Product Evaluation Report

Date:	August 2, 2023
PTC Report No.:	2397-PER
Report Revision No.:	4
PTC Project No.:	422-0615
Product Mfg.:	Solatube International, Inc. 2210 Oak Ridge Way Vista, CA 92081
Product Name:	Solatube M74 DS Curb Mount TDD with Amplifier - Dual Glazed Solatube M74 DS Curb Mount TDD with Amplifier - Single Glazed
Product Category:	Sky Lights
Product Sub-Category:	Skylight
Compliance Method:	Product Approval Rule 61G20-3.005 (1)(d) – Product Evaluation Report by a Licensed Professional Engineer
Prepared By:	Robert J. Amoruso, P.E. Florida P.E. License Number 49752 PTC Product Design Group, LLC FBPE Certification of Authorization No. 25935

CERTIFICATE OF INDEPENDENCE

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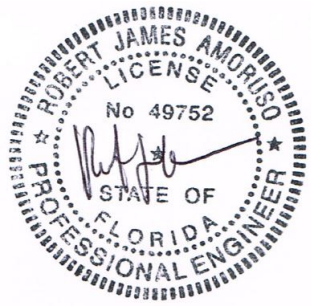

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Evaluated by:
Robert J. Amoruso, P.E.
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Project Scope

Evaluate Solatube M74 DS Curb Mount TDD with Amplifier - Dual Glazed for conformance to the 8th Edition (2023) Florida Building Code – Building and Residential Volumes including the High Velocity Hurricane Zone (HVHZ) and Solatube M74 DS Curb Mount TDD with Amplifier - Single Glazed Tubular Daylight Devices for conformance to the 8th Edition (2023) Florida Building Code – Building and Residential Volumes including the High Velocity Hurricane Zone (HVHZ).

The engineering analysis (Reference 3.a) determines the anchorage of the product to the supporting substrate and the product evaluation report (this document) summarizes 8th Edition (2023) FBC compliance verification and appropriate Limitations and Conditions of Use.

Description of Product – Installation Requirements

See Reference 1 for a description of the product, its installation and other pertinent data related to its approved use.

Limitations and Conditions of Use

This product evaluation report contains or makes reference to specifications, technical details and installation details and/or methods that pertain to the proper use and/or installation of the product specified herein. Specific limitations and conditions of its use including but not limited to the following are contained in Reference 1 and are the subject of Product Approval in accordance with the State of Florida Product Approval Rule 61G20-3.

- Design Pressure Rating (psf)
- Installation substrate requirements.
- Installation anchor requirements.
- Installation restrictions.
- Product description.
- Product components.

Code Conformance – Performance Testing

Reference 2.a conducted testing to the following standard(s). See Reference 3.b for Code Conformance Evaluation to the 8th Edition (2023) FBC for these testing standards as applicable.

1. AAMA/WDMA/CSA 101/I.S.2/A440-11, North American Fenestration Standard/Specification for windows, doors, and skylights.
2. ASTM E1886-13, 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.
3. ASTM E1996-12, Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors and Storm Shutters Impacted by Windborne Debris in Hurricanes.

4. ASTM E283-04, Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
5. ASTM E330-02, Standard Test Method for Structural Performance of Exterior windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
6. ASTM E547-00, Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Cyclic Static Air Pressure Difference
7. TAS201-94, Impact Test Procedures.
8. TAS202-94, Criteria for Testing Impact & Non-Impact Resistant Building Envelope Components Using Uniform Static Air Pressure.
9. TAS203-94, Criteria for Testing Products Subjected to Cyclic Wind Pressure Loading.

LIGHT AMPLIFIER OPTION VS. OPEN CEILING LIGHT DIFFUSER MODEL TESTED

The Light Amplifier Option shown on M74 DS-O-DP-FC-A-L2-REG and M74 DS-O-DPP-FC-A-L2-REG replaces the Light Diffuser Option of the Open Ceiling model shown on M74 DS-O-DP-FC-B-L2-REG and M74 DS-O-DPP-FC-B-L2-REG.

1. There are no changes to those components making up the roof-top portion of the TDD that comprise the structural, air infiltration and water penetration components that include:
    a. Roof Top portion: Dome, Clamps, Curb Cap, Foam Insulation etc.
    b. Extension Tube
2. Remove Light Diffuser Components:
    a. Light Diffuser, Seal, & Retaining Belt Assembly
3. Add Light Amplifier Components:
    a. Amplifier (Conical Tube Section)
    b. Enlarged Light Diffuser, Enlarged Seal, & Enlarged Retaining Belt Assembly
        i. These new components use material common to the 1st Phase
        ii. The only changes are in the new conical shaped tube section and increased diffuser assembly size.

Because the overall structural components of the TDD as well as the components affecting air infiltration and water penetration remain identical, and because installation requirements have not changed, exiting testing in Reference 2 remains applicable to these models/series.

DESIGN PRESSURE LIMITATIONS

- From Reference 2.a.iv and 2.a.v (air, water and structural) and 2.a.i (impact/cyclic) testing of Solatube M74 DS Curb Mount Open Ceiling TDD - Single and Dual Glazed:
    - Uniform Load Structural Test Pressures where +160/-160 psf.
    - Water Test Pressure of +12.11 psf.
    - Cyclic Wind Loading Pressure of +/-80 psf.
- From Reference 2.a.ii (air, water and structural and impact/cyclic) testing of Solatube M74 DS Curb Mount Open Ceiling TDD – Single and Dual Glazed to HVHZ requirements:

    - Uniform Load Structural Test Pressures where +160/-160 psf.
    - Water Test Pressure of +12 psf.
    - Cyclic Wind Loading Pressure of +/-80 psf.
- Apply the following factors to arrive at Design Pressure:
    - A Safety Factor of 2 applied to the Uniform Load Structural Test Pressures to arrive at Design Pressures of +80/-80 psf.
    - A factor of 1/0.15 = 6.67 applied to the Water Test Pressure arrive at Design Pressure of +80 psf.
- Overall Design Pressure is +/-80 psf.

Code Conformance – Plastics

The 8th Edition (2023) Florida Building Code, Chapter 26 defines requirements for Approved Plastics.

The table below summarizes BOM components and requisite test report/evaluation report/NOA references demonstrating compliance. The tables on the following pages summarize plastics testing results for applicable components. See Reference 3.b for Code Conformance Evaluation to the 8th Edition (2023) FBC for the testing standards mentioned below. BOM Item No. in parenthesis ().

BILL OF MATERIALS					**Plastics Test Report No. (* ASTM E84 or D2843 required for Smoke Density, not both)**					**DWG NO. APPLICABLE, YES/NO**	
ITEM NO.	**PART NUMBER**	**DESCRIPTION**	**QTY.**	**MATERIAL**	**ASTM G155/D638**	**ASTM D635**	**ASTM D1929**	**ASTM E84***	**ASTM D2843***	**M74 DS-O-DPP-FC-A-L2-REG**	**M74 DS-O-DP-FC-A-L2-REG**
1	*508005*	*OUTER DOME M74 DS*	*1*	*Plaskolite / TUFFAK SL*	*TUFFAK NOA*	*ICC-ES ESR-2728 and TUFFAK NOA*	*ICC-ES ESR-2728 and TUFFAK NOA*	*NA*	*ICC-ES ESR-2728 and TUFFAK NOA*	*YES*	*YES*
2	*510510*	*INNER THERMAL DISC M74 DS*	*1*	*Eastman / Spectar*	*NA*	*ICC-ES ESR-1407*	*ICC-ES ESR-1407*	*NA*	*ICC-ES ESR-1407*	*YES*	*NO*
				Plaskolite / Vivak	*NA*	*QAI Laboratories No. TJ1009-3*	*QAI Laboratories No. RJ2298F-1*	*NA*	*QAI Laboratories No. TJ1009-2*		
14	*500375*	*INSULATION SECTION, RIGID*	*4*	*R-Max / TSX-8500*	*NA*	*NA*	*NA*	*ICC-ES ESR-1864*	*NA*	*YES*	*YES*
				DOW / Thermax Sheathing	*NA*	*NA*	*NA*	*ICC-ES ESR-1659*	*NA*	*YES*	*YES*
26	*420986*	*DIFFUSER M74 DS AMP. PRISMATIC PANEL*	*1*	*Plaskolite / Optix*	*NA*	*ICC-ES RE-2590*	*ICC-ES RE-2590*	*NA*	*ICC-ES RE-2590*	*YES*	*YES*

(1) OUTER DOME M74 DS – Plaskolite / TUFFAK SL					
Attribute	**Report Reference**	**ASTM**	**Result**	**Acceptance Criteria**	
Outdoor Exposure	TUFFAK NOA	ASTM G155 and D638	1%	+/- 10% difference in tensile strength	
Rate of Burning	ICC-ES ESR-2728 and TUFFAK NOA	ASTM D635	CC1	CC1 or CC2	
Self-Ignition Temperature		ASTM D1929	Met per ICC-ES ESR-2728 and 1022°F (NOA)	≥ 650°F	
Smoke Density		ASTM D2843	Met per ICC-ES ESR-2728 and 57.7 % (NOA)	≤ 75	
Conclusion: ACCEPTABLE ICC-ES ESR-2728 confirms acceptance to the IBC, Section 2606 which requires the same Acceptance Criteria as the 8th Edition (2023) FBC, Chapter 26. TUFFAK NOA confirms testing meets 8th Edition (2023) Florida Building Code.					

(2) INNER THERMAL DISC 640DS - Eastman / Spectar					
Attribute	**Report Reference**	**ASTM (per 2006 ICC)**	**Result**	**Acceptance Criteria**	
Rate of Burning	ICC-ES ESR-1407	ASTM D635-03	CC1	CC1 or CC2	
Self-Ignition Temperature	ICC-ES ESR-1407	ASTM D1929-96(2001)e1	Met per ICC-ES ESR-1407	≥ 650°F	
Smoke Density	ICC-ES ESR-1407	ASTM D2843-99(2004)	Met per ICC-ES ESR-1407	≤ 75	
Conclusion: ACCEPTABLE ICC-ES ESR-1407 confirms acceptance to the IBC, Section 2606 which requires the same Acceptance Criteria as the 8th Edition (2023) FBC, Chapter 26.					

(2) INNER THERMAL DISC 640DS - Plaskolite / Vivak					
Attribute	**Report Reference**	**ASTM**	**Result**	**Acceptance Criteria**	
Rate of Burning	QAI Laboratories No. TJ1009-3	ASTM D635-06	CC1	CC1 or CC2	
Self-Ignition Temperature	QAI Laboratories No. RJ2298F-1	ASTM D1929-12	880°F	≥ 650°F	
Smoke Density	QAI Laboratories No. TJ1009-2	ASTM D2843-10	68%	≤ 75	
Conclusion: ACCEPTABLE					

(14) INSULATION SECTION, RIGID - R-Max / TSX-8500					
Attribute	**Report Reference**	**ASTM (per 2006 ICC)**	**Result**	**Acceptance Criteria**	
Smoke Developed Index	ICC-ES ESR-1864	ASTM E84-04	<450	≤ 450	
Flame Spread Index			<25	≤ 75	
Conclusion: ACCEPTABLE ICC-ES ESR-1864 confirms acceptance to the IBC, Section 2603 which requires the same Acceptance Criteria as the 8th Edition (2023) FBC, Chapter 26.					

(14) INSULATION SECTION, RIGID - DOW / Thermax Sheathing					
Attribute	**Report Reference**	**ASTM (per 2006 ICC)**	**Result**	**Acceptance Criteria**	
Smoke Developed Index	ICC-ES ESR-1659	ASTM E84-04	<450	≤ 450	
Flame Spread Index			<25	≤ 75	
Conclusion: ACCEPTABLE ICC-ES ESR-1659 confirms acceptance to the IBC, Section 2603 which requires the same Acceptance Criteria as the 8th Edition (2023) FBC, Chapter 26.					

(26) DIFFUSER M74 DS PRISMATIC PANEL - Plaskolite / Optix					
Attribute	**Report Reference**	**ASTM (per 2006 ICC)**	**Result**	**Acceptance Criteria**	
Rate of Burning	ICC-ES ESR-2590	ASTM D635-03	CC2	CC1 or CC2	
Self-Ignition Temperature	ICC-ES ESR-2590	ASTM D1929-96(2001)e1	Met per ICC-ES ESR-2590	≥ 650°F	
Smoke Density	ICC-ES ESR-2590	ASTM D2843-99(2004)	Met per ICC-ES ESR-2590	≤ 75	
Conclusion: ACCEPTABLE ICC-ES ESR-2591 confirms acceptance to the IBC, Section 2606 which requires the same Acceptance Criteria as the 8th Edition (2023) FBC, Chapter 26.					

Performance and Testing Standards

Reference 2.a conducted air, water and structural testing including impact and cyclic loading to the following standard(s). See Reference 3.b for Code Conformance Evaluation to the 8th Edition (2023) FBC for these testing standards as applicable.

1. AAMA/WDMA/CSA 101/I.S.2/A440-11, North American Fenestration Standard/Specification for windows, doors, and skylights.
2. ASTM E1886-13, 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.
3. ASTM E1996-12, Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors and Storm Shutters Impacted by Windborne Debris in Hurricanes.
4. ASTM E283-04, Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
5. ASTM E330-02, Standard Test Method for Structural Performance of Exterior windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
6. ASTM E547-00, Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Cyclic Static Air Pressure Difference
7. TAS201-94, Impact Test Procedures.
8. TAS202-94, Criteria for Testing Impact & Non-Impact Resistant Building Envelope Components Using Uniform Static Air Pressure.
9. TAS203-94, Criteria for Testing Products Subjected to Cyclic Wind Pressure Loading.

Reference 2.b.i conducted plastic testing to the following standard(s). See Reference 3.b for Code Conformance Evaluation to the 8th Edition (2023) FBC for these testing standards as applicable.

1. ASTM D638-03, Standard Test Method for Tensile Properties of Plastics
2. ASTM D638-06, Standard Test Method for Tensile Properties of Plastics
3. ASTM D1929-96 (2001)e1, Standard Test Method for Determining Ignition Temperature of Plastics.
4. ASTM D1929-12, Standard Test Method for Determining Ignition Temperature of Plastics.
5. ASTM D2843-99(2004), Standard Test Method for Density of Smoke from the Burning or Decomposition of Plastics.
6. ASTM D2843-10, Standard Test Method for Density of Smoke from the Burning or Decomposition of Plastics.
7. ASTM E84-04, Standard Test Method for Surface Burning Characteristics of Building Materials

Reference 2.b.ii conducted plastics testing to the following standard(s) in which the Plaskolite TUFFAK NOA confirms that plastic testing meets the 8th Edition (2023) FBC/FRC.

1. ASTM D638, Standard Test Method for Tensile Properties of Plastics
2. ASTM D1929, Standard Test Method for Determining Ignition Temperature of Plastics.
3. ASTM D2843, Standard Test Method for Density of Smoke from the Burning or Decomposition of Plastics.

