* Delete one of the following two paragraphs. Note that lamps are not provided with fixture.

Universal: Type INC, for two 23 W maximum CFL, maximum total length 4-3/4 inch, ceramic screw-in lamp holder, medium base, two lamps.

Compact Fluorescent: Type CFL, dedicated compact fluorescent fixture, for one 26 W, 4-pin lamp.

Electrical Requirements: 110 V, 15 amp GFCI circuit for damp and wet conditions.

\*\* NOTE TO SPECIFIER \*\* Exhaust Fan can be selected only when Round Diffuser/Decorative Fixtures are used.

Exhaust Fan: Type VEN, permanently lubricated in-line fan motor, 110 cfm (52 L/s) capacity.

Exhaust Duct: Flexible, Class 1, in accordance with UL 181. Provide as specified in Section 23 31 00 - HVAC Ducts and Casings.

Air Intake trim: Injection molded impact resistance acrylic with trim to fit installation conditions.

\*\* NOTE TO SPECIFIER \*\* Vent cap is optional, delete if not required. Exhaust duct is not supplied by Solatube.

Exhaust Vent Cap: Type RV, low-profile roof cap.

\*\* NOTE TO SPECIFIER \*\* Delete one of the following two paragraphs.

Electrical Requirements: 115 V; install fan on same switch as internal light fixture.

Electrical Requirements: 115 V; wall switch.

\*\* NOTE TO SPECIFIER \*\* The following Accessories are optional. Select those required and delete those not required.

* + - 1. Accessories
         1. Switch: Type SW, Manufacturer-specific low voltage DC DP/DT switch (white) required to operate Daylight Dimmer. Note: A maximum of 10 units can be connected to one switch. For use with Daylight Dimmer, Type D, only.
         2. Cable: Type CA, Two conductor, 22 gauge, low voltage cable (500 ft.) for multiple unit DC connections. For use with Daylight Dimmer, Type D, only when aggregate circuit runs do not exceed 200 feet (60.96 m).

\*\* NOTE TO SPECIFIER \*\* Solatube Smart LED System used for daylighting systems with suspended or hard ceilings. Tubular daylighting device with LED Fixture, consists of roof dome, reflective tube, integrated Smart LED fixture, daylight sensing controls, and diffuser/fixture assembly; in a configuration as indicated on the Drawings.

* + 1. Daylighting Device with LED Fixture:
       1. Model:
          1. Solatube Smart LED Daylighting System. AAMA Type TDDCC.
       2. Capture Zone:
          1. Domes:

Roof Dome Assembly: 10 inch (250 mm) transparent, UV and impact resistant dome with flashing base supporting dome and top of tube.

\*\* NOTE TO SPECIFIER \*\* Select one of the following two dome paragraphs as required. Delete the paragraph not required. Acrylic Shock Inner Dome meets Florida Building Code High Velocity Wind Zone and Texas Department of Insurance Impact Resistant zone requirements. Use Shock Inner Domes only in high velocity wind zones.

Outer Dome Glazing: Type DU 0.125 inch (3 mm) minimum thickness injection molded acrylic classified as CC1 material; UV inhibiting (100 percent UV C, 100 percent UV B and 98.5 percent UV A), impact modified acrylic blend.

Raybender 3000: Variable prism optic molded into outer dome to capture low angle sunlight and limit high angle sunlight.

\*\* NOTE TO SPECIFIER \*\* Select the following paragraph if required. Delete if not required. Acrylic Shock Inner Dome meets Florida Building Code High Velocity Wind Zone and Texas Department of Insurance Impact Resistant zone requirements. Use Shock Inner Domes only in high velocity wind zones.

Acrylic Dome Plus Shock Inner Dome Glazing: Type DUI, Inner Dome is 0.115 inch (2.9 mm) minimum thickness classified as CC1 material. High impact injection molded acrylic required for high velocity wind zones.

LightTracker Reflector: Aluminum sheet, thickness 0.015 inch (0.4 mm) with Spectralight Infinity. Positioned in dome to capture low angle sunlight.

Tube Ring: Attached to top of base section; 0.090 inch (2.3 mm) nominal thickness injection molded high impact acrylic; to prevent thermal bridging between base flashing and tubing and channel condensed moisture out of tubing.

Dome Seal: Polyethylene foam seal, black, 0.13 inch (3.2 mm) thick by 14.62 (371 mm) diameter, 2 PCF polyethylene foam.

* + - * 1. Dome Options:

\*\* NOTE TO SPECIFIER \*\* Select the dome options required from the following paragraphs and delete those not required.

Dome Edge Protection Band: Type PB, for fire rated Class A, B or C roof applications. Aluminized steel nominal thickness of 0.028 inches (0.7 mm).

