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

TUBULAR DAYLIGHTING DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Production fabricated engineered leak proof tubular daylighting system (VELUX SUN TUNNEL™) consisting of an exterior pitched/low profile roof flashing with a self aligning pivoting device for installation in shingles/wooden shakes/tile roofs with an acrylic/polycarbonate dome, an interior ceiling ring and dual diffuser joined by a flexible/rigid reflective tunnel. A ZTL 114 50 watt light fixture for the TGR/TGF and TMR/TMF 10” or 14” or a ZTL 122 75 Watt light fixture for the TGF 22” low profile is available. A ZTM and ZTG tile accessory kit is needed 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. ANSI 101/I.S.2/NAFS-02 – Voluntary Performance Specification for Windows, Skylights, and Glass Doors (Includes all applicable reference standards).

D. ASTM E 84 – Standard Test Method for Surface Burning Characteristics of Building Materials.

E. ASTM D 635-03 – Test Method for Rate of Burning and/or Extent of Time of Burning of Self-supporting plastics in a Horizontal Position.

F. ASTM D 638-03 – Standard Test Method for Tensile Properties of Plastics.

G. ASTM D-1003 – 00 - Standard Test Method for Haze and Luminous Transmittance of Transparent plastics.

H. ASTM D-1929-96(2001) – Standard Test Method for Ignition Properties of Plastics.

I. ASTM G 155-05a – Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials.

J. ASTM D 2843 – 99(2004) – Standard Test Method for Density of Smoke from the Burning or Decomposition of Plastics

K. ASTM E 330 – Structural Performance of Exterior Windows, Curtain Walls, and Doors

L. ASTM E 108 - Standard Test Methods for Fire Tests of Roof Coverings

M. 29 CFR 1910.23(e)(8) – Occupational Safety and Health Standards for Walking-Working Surfaces to Guard Floor and Wall Openings and Holes.

N. ISO 9001 – Standardized Requirements for a Quality Management System

O. ISO 14001 certified – Standardized Requirements for Environmental Management Systems

P. International Building Code (IBC) – Model building code developed by International Code Council

Q. International Energy Conservation Code (IECC) – Model Energy Building Code

R. International Residential Code (IRC) – Comprehensive Residential Code That Creates Minimum Regulation for One and Two Family Dwellings of Three Stories or Less.

S. ASTM D 790 – Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.

E. ASTM D 1499 – Standard Practice for Filtered Open-Flame Carbon Arc Exposure of Plastics.

F. ASTM D 4803 – Standard Test Method for Predicting Heat Buildup in PVC Building Products.

H. ASTM D 4804 – Standard Test Method for Determining the Flammability Characteristics of Nonrigid Solid Plastics.

I. ASTM E 283 –Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors.

J. 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 G 152 – Standard Practice for Operating Open Flame Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials.

N. ASTM G 1523 – Standard Practice for Operating Enclosed Carbon Arc Lights Apparatus for Exposure of Nonmetallic Materials.

O. ASTM G 155-05a – Standard Practice for Operating Xenon Arc Light Apparatus for Exposure for Nonmetallic Materials.

P. ASTM D 2565 – Standard Practice for Xenon Arc Exposure of Plastics Intended for Outdoor Applications.

Q. ASTM E 1886 – 02 - Standard Test Method for Performance of Exterior Window, Curtain Walls, Doors, and Storm Shutters Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials.

R. ASTM E 1996 – 02 - Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Storm Shutters Impacted by Windborne Debris in Hurricanes.

S. 2003 International Building Code, chapter 8 Interior Finishes, Section 803 wall and Ceiling Finishes; NFPA 5000, Chapter 10 Interior Finish, section 10.3 Interior Wall or Ceiling Finish Testing and Classification

T. ICBO-ES AC 16 – Acceptance Criteria for Plastic Skylights.

U. ICBO-ES AC 79 – Acceptance Criteria for Skylights with Plastic Frames.

V. ICBO-ES Evaluation Report – ER-5185

W. Miami-Dade PA TAS 201 – Impact Test Procedures.

X. Miami-Dade PA TAS 202 – Criteria for Testing Impact and Non Impact Resistant Building Envelope Components Using Uniform Static Air Pressure.

