

VELUX America Inc.
SPECIFICATION FOR MODEL TGR/TGF and TMR/TMF
FLEXIBLE/RIGID SUN TUNNEL

SECTION 08625
TUBULAR DAYLIGHTING DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

Engineered tubular daylighting system (VELUX SUN TUNNEL™) consisting of an exterior pitched or low profile roof flashing for installation in shingles/wooden shakes/tile roofs with an acrylic or polycarbonate dome. A self aligning pivoting device and an interior ceiling ring with dual diffuser assembly are joined by 14/21-inch nominal flexible reflective tunnel or 10/14-inch nominal rigid reflective tunnel. A ZTL electric light fixture accessory is needed to provide artificial lighting at night for all sizes. A ZTM and ZTG tile accessory kit is available for tile roofing applications.

1.02 Related Sections

- A. Section 01352 – LEED Requirements
- B. Section 01524 – Construction Waste Management
- C. Section 07311 - Asphalt Shingles: Flashing of skylight base.
- D. Section 07320 - Roof Tiles: Flashing of skylight base.
- E. Section 07720 – Roof Accessories: Skylight Curb
- F. Section 08620 - Unit Skylights: (Skylights without reflective tube.)
- G. Section 08630 - Metal Framed Skylights.

1.03 REFERENCE STANDARDS

- A. AAMA/WDMA/CSA 101/I.S.2/A440-08 – North American Fenestration Standard/Specification for windows, doors, and skylights (Includes all applicable reference standards).
- B. AAMA/WDMA/CSA 101/I.S.2/A440-05 – Standard/Specification for windows, doors, and unit skylights (Includes all applicable reference standards).
- C. ASTM D 635 – Test Method for Rate of Burning and/or Extent of Time of Burning of Self-supporting plastics in a Horizontal Position.
- D. ASTM D-1929 – Standard Test Method for Ignition Properties of Plastics.
- E. ASTM D 2843– Standard Test Method for Density of Smoke from the Burning or Decomposition of Plastics
- F. ASTM E 84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
- G. ASTM E 108 - Standard Test Methods for Fire Tests of Roof Coverings
- H. ASTM E 283 –Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors.
- I. ASTM E 330 – Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.

- L. ASTM E 331 – Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors and Curtain Walls by Static Air Pressure Difference.
- M. ASTM E 547 – Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors and Curtain Walls by Cyclic Static Air Pressure Difference.
- N. ASTM E 1886 - Standard Test Method for Performance of Exterior Window, Curtain Walls, Doors, and Storm Shutters Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials.
- O. ASTM E 1996 - Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Storm Shutters Impacted by Windborne Debris in Hurricanes.
- P. ISO 9001 – Standardized Requirements for a Quality Management System
- Q. ISO 14001 certified – Standardized Requirements for Environmental Management Systems

Thermal

- A. NFRC 100, Procedure for Determining Fenestration Product U-factors
- B. NFRC 200, Procedure for Determining Fenestration Product Solar Heat Gain Coefficient at Normal Incidence

1.03 QUALITY ASSURANCE

- A. Tubular daylighting device (VELUX SUN TUNNEL™) with exterior roof flashing, exterior dome, intermediate tunnel pivoting device, diffuser, reflective tunnel, adjustable elbow (TGR/TMR) and components required for a complete and weatherproof installation shall be manufactured to the highest standards of quality and craftsmanship in accordance with VELUX Manufacturing Standards and ISO 9001 and 14001.

1.04 SYSTEM DESCRIPTION

- A. Exterior Dome: 0.125-inch thick injection molded acrylic or polycarbonate
- B. Flashing System: Low profile TGF/TGR is a one piece 25 gauge, G90 galvanized sheet steel flashing that projects 4 inches above the roof deck for the 14 and 21-inch flashings. Pitched TMF/TMR is a one-piece 25 gauge, G90 galvanized sheet steel pitched flashing that projects 2.875-inches high on the backside and 10.5-inches on the front side above the roof deck for the 10 and 14-inch flashings.
- C. Pivot/Intermediate rings: Pivoting socket joint which secures upper elbow, allows for an additional 11 degrees of adjustability to help align tunnel sections, and provides a thermal break between the flashing and the dome and between the tunnel and the dome.

- D. Condensation control: Integral internal condensation collection gutter and drainage slots
- E. Insect Barrier/Dome Seal – polyurethane foam between the dome and the intermediate ring.
- F. Rigid tunnel: 10-inch and 14-inch nominal outside diameters, 2-feet in length, 24 gauge thickness, 98% specular reflective silver coated aluminum with a 20 year warranty.
- G. Rigid elbows : 45 degree adjustable for 10 and 14-inch nominal outside diameters, 24 gauge thickness, 98% specular reflective silver coated aluminum with a 20 year warranty.
- H. Flexible Tunnel: 14 and 21-inch nominal outside diameters with metalized polyester, fiberglass scrim and spring steel wire. 14” and 22” nominal outside diameters, 8-feet in length for the TMF/TGF 014 and 6-feet in length for the TGF 021
- I. Round ceiling ring: A round diffuser assembly with a paintable acrylic trim ring and mounting ring.
- J. Diffuser: Frosted(standard) or prismatic(optional) lower acrylic diffuser and a crackled clear upper acrylic diffuser. The two diffusers are secured in a santoprene gasketing system that provides an air tight seal with a 0.5-inch air space separating the upper and lower diffusers.

1.05 ACCESSORIES

- A. Electric light kit: ZTL 114 for SUN TUNNEL sizes 010 and 014 and ZTL 122 for Sun Tunnel sizes 021 and 022. The following lamps sizes are recommended for the ZTL in different VELUX SUN TUNNEL sizes:
 - i. 10-inch tunnel: R20 50 watt max Daylight bulb or R30 15 watt compact fluorescent flood
 - ii. 14-inch tunnel: R20 75 watt max Daylight bulb or R30 18 watt compact fluorescent flood
 - iii. 22-inch tunnel: Par 2 18 watt fluorescent bulb
- B. ZTG/ZTM Tile Accessory kit to be used with VELUX SUN TUNNELS to enable a water tight installation with tile or thick roofing materials. The ZTM 010 and ZTM 014 options consist of a 0.02-inch zero-temper aluminum sheet with a 5-inch or 7.5-inch turret and will be used with the standard TMR 010, TMR 014, and the TMF 014 SUN TUNNELS. The ZTG 022 option consists of a 0.02-inch zero-temper aluminum sheet with a 1.25-inch circular up stand to be used with the standard TGF 022 SUN TUNNELS.
- C. ZTA turret extenders, to be used in areas where the domes need to be elevated and additional 6.5-inches or 9-inches. Turret extenders available for all sizes
- D. ZZZ 192 fire ring in nine different sizes for VELUX SUN TUNNELS with and without turrets

1.05 PERFORMANCE REQUIREMENTS

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- A. Models TMF/TMR and TGF/TGR VELUX SUN TUNNELS with acrylic and polycarbonate domes tested to meet or exceed the provisions of AAMA/WDMA/CSA 101/I.S.2/A440-08 and AAMA/WDMA/CSA 101/I.S.2/A440-05 for air leakage, water infiltration, download pressure and uplift pressure. For download and uplift pressures the products were installed in 0.5-inch (OSB) plywood with ten 1.5-inch self-drilling screws.
- i. Air infiltration: Less than or equal to 0.03 cfm/ft² air infiltration with acrylic dome and less than or equal to 0.02 cfm/ft² air infiltration with polycarbonate dome when tested at a positive of 1.6 psf. Canadian air infiltration/exfiltration level is fixed. Tested and measured in accordance with ASTM E 283.
 - ii. Water infiltration: No water penetration at a test pressure of 12 psf as test and measured in accordance with ASTM E 547
 - iii. Download pressure: Minimum download performance rating of 250 psf as tested and measured in accordance with ASTM E 330, Procedure A
 - iv. Uplift pressure: Tested and measured in accordance with ASTM E 330, Procedure A to achieve a minimum uplift rating of -
 1. 40 psf for acrylic models TGF 021, TGF 014
 2. 125 psf for acrylic models TGR 014, TGR 010
 3. 85 psf for acrylic models TMR 014, TMR 010
 4. 80 psf for acrylic model TMF
 5. 65 psf for polycarbonate models TGF 021, TGF 014
 6. 80 psf for polycarbonate models TGR 014, TGR 010, TMR 014, TMR 010, TMF 014
- B. Hurricane Testing: Models TMF/TMR and TGF/TGR VELUX SUN TUNNELS with polycarbonate domes tested in accordance with ASTM E 1886 and ASTM E 1996. Design pressure rating shall achieve a minimum positive pressure of 50 psf and a minimum negative pressure of 50 psf. Missile impacts shall be a minimum of missile level C for Wind Zone 3.
- C. Fire Testing:
- i. Burning Brand Test: Models TGF/TGR VELUX SUN TUNNELS with acrylic dome, ZZZ 192 fire ring and turret have been tested in accordance to ASTM E 108 to achieve a Class B rating.
 - ii. Rate of Burn Testing: Acrylic domes shall be tested in accordance with ASTM D 625 to achieve a minimum CC2 classification. Polycarbonate domes shall be tested in accordance with ASTM D 635 to achieve a minimum CC1 classification.
 - iii. The acrylic and polycarbonate domes shall have a smoke density rating of less than 75 when tested in accordance with ASTM D 2843 and a self-ignition temperature greater than 650 degrees Fahrenheit when tested in accordance with ASTM D1929.
 - iv. The Smoked Development Index and Flame Spread Index for the diffuser and trim ring shall have a minimum Class C rating when tested in accordance with ASTM E 84.
- E. Thermal Performance:

- i. Models TMF/TMR and TGF/TGR VELUX SUN TUNNELS with acrylic and polycarbonate domes tested in accordance with NFRC Procedure 100 shall have a U-factor no greater than 0.30.
 - ii. Models TMF/TMR and TGF/TGR VELUX SUN TUNNELS with acrylic and polycarbonate domes tested in accordance with NFRC Procedure 200 shall have a Solar Heat Gain Coefficient (SHGC) no greater than 0.30.
- F. Condensation Control: Integral internal condensation collection gutter and drainage slots.

1.06 SUBMITTALS

- A. Manufacturer's unit dimensions, rough opening and finished framing dimensions, affected related work, and installation requirements are shown in manufacturer's installation instructions.
- B. Product Data: For Model TMF/TMR and TGR/TGF VELUX SUN TUNNELS, sizes and glazing options are indicated in manufacturer's printed material.

1.07 DELIVERY, HANDLING, STORAGE

- A. Deliver products in manufacturer's original containers, dry, undamaged, seals and labels intact.
- B. Store and protect products in accordance with manufacturer's recommendations.

PART 2 PRODUCTS

2.01 MANUFACTURER

- A. VELUX America Inc. product Model TMF/TMR and TGF/TGR VELUX SUN TUNNELS with exterior dome, flashing system, reflective aluminum tunnel, ceiling ring and diffuser as specified in this section and as manufactured by VELUX America Inc in the United States of America.

2.02 MATERIALS

- A. Exterior Dome: clear acrylic or polycarbonate (impact), includes UV absorbers to prevent UV transmittance and yellowing
- B. Flashing System: G90 galvanized sheet steel with neutral gray color
- C. Pivot Ring: Black polypropylene
- D. Flexible Tunnel (TGF/TMF): Metalized polyester, fiberglass scrim and spring steel wire, meeting ASTM E84 Class A requirements for smoke development index and flame spread index
- E. Rigid Tunnel, Upper Rigid Elbow, Lower Rigid Elbow (TGR/TMR): Silver coated aluminum
- F. Ceiling Ring: White Acrylonitrile Styrene Acrylate (ASA) plastic

- G. Trim Ring: Paintable white acrylic
- H. Locking Snap Ring: Steel
- I. Diffuser: Dual diffuser system, upper acrylic diffuser over a lower acrylic diffuser secured by a flexible white santoprene gasketing system
- J. Fasteners: Exterior dome to flashing system #8 x 0.75-inch Phillips 18–8 corrosion-resistant screws; Flashing to roof sheeting 1 ½” pan head 18-8 stainless steel screws; Intermediate ring to flashing system #10 x 0.5-inch Phillips Flat head; Tunnel joint screws #6 x 0.375-inch Phillips pan head self drilling.

2.03 COMPONENTS

- A. Dome
- B. Flashing
- C. Pivot Ring
- D. 4-inch aluminum ring (TGF/TMF)
- E. Rigid upper elbow (TGR/TMR)
- F. Flexible tunnel (TGF/TMF)
- G. Rigid tunnel (TGR/TMR)
- H. Lower rigid elbow (TGR/TMR)
- I. 1-inch locking snap ring (TGF/TMF)
- J. Ceiling Ring
- K. Diffusers
- L. Trim ring
- M. Screws
- N. Tape
- O. Pile gasket (TGR/TMR)

2.06 FABRICATION

- A. Finish, fabricate and shop prepare all assemblies under responsibility of the manufacturer.
- B. Fabricate to allow for thermal movement of materials where subject to a temperature differential.
- C. Provisions shall be made to insure against accumulated water in contact with system components.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify rough opening dimensions and proper orientation of tubular daylighting device.

3.02 INSTALLATION

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- A. Install in accordance with manufacturer's installation instructions.
- B. Align tubular daylighting device free of warp or twist, maintain dimensional tolerances.
- C. Apply sealant to the roof deck or bottom side of the flashing prior to Attaching the flashing system to the roof sheathing with the supplied 1 ½" pan head stainless steel screws in the locations of the pre punched holes to accommodate construction tolerances and other irregularities.
- D. Provide thermal isolation when components penetrate or disrupt building insulation. Pack fibrous insulation in ceiling rough opening to maintain continuity of thermal barriers. In Canada secure vapor barrier to the components that penetrate the ceiling.
- E. Coordinate attachment and seal of perimeter air and vapor barrier material.

END OF SECTION