* + - * 1. Flashings:

Roof Flashing Base:

One Piece: One piece, seamless, leak-proof flashing functioning as base support for dome and top of tube. Sheet steel, corrosion resistant conforming to ASTM A 653/A 653M or ASTM A 463/A 463M or ASTM A 792/A 792M, 0.028 inch (0.7 mm) plus or minus .006 inch (.015 mm) thick.

\*\* NOTE TO SPECIFIER \*\* Select one of the following flashing paragraphs and delete those not required. Steel bases are available both flat and pitched. For a different roof slope use the base that is the closest fit but be aware that the skylight dome will not be mounted precisely level. Curb cap is normally used only on metal roofs or other roofs where curb is preferred and provided by others.

Base Flat: Flat Type F4, no pitch 4 inches (102 mm) high.

Base Flat: Flat Type F6, no pitch 6 inches (152 mm) high.

Base Pitched: Pitched Type FP, 22.5 degrees slope from horizontal, 4 inches (102 mm) high.

Tile Roof No Pitch: No Pitch Type FT, 4 inches (102 mm) high. Tile Roof Counter-Flashing: corrugated aluminum 1100-0, 0.020 inch (.508 mm).

Tile Roof Pitched: Pitched Type FPT, 22.5 degrees slope from horizontal, 4 inches (102 mm) high. Tile Roof Counter-Flashing: corrugated aluminum 1100-0, 0.020 inch (.508 mm).

\*\* NOTE TO SPECIFIER \*\* The following flashing paragraphs are optional. Select those required and delete those not required. Flashing insulator is intended to seal the roof opening and prevent condensation forming on the flashing interior from exposure to humid air in unventilated spaces. Metal roof flashing kit is available for sealing base flat or pitched flashing specified above.

Flashing Options:

Flashing Insulator: Type FI, thermal isolation material for use under flashing.

Metal Roof Flashing Kit: Type MR, includes Butyl tape, flashing screws, speed nuts, corner washers and polyurethane sealant.

\*\* NOTE TO SPECIFIER \*\* Select turret extension paragraphs as required. If more than one size is required indicate requirements on the Drawings. Roof Flashing Turret Extension used to raise the height of the dome above roof level. This extends the height of the turret found on the curb cap or self flashing. Must order additional tubing to include the added height of turret.

Roof Flashing Turret Extensions: Provide manufacturer's standard extension tubes for applications requiring:

\*\* NOTE TO SPECIFIER \*\* Select one or more of the following turret extension paragraphs and delete those not required.

Type T2, Additional lengths of 2 inches (50 mm) extension.

Type T4, Additional lengths of 4 inches (100 mm) extension.

Type T12, Additional lengths of 12 inches (300 mm) extension.

Type T24, Additional lengths of 24 inches (600 mm) extension.

Type T36, Additional lengths of 36 inches (900 mm) extension.

Type T48, Additional lengths of 48 inches (1200 mm) extension.

* + - 1. Transfer Zone:
         1. Extension Tubes: Aluminum sheet, thickness 0.015 inch (0.4 mm).

\*\* NOTE TO SPECIFIER \*\* Indicate the total length of run on the Drawings. Note that at least one extension tube is required for diffuser mounting. Top and Bottom 30-degree Angle Tubes are provided standard with Brighten Up Series. Standard Type EXX reflective extension tubes are 24 inches (610 mm) in overall length.

Reflective Tubes:

Reflective extension tube, Type EXX with total length of run as indicated on the Drawings.

Interior Finish: Spectralight Infinity with INFRAREDuction Technology combining ultra-high Visible Light reflectance with Ultra-low Infrared (IR) reflectance.

Extension Tube Options

\*\* NOTE TO SPECIFIER \*\* Select the following optional Extension Tube and Angle Adapters as required. Delete options not required. Note that at least one 24 inch extension tube is required for diffuser.

Extension Tube Angle Adapter: Provide manufacturer's standard adapters for applications requiring:

Type A1, one 0 to 90 degree extension tube angle adapter.

Type A2, two 0 to 90 degree extension tube angle adapters.

Severe Climate Glazing: Type SCG, PET GAG plastic glazing to minimize potential for condensation and heat loss. Nominal thickness 0.039 inches (0.99 mm).

Wire Suspension Kit: Type E, Use the wire suspension kit when additional bracing to the structure is required.

* + - 1. Delivery Zone:
         1. Smart LED Amplifier:

\*\* NOTE TO SPECIFIER \*\* Select the following Smart LED Amplifier paragraph if required and delete if not required.

Solatube IC-rated Smart LED Primary Fixture: Type 430P LED Light Fixture, 14 inch diameter (350 mm). UL and CSA Listed.

Amplifier Housing: Injection molded polycarbonate housing with minimum thickness of 0.078 inches (2 mm), overall outer diameter of 16.33 inches (415 mm) tapering to an outer diameter of 9.84 inches (250 mm) and 8.26 inches (210 mm) tall. Housing includes an integrated ceiling ring with nominal thickness of 0.110 inches (2.8 mm).

