



## Equivalency Evaluation to 2010 FBC

Date:	December 15, 2011
PTC Report No.:	1974-1
Report Revision No.:	0
PTC Project No.:	411-1016
Product Mfg.:	Solatube International, Inc. 2210 Oak Ridge Way Vista, CA 92081
Product Name:	Impact 10" 160 (DS) and 14" 290 (DS) Tubular Daylight Device - HVHZ
Product Category:	Sky Lights
Product Sub-Category:	Skylight
Compliance Method:	Product Approval Rule 9N-3.015(4)(d) – Equivalency of Standards
Prepared By:	Robert J. Amoruso, P.E. Florida P.E. License Number 49752 PTC Product Design Group, LLC FBPE Certification of Authorization No. 25935

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# Project Scope

Evaluate equivalency of testing standards used for the performance testing of Solatube Impact 160 DS (10”) and 290 DS (14”) Tubular Daylight Device for conformance to the 2010 Florida Building Code – Building and Residential Volumes including the High Velocity Hurricane Zone (HVHZ).

## 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.

## Performance and Testing Standards

Reference 2.a conducted air, water and structural testing including impact and cyclic loading to the following standard(s).

- 1) TAS 201-94 - *Impact Test Procedures*
- 2) TAS 202-94 - *Criteria for Testing Impact & Nonimpact Resistant Building Envelope Components Using Uniform Static Air Pressure*
- 3) TAS 203-94 - *Criteria for Testing Products Subject to Cyclic Wind Pressure Loading*

Reference 2.b, 2.c, 2.d, 2.e, 2.g and 2.h conducted plastics testing to the following standard(s).

- 1) ASTM G155-05a, *Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Non Metallic Materials*
- 2) ASTM G155-00ae1, *Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Non Metallic Materials*
- 3) ASTM D638-03, *Standard Test Method for Tensile Properties of Plastics*
- 4) ASTM D635-06, *Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.*
- 5) ASTM D635-74, *Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.*
- 6) ASTM D1929-96 (2001)e1, *Standard Test Method for Determining Ignition Temperature of Plastics.*
- 7) ASTM D1929-96, *Standard Test Method for Determining Ignition Temperature of Plastics.*
- 8) ASTM D1929-68(1975), *Standard Test Method for Determining Ignition Temperature of Plastics.*
- 9) ASTM E84-06, *Standard Test Method for Surface Burning Characteristics of Building Materials*
- 10) ASTM E84-09a, *Standard Test Method for Surface Burning Characteristics of Building Materials*
- 11) ASTM D 2843-99, *Standard Test Method for Density of Smoke from the Burning or Decomposition of Plastics.*
- 12) ASTM D 2843-93, *Standard Test Method for Density of Smoke from the Burning or Decomposition of Plastics.*

Reference 2.f recorded ICC/FBC conforming plastics testing in the following evaluation reports.

- 1) ICC-ES Report No. ER-1084

## References and Supporting Documents

- 1) Drawings
  - a. SOLA0004, Rev. A, dated 12/15/11, *Solatube Impact 160 DS (10") and 290 DS (14") Tubular Daylight Device – Installation Anchorage Details.*
- 2) Testing (note that References 2.b thru 2.h have the BOM Item description and (Item No.) shown)
  - a. Architectural Testing Inc. Test Report No. 85320.01-301-18, dated 9/08/08, *Solatube Impact 160 DS (10") and 290 DS (14") Tubular Daylight Device testing to TAS 201, TAS 202 and TAS 203.*
  - b. OUTER DOME (1), DOME RING (3), TOP TUBE CLIP (7) AND INNER DOME (25) testing for High Impact Acrylic PMMA (Poly(methyl methacrylate))
    - i. Intertek Test Report No. 3143957-004, dated 9/24/08, testing to ASTM G155-05a and D638-08 in accordance with ASTM D2565-99.
    - ii. SGS Test Report No. 177:013002-01-R1, dated 6/10/08, testing to ASTM D635-06.
    - iii. SGS Test Report No. 177:013002-02-R1, dated 6/10/08, testing to ASTM D1929-96.
    - iv. SWRI Test Report No. 01.12693.01.139, dated 4/5/07, testing to ASTM E84-06.
  - c. OUTER DOME (1), DOME RING (3), TOP TUBE CLIP (7) AND INNER DOME (25) testing for High Impact Acrylic PMMA (Poly(methyl methacrylate))
    - i. Architectural Testing Inc. Test Report No. 58735.01-106-18, dated 1/4/07, testing to ASTM G155-00ae1 and D638-03.
    - ii. SGS Test Report No. 177:002666-03, dated 1/2/07, testing to ASTM D635-06.
    - iii. SGS Test Report No. 177:002666-01, dated 1/13/07, testing to ASTM D1929-96(2001)e1.
    - iv. SGS Test Report No. 177:002666-02, dated 1/2/07, testing to ASTM D2843-99.
  - d. EFFECT LENS (17), PET-GAG (PET – Polyethylene Terephthalate, High Frequency Welding Grade - GAG) testing
    - i. SGS Test Report No. 2138368-1, dated 8/27/10, testing to ASTM D635-06.
    - ii. SGS Test Report No. 2138368-3, dated 2/2/10, testing to ASTM D1929-96(2001)e1.
    - iii. SGS Test Report No. 2138368-2, dated 8/31/10, testing to ASTM E84-09a.
  - e. CEILING RING (16) AND DRESS RING (19) testing for Medium Impact Acrylic PMMA (Poly(methyl methacrylate))
    - i. SGS Test Report No. 177:013002-01-R1, dated 6/10/08, testing to ASTM D635-06.
    - ii. SGS Test Report No. 177:013002-02-R1, dated 6/10/08, testing to ASTM D1929-96.
    - iii. SWRI Test Report No. 01.12693.01.139, dated 4/5/07, testing to ASTM E84-06.

