



ASTM E 108-TEST REPORT

Report No.: D8409.01-121-24
Test Dates: May 28, 2014 and May 29, 2014

Rendered to:
FURBISH COMPANY
Brooklyn, Maryland

PRODUCT TYPE: High Performance Living Roof
SERIES/MODEL: EcoCline 2+2

Test Method: UL 790-04 / ASTM E 108-07a, *Standard Test Methods for Fire Tests of Roof Coverings*

Summary of Results		
Roof Covering Description	ASTM E108 Classification	Results
Mixed plugs of Sedum and Festuca glauca vegetation, EcoCline Media Type B2, EcoCline Filter Fabric, and EcoCline Water Retention and Drainage layer	Class A	Pass

This report contains in its entirety:

- Cover Page:** 1 page
- Report Body:** 9 pages
- Photographs:** 4 pages
- Diagram:** 1 page

Reference must be made to Report No. D8409.01-121-24 for complete test specimen description and detailed test results.

1.0 Report Issued To: Furbish Company
3430 2nd Street Suite 300
Brooklyn, Maryland 21225

2.0 Test Laboratory: Architectural Testing, Inc.
130 Derry Court
York, Pennsylvania 17406
717-764-7700

3.0 Project Summary:

3.1 Introduction: This fire test standard aims to measure relative fire characteristics of roof coverings under simulated fire scenarios which originate outside the building. Under controlled laboratory conditions, the behavioral response of materials, products or assemblies as affected by heat and flame are described. The performances of the roof covering systems are described only under specific conditions. Information is not provided by these tests that are applicable to any scenarios other than the specific conditions experienced during testing. Information is not provided by these tests that are applicable to actual fire situations because of the inherent differences between the classes as it pertains to fire source and fire application; no comparison between the classes exist. Results from tests are applicable to the specifics of the test and the aspect in which the tests were conducted, and are not applicable to similar materials or the results of those materials when used in concert with other materials.

3.2 Product Type: High Performance Living Roof

3.3 Series/Model: EcoCline 2+2

3.4 Compliance Statement: Results obtained are tested values and were secured by using the designated test method(s). This report does not constitute certification of this product nor an opinion or endorsement by this laboratory. It is the exclusive property of the client so named herein and relates only to the specimens tested. This report may not be reproduced, except in full, without the written approval of Architectural Testing, Inc.

3.5 Test Dates: 05/28/2014 & 5/29/2014

3.6 Test Sample Source: The test decks were built by ATI personnel and the remaining components were supplied and built by Furbish Company personnel.

3.0 Project Summary: (continued)

3.7 Test Procedure:

3.7.1 UL 790-04 / ASTM E108-07a, *Standard Methods for Fire Tests of Roof Coverings*

3.7.1.1 Class A procedures for *Calibration, Spread of Flame, Intermittent Flame*, and *Burning Brand* Procedures were followed for the testing outlined in this report.

4.0 Test Details:

4.1 Specimen Description: Class A test decks for the *Spread of Flame, Intermittent Flame*, and *Burning Brand* assemblies were constructed of 2x4 lumber and 15/32 inch Type AC grade plywood with face and back veneers of Douglas Fir. Test deck from top to bottom consisted of a mixed plugs of Sedum and Festuca glauca vegetation supplemented with Sedum cuttings applied at a rate of 30 lb. per 1,000 ft², EcoCline Media Type B2, EcoCline Filter Fabric, and EcoCline Water Retention and Drainage layer.

4.1.1 Spread of Flame

4.1.1.1 Test Deck - 40 inches wide by 8 feet long with a 1/8 inch by 40 inch horizontal joint at 8 inches from the edge of the deck.

4.1.1.2 Roof Covering – One plug per square foot of Sedum and Festuca glauca vegetation, 2 inch of EcoCline Media Type B2, one layer of EcoCline Filter Fabric, and 2 inches of EcoCline Water Retention and Drainage layer.

4.1.2 Burning Brand

4.1.2.1 Test Deck - 40 inches wide by 52 inches long with a 1/8 inch full length 40 inch horizontal joint at 22-1/2 inches and a 1/8" inch partial 22-1/2 inch vertical joint centered at 20 inches and located on the far side of the deck during exposure.

4.1.2.2 Roof Covering – One plug per square foot of Sedum and Festuca glauca vegetation, 2 inch of EcoCline Media Type B2, one layer of EcoCline Filter Fabric, and 2 inches of EcoCline Water Retention and Drainage layer.

4.1.3 Intermittent Flame

4.1.3.1 Test Deck – Test Deck - 40 inches wide by 52 inches long with a 1/8 inch horizontal joint at 22-1/2" and a 1/8 inch vertical joint centered and on the back side of the test deck.

4.1.3.2 Roof Covering - One plug per square foot of Sedum and Festuca glauca vegetation, 2 inch of EcoCline Media Type B2, one layer of EcoCline Filter Fabric, and 2 inches of EcoCline Water Retention and Drainage layer.

4.0 Test Details: (continued)

4.2 Storage Information: Decks were stored in the fire laboratory prior to testing. Typical laboratory conditions are 64°F and 30% relative humidity.

4.3 Moisture Content: Moisture content of the lumber and plywood were verified prior to testing. Plywood was less than 8% and the lumber was within 8-10%.

4.4 Equipment Calibration: A Fire Test Apparatus as described in ASTM E 108 was used to generate 12 ± 0.5 mph air current and flame temperature of $1400 \pm 50^\circ\text{F}$. Air speed and flame temperature of the Fire Test Apparatus were calibrated prior to testing. A gas burner with flame temperature of $1630 \pm 50^\circ\text{F}$ was used to ignite the brands for testing. See Section 5.1 for more information on equipment calibration.

4.5 Spread of Flame Procedure: After calibration of equipment, a test specimen described in Section 4.1.1 was placed into the steel framed holder for testing at a zero slope and refractory mortar applied at the leading edge of the deck. The fire test apparatus was turned on and the specimen was subjected to continuous flame and air current for duration of 10 minutes. Observations were documented and reported in Section 5.0.

4.6 Intermittent Flame Procedure: After calibration of equipment, a test specimen described in Section 4.1.2 was placed into the steel framed holder for testing at a zero slope and refractory mortar applied at the leading edge of the deck. The fire test apparatus was turned on and the specimen was subjected to 15 cycles of two minute flame and air current and two minutes without flame. Observations were documented and reported in Section 5.0.

4.7 Burning Brand Procedure: Brand was oven conditioned at 105 to 120°F for a minimum of 24 hours prior to testing and weight verified to be within 2000 ± 150 grams. Brand consisted of three layers of twelve 1 inch by 1 inch by 12 inch strips of Douglas Fir forming a grid of 12 inch square by 2-1/4 inch thick. The brand was ignited by exposing each 12 inch by 12 inch face for 30 seconds, each 2-1/4 inch by 12 inch face for 45 seconds, and the 12 inch by 12 inch faces again for 30 seconds into the gas burner. Total duration of ignition exposure was 5 minutes. After the brand was ignited, it was placed onto the test specimen described in Section 4.1.3 at a zero slope. Brand was centered laterally with respect to the vertical panel joint and with the upper edge of the brand 3 inches above the horizontal joint of the test deck. Fire Test Apparatus without flame but only air current was turned on and the specimen was tested for 90 minutes or until the brand was completely consumed and the exposed and underside surfaces of the test deck did not exhibit signs of combustion. Observations were documented and reported in Section 5.0.

4.0 Test Details: (continued)

4.8 Official Observers:

<u>Name</u>	<u>Company</u>
Scott Gingrich	Architectural Testing, Inc.
Ben Green	Architectural Testing, Inc.

5.0 Test Data & Observations:

5.1 Calibration Information:

May 28, 2014

Average Wind Speed: 12.2 mph
 Ambient Temperature: 73°F
 Average Flame temperature: 1422°F

May 29, 2014

Average Wind Speed: 11.7 mph
 Ambient Temperature: 66°F

5.2 Results:

Intermittent Flame:

Specimen #1

Time (min:sec)	Observations
00:01	Start Test
00:02	Specimen ignition
After Test	Specimen ignited but no underlayment or sustained flaming on the underside of the deck was observed; PASS .

Intermittent Flame:

Specimen #2

Time (min:sec)	Observations
00:01	Start Test
00:02	Specimen ignition
After Test	Specimen ignited but no underlayment or sustained flaming on the underside of the deck was observed; PASS .

5.0 Test Data & Observations: (continued)Spread of Flame:

Specimen #1

Time (min:sec)	Observations
00:01	Start Test
00:07	Material ignition
00:07	Surface burning reached 1 foot
10:00	Test concluded
After Test	Specimen ignited but the flame propagation never reached failure criteria of six feet; PASS .

Spread of Flame:

Specimen #2

Time (min:sec)	Observations
00:01	Start Test
00:02	Material ignition
00:08	Surface burning reached 1 foot
10:00	Test concluded
After Test	Specimen ignited but the flame propagation never reached failure criteria of six feet; PASS .

Burning Brand:

Specimen #1

Time (min:sec)	Event	Observations
00:01	Brand Placed on Deck	Start of test
02:35	Ignition	Specimen ignition above deck
33:13	Brand Consumed	Brand Consumed. Test concluded.
After Test		No sustained flaming on the underside of the deck was observed; PASS .

5.0 Test Data & Observations: (continued)Burning Brand:

Specimen #2

Time (min:sec)	Event	Observations
00:01	Brand Placed on Deck	Start of test
05:46	Ignition	Specimen ignition above deck
28:36	Brand Consumed	Brand Consumed. Test concluded.
After Test	No sustained flaming on the underside of the deck was observed; PASS .	

Burning Brand:

Specimen #3

Time (min:sec)	Event	Observations
00:01	Brand Placed on Deck	Start of test
00:03	Ignition	Specimen ignition above deck
27:01	Brand Consumed	Brand Consumed. Test concluded.
After Test	No sustained flaming on the underside of the deck was observed; PASS .	

Burning Brand:

Specimen #4

Time (min:sec)	Event	Observations
00:01	Brand Placed on Deck	Start of test
00:03	Ignition	Specimen ignition above deck
27:22	Brand Consumed	Brand Consumed. Test concluded.
After Test	No sustained flaming on the underside of the deck was observed; PASS .	



Test Conclusion:

The test specimens provided to Architectural Testing by Furbish Company and described in this test report **met** the conditions of acceptance of UL 790-04 / ASTM E 108 Class A *Spread of Flame, Intermittent Flame, and Burning Brand* procedures at a zero slope.

The service life of this report will expire on the stated Test Record Retention End Date, at which time such materials as drawings, data sheets, samples of test specimens, copies of this report, and any other pertinent project documentation, shall be discarded without notice.

This report does not constitute certification of this product nor an opinion or endorsement by this laboratory. It is the exclusive property of the client so named herein and relates only to the specimen(s) tested. This report may not be reproduced, except in full, without the written approval of Architectural Testing, Inc.

For ARCHITECTURAL TESTING, INC.

Scott Gingrich
Technician – Fire Testing

Matthew Freeborn
Manager – Fire Testing

SDG:ddr

Attachments (pages): This report is complete only when all attachments listed are included.
Appendix A: Photographs (4)
Diagram (1)

This report produced from controlled document template ATI 00538, revised 01/19/12.

Revision Log

<u>Rev. #</u>	<u>Date</u>	<u>Page(s)</u>	<u>Revision(s)</u>
0	09/04/2014	N/A	Original report issue
1	9/5/2014	Cover Page and Pages 3 and 8	Added UL 790 reference Specimen Description: Added to vegetation description

Appendix A

Photographs



**Photo No. 1
Installation (Typical)**



**Photo No. 2
Intermittent Flame (Typical)**



**Photo No. 3
Spread of Flame (Typical)**



**Photo No. 4
Burning Brand (Typical)**



Photo No. 5
Intermittent Flame Post Test (Typical)



Photo No. 6
Spread of Flame Post Test (Typical)



Photo No. 7
Burning Brand Post Test (Typical)

Appendix B

Diagram

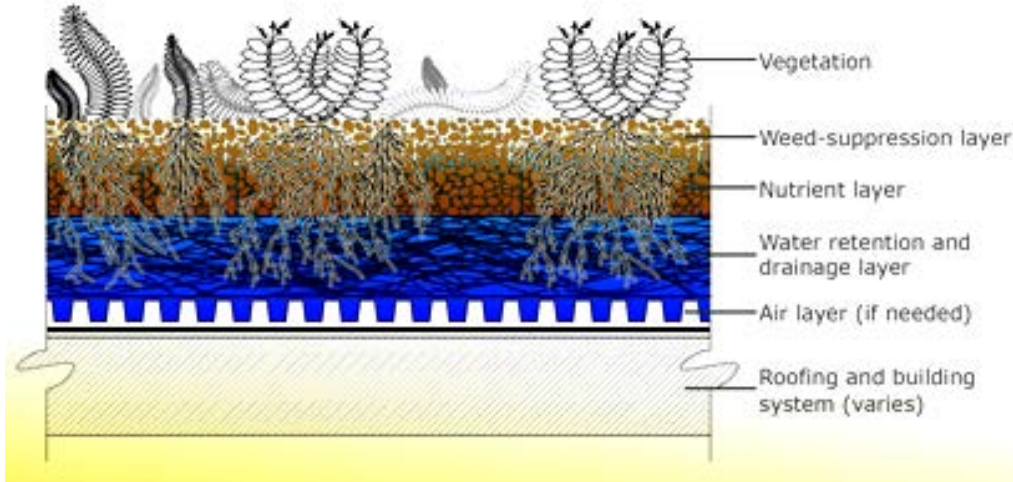


Diagram No. 1
Cross-Sectional View of Typical System