Ceiling Ring Seal: Polyethylene foam seal, white, 0.25 inch (6.4 mm) wide by 0.19 inch (4.8 mm) high, 2 PCF polyethylene foam with low-tack pressure sensitive adhesive.

Amplifier: One piece of Spectralight specular, enhanced aluminum consisting of 16 facets with a minimum thickness of 0.015 inches (0.39 mm), mechanically secured to inside of housing.

Amplifier/Heat Sync system maintains LED junction temperature < 92 degrees C at Attic Ambient < 50 degrees C.

Daylight Sensor: Factory set photo cell offers continuous LED ON/OFF modulation according to daylight intensity.

Light Optimizing Lens: Fresnel lens technology redirects both solar and electric light down to diffuser assembly. Minimum 0.031 inches (0.8 mm) thick.

Light Emitting Diodes (LED): Four 3000K high efficacy emitters at a CRI = 80. Color variation is maintained within 4-step MacAdam Ellipse. LED are bonded to amplifier/heat-sink with thermal transfer adhesive and mechanically secured to amplifier with fasteners concealed under amplifier housing.

Driver: Type 120, UL and CSA Listed. Universal input values ranging between100 and 240V input at 50-60Hz. Rated output power 32 watts. Mounted remote from luminaire and enclosed in junction box assembly.

Dedicated cable connects Driver to Primary Smart LED Amplifier Controller through unique 2-pin polarized plug connector.

Cable Length 4 feet (1220 mm) from driver to Smart LED primary luminaire.

\*\* NOTE TO SPECIFIER \*\* Select the following Secondary Fixture as an addition to the Smart LED Amplifier and delete the if not required.

Solatube IC-rated Smart LED Secondary Fixture: Type 430S LED Light Fixture, 14 inch diameter (350 mm). Must be used in conjunction with Type: 430P (Primary unit). UL and CSA Listed.

Amplifier Housing: Injection molded polycarbonate housing with minimum thickness of 0.078 inches (2 mm), overall outer diameter of 16.33 inches (415 mm) tapering to an outer diameter of 9.84 inches (250 mm) and 8.26 inches (210 mm) tall. Housing includes an integrated ceiling mounting ring with nominal thickness of 0.110 inches (2.8 mm).

Ceiling Ring Seal: Polyethylene foam seal, white, 0.25 inch (6.4 mm) wide by 0.19 inch (4.8 mm) high, 2 PCF polyethylene foam with low-tack pressure sensitive adhesive.

Amplifier: One piece of Spectralight Specular enhanced aluminum consisting of sixteen (16) facets with a minimum thickness of 0.015 inches (0.39 mm), mechanically secured to inside of housing.

Amplifier/Heat Sync system maintains LED junction temperature < 92 degrees C at Attic Ambient < 50 degrees C.

Daylight Sensor: Factory set photo cell offers continuous LED ON/OFF modulation according to daylight intensity.

Light Optimizing Lens: Fresnel lens technology redirects both solar and electric light down to diffuser assembly. Minimum 0.031 inches (0.8 mm) thick.

Light Emitting Diodes (LED): Four 3000K high efficacy emitters at a CRI = 80. Color variation is maintained within 4-step MacAdam Ellipse. LED are bonded to amplifier/heat-sink with thermal transfer adhesive and mechanically secured to amplifier with fasteners concealed under amplifier housing.

Dedicated cable connects Secondary Smart LED Unit to Primary Unit through unique 2-Pin polarized plug connector. Cable length 15 feet (4572 mm).

* + - * 1. Diffusers/Decorative Fixtures: Dual Glazed Diffuser Assembly.

Upper glazing: PET GAG plastic with EPDM low density sponge seal to minimize condensation and bug, dirt, and air infiltration per ASTM E283. The nominal thickness is 0.039 inches (0.99 mm).

\*\* NOTE TO SPECIFIER \*\* Select one of the following effect lens and delete those not required. The Natural Effect Lens provides brilliant white natural daylight. The Softening Effect Lens creates a subtle, softer natural lighting effect.

Natural Effect Lens: Type LN.

Softening Effect Lens: Type LS.

Warm Effect Lens: Type LW.

Warm Softening Effect Lens: Type LWS.

\*\* NOTE TO SPECIFIER \*\* Select one of the following Diffuser Assembly paragraphs and delete the paragraphs not required.

Lower glazing with integral injection molded acrylic Dress Ring classified as CC2 material. Nominal thickness is 0.110 inches (2.8 mm)

\*\* NOTE TO SPECIFIER \*\* Select one of the following lower glazing diffuser or decorative fixture lens paragraphs and delete those not required.