Y. Miami-Dade PA TAS 203 – Criteria for Testing Products Subject to Cyclic Wind Pressure Loading.

Z. Underwriter's Laboratories: Luminaries Fittings, UL 1598

AA. UL746C, Polymeric Materials – Use in Electrical Equipment Evaluations, Section 58, Resistance to impact Test.

Thermal

A. NFRC 100, Procedure for Determining Fenestration Product U-factors

B. NFRC 102, Test Procedure for Measuring Steady-State Thermal Transmittance of Fenestration Systems

C. NFRC 200, Procedure for Determining Fenestration Product Solar Heat Gain Coefficient at Normal Incidence

D. NFRC 500, Procedure for Determining Fenestration Product Condensation Resistance Values

Solar

A. NFRC 201, Interim Standard Test Method for Measuring the Solar Heat Gain Coefficient of Fenestration Systems Using Calorimeter Hot Box Methods

1.03 QUALITY ASSURANCE

A. Tubular daylighting device (VELUX SUN TUNNEL™) with exterior roof flashing with intermediate tunnel pivoting device, exterior dome/interior diffuser, reflective tunnel, adjustable elbow 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 that comply with the ICBO ES Acceptance Criteria for Quality Control Manuals.

1.04 SYSTEM DESCRIPTION

A. Exterior Dome: 92% transparent impact resistant acrylic, includes UV absorbers to prevent UV transmittance and yellowing.

B. Flashing System: Low profile TGF/TGR is a Galvalume .023" thick flashing that projects 4 inches above the roof deck for the 10", 14" and 22" flashings. Pitched TMF/TMR is a Galvalume .030" thick pitched flashing that projects 2 7/8" high backside and 10 ½" on front side above the roof deck for the 10" and 14" flashing.

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 diameter, 2-foot 98% super specular reflective silver backed aluminum with a 20 year warranty.

G. Rigid elbows : 45 degree adjustable 10 and 14-inch nominal outside diameter, 98% super specular reflective silver backed aluminum with a 20 year warranty.

H. Flexible Tunnel: Metalized polyester, fiberglass scrim and spring steel wire.

I. Round ceiling ring: A round dual diffuser assembly with a paintable acrylic trim ring and mounting ring.

J. Interior Dual Diffuser: Frosted/prismatic acrylic lower diffuser with a clear acrylic upper. A Santapreme gasket provides the seal and a ½" (14mm) air space separates the two diffusers.

1.05 ACCESSORIES

A. Electric light kit: ZTL 102 for Sun Tunnel size 010 and 014 and ZTL 103 for Sun Tunnel size 022, fixture fitting for VELUX SUN TUNNELS with the following recommended lamps: 010 10" diameter R20 50 watt max Daylight bulb or R30 15 watt compact florescent flood, 014 14" R20 75 watt max Daylight bulb or R30 18 watt compact florescent flood, 022 22" diameter used a Par 2 18 watt florescent bulb, UL #227928.

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 0 – Temper aluminum sheet with a 5-inch or 8.5-inch turret and will be used with the standard TMR 010, TMR 014, and the TMF 010. The ZTG 022 option consists of a 0.02 inch 0 – Temper aluminum sheet with a 1 ¼" circular up stand will be used with the standard TGF 022.

C. ZTA turret extenders, to be used in areas where the domes need to be elevated and additional 6.5" or 9". Available for all sizes

D. ZZZ 192 fire ring in nine different sizes. For the 010, 014, and 022 VELUX SUN TUNNELS with and without turrets

1.05 PERFORMANCE REQUIREMENTS

A. Model TMF/TMR and TGF/TGR VELUX SUN TUNNELS with acrylic or polycarbonate domes to withstand dead and live loads caused by pressure and uplift of wind acting normal to plane of roof as tested in accordance with National Evaluation Services, Inc. to a download pressure of +19,140 Pa (400.00 psf) and an uplift pressure of -6240 Pa (130.41 psf) for the TGF/TGR with an acrylic or polycarbonate dome or a download pressure of +21,120 Pa (441.38 psf) and an uplift pressure of -10,080 Pa (210.66 psf) for the TMF/TMR with an acrylic or polycarbonate dome and measured in accordance with ANSI/ASTM E 330, AAMA/WDMA/CSA 101/I.S.2/A440-05 and 101/I.S.2/NAFS-02 while the products were installed in ½" (OSB) plywood with 10 1 ½" pan head self-drilling screws.

B. Configuration: Fixed.

C. Model TMF/TMR and TGF/TGR VELUX SUN TUNNELS meets or exceeds the performance levels specified in AAMA/WDMA/CSA 101/I.S.2/A440-05 and 101/I.S.2/NAFS-02 for air leakage resistance.

D. Infiltration and Infiltrations Air leakage through assembly limited to <0.05 $L/s/m^2$ (<0.01 cfm/ft^2) for the TMF/TMR with an acrylic/polycarbonate dome,

measured at a reference differential pressure across assembly of 75 Pa (1.57 psf) as measured in accordance with AAMA/WDMA/1600/IS7, ANSI/ASTM E 283 and 101/I.S.2/NAFS-02 North American Fenestration Standard.

E. Water infiltration: No water penetration noted when measured in accordance with AAMA/WDMA/CSA 101/I.S.2/A440-05, ANSI/ASTM E 331, and 101/I.S.2/NAFS-02 North American Fenestration Standard with a test pressure differential of 720 Pa(15.0 psf).

E. 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 and interior diffuser as specified in this section and as manufactured by VELUX America Inc.

2.02 MATERIALS

A. Exterior Dome: Plexiglass, MC Grade A, acrylic or polycarbonate (for impact), 3.25 mm thick (0.125 inch), injection molded. Maximum positive load, 3.8 KPa (80 psf), maximum negative load, 3.6 KPa (75 psf).

B. Flashing System: one piece, self-flashing, 0.030” thick Galvalume, aluminized sheet steel.

C. Fasteners: Exterior dome to flashing system #8 x ¾" Philips 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 ½" Phillips Flat head, Tunnel joint screws #6 x 3/8" Phillips pan head self drilling.

D. Flexible Tunnel: Metalized polyester, fiberglass scrim and spring steel wire. 14" and 22" nominal outside diameters, 8 foot in length for the TMF/TGF 014 and 6 foot in length for the TGF 022 meeting the requirements of ASTM E84-03a and UL 746C Standard for Safety for Polymeric Material.

E. Rigid Tunnel: Coated aluminum, 0.51 mm (0.020 inches) thick, 98% total reflectance.

F. Interior Diffuser: Dual diffuser system, Clear acrylic diffuser over a standard frosted lower diffuser jointed by a flexible gasketing system that maintains a ¾" air gap between the diffusers. An optional K-12 clear prismatic acrylic is also an option for the lower diffuser/

2.03 COMPONENTS

A. Flashing: Galvalume, aluminized 0.030 sheet.

B. Ceiling ring and trim ring, material is Acrylic

C. Dual diffuser Ceiling ring gasket: flexible Santapreme (TPE)

D. Spring snap-rings: stainless steel, 1".

E. Fasteners: Exterior dome to flashing system #8 x ¾" Philips with washer 18–8 corrosion-resistant screws, Flashing to roof sheeting 1 ½" pan head stainless steel screws, Intermediate ring to flashing system #10 x ½" Phillips Flat head, Tunnel joint screws #6 x 3/8" Phillips pan head self drilling.

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

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.