References and Supporting Documents

1) Drawings

    a. Applicable to this product Approval Document

        i. M74 DS-O-DPP-FC-A-L2-REG, signed and sealed by Robert J. Amoruso, P.E. on 10/13/15, *Solatube M74 DS Curb Mount TDD with Amplifier - Dual Glazed.*
        ii. M74 DS-O-DP-FC-A-L2-REG, signed and sealed by Robert J. Amoruso, P.E. on 10/13/15, *Solatube M74 DS Curb Mount TDD with Amplifier - Single Glazed.*

2) Testing

    a. Performance Testing
        i. Architectural Testing Inc. (Fresno, CA) **Test Report No. 08050.01-301-44** Dated 7/14/2014
            1. Solatube M74-DS Open Ceiling Tubular Daylight Device
            2. ASTM E1886-13 and ASTM E1996-12
            3. Series/Model M74 DS-O-DP-FC-B-L2 (Single Dome)
            4. Series/Model M74 DS-O-DDP-FC-B-L2 (Dual Dome)
            5. Wind Zone 4, Missile Level D
            6. DP = 80 psf
        ii. Architectural Testing lnc. (Fresno, CA) **Test Report No. D8050.02-301-44** Dated 7/14/2014
            1. Solatube Open Ceiling Tubular Daylighting Device M74 DS
            2. Series/Model M74 DS-O-DP-FC-B-L2 (Single Dome)
            3. Series/Model M74 DS-O-DDP-FC-B-L2 (Dual Dome)
            4. TAS-201, TAS-202, and TAS 203 (Signed and Sealed by Tyler Westerling, P.E.)
            5. Large Missile Impact
            6. DP = 80 psf
        iii. Architectural Testing Inc. (Fresno, CA) **Test Report No. D8050.03-301-44** Dated 7/14/2014
            1. Solatube M74-DS Open Ceiling Tubular Daylight Device
            2. Occupational Safety and Health Administration/ U.S. Department of Labor Regulations Standards - 29 CFR 1926 Subpart M (Fall Protection), 1926.501(b}(4)(i); 1926.501(i)(2); 1926.S01(b)(4)(ii)
        iv. Architectural Testing Inc. (Fresno, CA) **Test Report No. 08051.01-301-44** Dated 7/14/2014,
            1. Solatube Open Ceiling Tubular Daylighting Device M74 OS
            2. AAMA/WDMA/CSA 101/l.S.2/A440-11, NAFS
            3. Series/Model M74 DS-O-DP-FC-B-L2 (Single Dome)
            4. Series/Model M74 DS-O-DDP-FC-B-L2 (Dual Dome)
            5. DP = 80 psf

v. Architectural Testing Inc. (Fresno, CA) **Test Report No. D8051.02-301-44** Dated 7/14/2014
    1. Solatube M74 DS Single Glazed and Dual Glazed - Tubular Daylighting Device - Open Ceiling testing
    2. ICC-ES AC-16 (Part A3.1, A3.2, A3.3, A4.3 & Part 84.1), ASTM E 283-04, ASTM E 330-02 and ASTM E 547-00
    3. Series/Model M74 DS-O-DP-FC-B-L2 (Single Dome)
    4. Series/Model M74 DS-O-DDP-FC-B-L2 (Dual Dome)
    5. DP = 80 psf

b. Plastics Testing
    i. International Code Council Evaluation Services – Evaluation Reports
        1. ICC-ES ESR-1407
        2. ICC-ES ESR-1864
        3. ICC-ES ESR-1659
        4. ICC-ES ESR-2590
        5. ICC-ES ESR-2728

    ii. Miami-Dade Product Control Notice of Acceptance (NOA)
        1. Plaskolite, LLC TUFFAK Polycarbonate Sheet (formally Covestro MAKROLON Polycarbonate Sheet) NOA can be found here. (http://www.miamidade.gov/building/pc-result_detail_app.asp?app_alias=100477).

3) Reports
    a. PTC Report No. 2236, Rev. 0, *Solatube M74 DS Curb Mount Open Ceiling TDD - Anchorage Engineering*, dated 6/26/13, signed and sealed by Robert J. Amoruso, P.E.
    b. PTC Report No. 2397-EER, Rev. 4, *Solatube M74 DS Curb Mount Open Ceiling TDD with Amplifier – Referenced Testing Standards Equivalency Evaluation*, signed and sealed by Robert J. Amoruso, P.E.