Classic Vusion Diffuser: Type L4, molded acrylic plastic classified as CC2 material (nominal thickness 0.090 inches (2.29 mm) with injection molded acrylic Diffuser Trim Ring.

Classic OptiView (Fresnel Lens) Diffuser: Type L1, molded polycarbonate plastic classified as CC1 material, nominal thickness 0.022 inches (0.61 mm) with injection molded acrylic Diffuser Trim Ring.

JustFrost Decorative Fixture: Type L9, frosted acrylic plastic lens classified as CC2 material (nominal thickness is 0.16 inches (4 mm)), and decorative metal fasteners.

TierDrop Decorative Fixture: Type L10, frosted acrylic plastic lens classified as CC2 material (nominal thickness is 0.16 inches (4 mm)). Bottom layer is continuous with two stepped full-tempered glass rings on top and decorative metal fasteners.

OptiView Decorative Fixture: Type L11, molded polycarbonate plastic Fresnel Lens classified as CC1 material (nominal thickness is 0.022 inches (0.61 mm)) with full-tempered frosted glass bezel (nominal thickness is 0.16 inches (4 mm)), and decorative metal fasteners.

VividShade Decorative Fixture: Type L12, frosted acrylic plastic lens classified as CC2 material (nominal thickness is 0.16 inches (4 mm)), integral flame retardant linen shade with translucent frosted PVC inner liner, nominal thickness 0.16 inches (0.4mm); decorative zinc plated steel (concealed) and stainless steel (exposed) fasteners.

Lower decorative glazing with integral 2-piece aluminum/zinc alloy coated steel Fixture Mounting Ring, 23 gauge; nominal thickness 0.031inches (0.787 mm):

AuroraGlo Decorative Fixture: Type L16, Glass Bowl acid etched lens, with two-tone black/bronze painted decorative metal trim ring. Low profile.

AuroraGlo Decorative Fixture: Type L15, Glass Bowl acid etched lens, with white painted decorative metal trim ring. Low profile.

* + - * 1. Deliver Zone Options:

\*\* NOTE TO SPECIFIER \*\* Select one or more of the following Delivery Zone Options if required. Delete entirely not required.

Occupancy Sensor: Type: OC, rated for 5 volts. Current Consumption 170 &#181;A, Service Temperature minus 4 degrees F to 140 degrees F (minus 20 degrees C to 60 degrees C), detection range: 16.4 feet (5000 mm), included viewing angle 82 degrees to 92 degrees, temperature difference between target and surroundings should be > 7.2 degrees F (4 degrees C).

Local Dimmer Control utilizing a butterfly baffle design of Spectralight Infinity reflective material to minimize shadowing when in use: Provided with dimmer switch and cable.

Daylight Dimmer: Type D Electro-mechanically actuated daylight valve; for universal input voltages ranging between 90 and 277 V at 50 or 60 Hz; maximum current draw of 50 ma per unit; controlled by low voltage, series Type T02.

\*\* NOTE TO SPECIFIER \*\* The following Options/Accessories are optional. Select those required and delete those not required.

* + - 1. Accessories
         1. Switch: Type SW, Manufacturer-specific low voltage DC DP/DT switch (white) required to operate Daylight Dimmer. Note: A maximum of 10 units can be connected to one switch. For use with Daylight Dimmer, Type D, only.
         2. Cable: Type CA, Two conductor, 22 gauge, low voltage cable (500 ft.) for multiple unit DC connections. For use with Daylight Dimmer, Type D, only when aggregate circuit runs do not exceed 200 feet (60.96 m).
  1. ACCESSORIES
     1. Fasteners: Same material as metals being fastened, non-magnetic steel, non-corrosive metal of type recommended by manufacturer, or injection molded nylon.
     2. Suspension Wire: Steel, annealed, galvanized finish, size and type for application and ceiling system requirement.
     3. Sealant: Polyurethane or copolymer based elastomeric sealant as provided or recommended by manufacturer.

1. EXECUTION
   1. EXAMINATION
      1. Do not begin installation until substrates have been properly prepared.
      2. Examine openings, substrates, structural support, anchorage, and conditions for compliance with requirements for installation tolerances and other conditions.
      3. If substrate and rough opening preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
   2. PREPARATION
      1. Clean surfaces thoroughly prior to installation.
      2. Coordinate requirements for power supply, conduit and wiring.
      3. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
   3. INSTALLATION
      1. Install in accordance with manufacturer's printed instructions.
      2. 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.
      3. 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
      4. Align device free of warp or twist, maintain dimensional tolerances.
      5. 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.
      6. Inspect installation to verify secure and proper mounting. Test each fixture to verify operation, control functions, and performance. Correct deficiencies.
   4. CLEANING
      1. 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.
   5. PROTECTION
      1. Protect installed products until completion of project.
      2. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION