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# TEST REPORT

**Testing of Single Glazed Dome Materials per  
FM Approvals Standard 4431, Section 4.2,  
Test for Severe Hail**

**Prepared for:**

**Bristolite Skylights, Inc  
401 E. Goetz Ave.  
Santa Ana, CA 92707**

**Project ID: 3034346**

**Class: 4431**

**Date: 01/29/2009**

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FM Approvals Standard 4431, Section 4.2,  
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**from  
Bristolite Skylights, Inc  
401 E. Goetz Ave.  
Santa Ana, CA 92707**

**I INTRODUCTION**

- 1.1 Bristolite Skylights, Inc submitted their single glazed skylight dome materials to determine if they would meet the 2.0 in. (51 mm) diameter severe hail requirements of the **Standard** listed below for Skylights.
- 1.2 This Report may be reproduced only in its entirety and without modification.
- 1.3 **Standard:**

<b>Title</b>	<b>Class Number</b>	<b>Date</b>
Approval Standard for Skylights	4431	September, 2006

- 1.4 Examination consisted of Simulated Hail Resistance Testing using 2.0 in. (51 mm) diameter freezer ice balls.
- 1.5 Tests show that the Co-Polyester, Standard Fiberglass and Energy Star Fiberglass dome materials meet the 2.0 in. (51 mm) diameter severe hail requirements of the above standard.
- 1.6 This test program was not intended to, nor does it grant Approval by FM Approvals to any of the single glazed skylight dome materials submitted for testing by Bristolite Skylights, Inc.

**II DESCRIPTION**

- 2.1 Bristolite skylights are manufactured in a variety of materials. These products can be translucent or transparent and single or double skinned panels. Plastic skylights can be constructed of either thermoplastic or thermoset materials and are designed to admit light while maintaining the building envelope. Bristolite submitted 13 in. x 13 in. (330 mm x 330 mm) samples of 6 alternate skylight glazing materials. The below materials were submitted in the thicknesses shown.
- 2.1.1 Acrylic – 0.15 in (3.81 mm)  
Co-Polyester – 0.118 in (3.0 mm)  
Standard Fiberglass – 0.125 in (3.175 mm) nominal  
Energy Star Fiberglass – 0.125 in (3.175 mm) nominal  
Polycarbonate – 0.118 in (3.0 mm)  
Impact Modified Prismatic Acrylic – 0.187 in. (4.75 mm)

**III EXAMINATIONS AND TESTS**

- 3.1 Samples were submitted for examination and testing as described below.

FM APPROVALS  
3034346

- 3.1.1 Tests conducted were as required by the **Standard** listed in paragraph 1.3 above. Bristolite Skylight, Inc. requested that samples only be subjected to the Simulated Hail Resistance Test using 2.0 in. (51 mm) diameter freezer ice balls in order to evaluate the performance of the submitted samples.
- 3.1.2 Samples were not selected by FM Approvals personnel and as such data in this report may not be used to grant FM Approval in any future FM Approvals programs.
- 3.1.3 All data is on file at FM Approvals under Project I.D. 3034346 along with other documents and correspondence applicable to this program.

3.2 Simulated Hail Resistance Tests Using Freezer Ice Balls

- 3.2.1 Tests were conducted using the FM Approvals Freezer Ice Ball Simulated Hail Damage Test Apparatus to evaluate the ability of the skylight glazing materials to withstand a hailstorm without developing any through openings.
  - 3.2.1.1 Two samples of each test material were submitted for testing. The first sample of each material was designated as Sample A and was conditioned at 40°F ±5°F (4°C ±3°C) for a period of not less than 48 hours immediately prior to the test. Prior to being placed in the conditioning box, the samples were protected from exposure to direct sunlight.
  - 3.2.1.2 The second sample of each material was designated as Sample B and was conditioned (weathered) for 1000 hours in the FM Approvals Ultraviolet Weatherometer prior to conditioning at 40°F ±5°F (4°C ±3°C) for a period of not less than 48 hours immediately prior to the test.
  - 3.2.1.3 Each sample was tested within five (5) minutes of being removed from the 40°F ±5°F (4°C ±3°C) conditioning box.
- 3.2.2 For the severe hail damage tests, a 2.0 in. (51 mm) diameter frozen ice ball with a nominal weight of 0.1385 lbs (62.9 g), +10/-0% was projected at each test sample from a distance of 5 ft (3.2 m) at a nominal speed of 76.1 mph, +10/-0% in order to impact the sample with a nominal kinetic energy of 26.8 ft-lbs (36.4 J), +10/-0%. This procedure was repeated 10 times within a 12 in. (305 mm) diameter location on each of the test samples. After each impact the sample was inspected for any through openings.
- 3.2.3 Twelve 13 in. x 13 in. (330 mm x 330 mm) samples, two of each material were prepared. The results were as follows:

<u>Sample ID</u>	<u>Sample Material</u>	<u>Result</u>
1A	Acrylic	<u>Fail</u> – shattered during first impact
1B	Acrylic	<u>Fail</u> – shattered during first impact
2A	Co-Polyester	<u>Fail</u> – shattered during first impact
2B	Co-Polyester	<u>Fail</u> – first impact resulted in approximate 2.5 in. (64 mm) diameter opening

FM APPROVALS  
3034346

<u>Sample ID</u>	<u>Sample Material</u>	<u>Result</u>
3A	Standard Fiberglass	<u>Pass</u> – surface cracking visible on both sides of sample, no through openings developed
3B	Standard Fiberglass	<u>Pass</u> – surface cracking visible on both sides of sample, no through openings developed
4A	Energy Star Fiberglass	<u>Pass</u> – surface cracking visible on both sides of sample, no through openings developed
4B	Energy Star Fiberglass	<u>Pass</u> – surface cracking visible on both sides of sample, no through openings developed
5A	Polycarbonate	<u>Pass</u> – no visible cracking or through openings
5B	Polycarbonate	<u>Pass</u> – no visible cracking or through openings
6A	Impact Modified Prismatic Acrylic	<u>Fail</u> – shattered during first impact
6B	Impact Modified Prismatic Acrylic	<u>Fail</u> – first impact resulted in approximate 2.5 in. (64 mm) diameter opening

**IV CONCLUSIONS**

- 4.1 FM Approvals makes no judgment of product uniformity solely as a result of the tests performed. Product uniformity depends in part on product re-examination and manufacturing facilities and procedures which would be inspected under FM Approvals' Facilities and Procedures Audit program.
- 4.2 No Approval by FM Approvals, recognition, or listing has resulted from this program and this report should not be construed as granting such Approval.

**TESTING SUPERVISED BY:** D.A. Boardman

**PROJECT DATA RECORD:** Project I.D. 3034346

**ORIGINAL TEST DATA:** PDR for Project I.D. 3034346

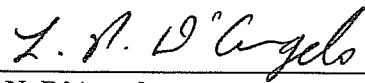
**ATTACHMENTS:** None

**REPORT BY:**



**D. A. Boardman**  
**Engineer – Materials Group**

**REPORT REVIEWED BY:**



**L.N. D'Angelo**  
**Technical Team Manager – Materials Group**