- iv. Intertek Test Report No. 3143957-004, dated 9/24/08, testing to ASTM G155-05a and D638-08 in accordance with ASTM D2565-99.
  - f. CEILING RING (16) AND DRESS RING (19) testing for Medium Impact Acrylic PMMA (Poly(methyl methacrylate))
    - i. ICC-ES Report No. ER-1084 demonstrates compliance to I-Codes for use in skylight applications. Report No. ER-1084 and 2010 FBC requirements same based on review of documented results.
  - g. DIFFUSER PANEL (18) testing for Medium Impact Acrylic PMMA (Poly(methyl methacrylate))
    - i. SGS Test Report No. 177:013002-03-R1, dated 6/10/08, testing to ASTM D635-06.
    - ii. SGS Test Report No. 177:013002-04-R1, dated 6/10/08, testing to ASTM D1929-96.
    - iii. SWRI Test Report No. 01.13536.01.060, dated 1/30/08, testing to ASTM E84-06.
  - h. DIFFUSER PANEL (18) testing for Polycarbonate
    - i. SGS Test Report No. 153367-2, dated 4/2/01, testing to ASTM D635-74.
    - ii. SGS Test Report No. 153367-1, dated 4/2/01, testing to ASTM D1929-68(1975).
    - iii. SGS Test Report No. 153367-3, dated 4/2/01, testing to ASTM D2843-93.
- 3) Reports
- a. PTC Report No. 1971, Rev. 0, *Solatube Impact 160 DS (10") and 290 DS (14") Tubular Daylight Device – Evaluation Report*, Dated 12/15/11, signed and sealed by Robert J. Amoruso, P.E.
- 4) 2010 Florida Building Code & 2010 Florida Residential Code
- a. Testing and Labeling Requirements
    - i. Section 1626/R4403.16.1 – Impact Tests (HVHZ – WBDR)
    - ii. Section 1626.1/R4403.16.2 – Large Missile Impact
    - iii. Section 1715.5.2.1.1 – Testing and Labeling of Skylights
    - iv. Section 1715.5.2.1.2 – Skylights and Sloped Glazing
    - v. Section 2411.8 – Sloped Glazing
  - b. Plastics Requirements
    - i. Section 2606.4 – Specifications, Light-transmitting plastics
    - ii. Section 2612.2/R4412.1.2 – Definitions, Approved Plastics

# Equivalency Evaluation – Plastics Testing

Test Standard used	2010 FBC/FRC Standard Revision Level	Comments
ASTM D635-06 ASTM D635-74	ASTM D635-03	Review of the revision year required by the code and that used in testing indicate no significant changes that would affect test results.
ASTM D638-03	Not Referenced in code.	
ASTM D1929-96 (2001)e1 ASTM D1929-96 ASTM D1929-68(1975)	ASTM D1929-96 (2001)e1	Same revision level used in test as required in code. -- OR -- Review of the revision year required by the code and that used in testing indicate no significant changes that would affect test results.
ASTM D2843-99 ASTM D2843-93	ASTM D 2843-99	Same revision level used in test as required in code. -- OR -- Review of the revision year required by the code and that used in testing indicate no significant changes that would affect test results.
ASTM E84-06 ASTM E84-09a	ASTM E84-07	Review of the revision year required by the code and that used in testing indicate no significant changes that would affect test results.
ASTM G155-05a ASTM G155-00ae1	Not Referenced in code.	

# Equivalency Evaluation – Air, Water and Structural Testing including Impact and Cyclic Loading

Reference 2.a tested uniform static air pressure in accordance with TAS-202-94, *Criteria for Testing Impact & Nonimpact Resistant Building Envelope Components Using Uniform Static Air Pressure*

- Testing to the above procedure documented in Reference 2.a is based on conformance to the 2007 FBC – Test Protocols with 2009 Supplements.
- The 2010 FBC – Test Protocols, TAS 202-94 revised Sections 1.1 and 5.2.2.2 related to calculation of design pressure using ASCE7-10. Section 5.2.7 was revised to remove revision level from ASTM E283 and Section 13.2.1 revised interval labeling on storm panels.

These changes do not affect the testing method or results obtained.

- **CONCLUSION:** Testing and documented results in Reference 2.a are compliant with the 2010 FBC – Building Volume, Residential Volume and Test Protocols.

Reference 2.a tested impact performance in accordance with TAS-201-94, *Impact Test Procedures*.

- Testing to the above procedure documented in Reference 2.a is based on conformance to the 2007 FBC – Test Protocols with 2009 Supplements.
- The 2010 FBC – Test Protocols, TAS 201-94, Section 13.2.1 revised interval labeling on storm panels.

These changes do not affect the testing method or results obtained.

- **CONCLUSION:** Testing and documented results in Reference 2.a are compliant with the 2010 FBC – Building Volume, Residential Volume and Test Protocols.

Reference 2.a tested post-impact cyclic wind pressure loading performance in accordance with TAS-203-94, *Criteria for Testing Products Subject to Cyclic Wind Pressure Loading*.

- Testing to the above procedure documented in Reference 2.a is based on conformance to the 2007 FBC – Test Protocols with 2009 Supplements.
- The 2010 FBC – Test Protocols, TAS 203-94, Section 14.2.1 revised interval labeling on storm panels.

These changes do not affect the testing method or results obtained.

- **CONCLUSION:** Testing and documented results in Reference 2.a are compliant with the 2010 FBC – Building Volume, Residential Volume and Test Protocols.