

# SOUTHWEST RESEARCH INSTITUTE®

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**FIRE PERFORMANCE EVALUATION OF "SAMPLE 6EFWT LOW E," A  
NOMINAL 1/4-IN. THICK *SCRIMLESS FOIL/POLYETHYLENE  
FOAM/WHITE SCRIMLESS FOIL*, IN GENERAL ACCORDANCE WITH  
THE 2006 EDITION OF NFPA 286, *STANDARD METHODS OF FIRE  
TESTS FOR EVALUATING CONTRIBUTION OF WALL AND CEILING  
INTERIOR FINISH TO ROOM FIRE GROWTH***

**FINAL REPORT**  
**Consisting of 20 Pages**

**SwRI Project No. 01.11811.01.420c**  
**Test Date: June 6, 2006**  
**Report Date: August 3, 2006**

**Prepared for:**  
**Environmentally Safe Products, Inc.**  
**313 West Golden Lane**  
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## ABSTRACT

This report presents the results of a fire performance evaluation of a nominal 1/4-in. thick Scrimless Foil/Polyethylene Foam/White Scrimless Foil material identified as “Sample 6EFWT Low E,” for Environmentally Safe Products, Inc., of New Oxford, PA. Testing was conducted in general accordance with the 2006 Edition of National Fire Protection Association (NFPA) Standard 286, *Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth*. The test standard requires the material tested to be installed on the interior of the test room frame. At the Client’s request, a metal frame was constructed to simulate an actual metal building installation according to Environmentally Safe Products, Inc.’s Low-E installation instructions. The test material was installed behind the frame, on the walls and ceiling. The test was conducted on June 6, 2006, by Southwest Research Institute’s® (SwRI®) Fire Technology Department, located in San Antonio, Texas.

NFPA 286 does not have criteria for passing or failing a product due to performance during the fire test. In general, this test is used as a tool for ranking material performance in a standard configuration. However, a major event that this test can identify is the propensity of a material to cause a standard room to “flashover,” which according to NFPA 286, is determined to have occurred when two of five specified conditions are attained.

A summary of the test results obtained for “Sample 6EFWT Low E” is given in the table below.

**Summary of Test Results and Flashover Limits.**

<b>Material ID</b>	<b>Maximum Rate of Heat Release (Total)</b>	<b>Total Heat Flux to the Floor</b>	<b>Maximum Average Upper Layer Temperature</b>	<b>Flames Exiting Doorway</b>	<b>Auto-Ignition of Paper Target</b>
“Sample 6EFWT Low E” Scrimless Foil/Polyethylene Foam/White Scrimless Foil	261 kW	2.1 kW/m <sup>2</sup>	280°C	No	No
Flashover Limits Per Section 1.3.11 of NFPA 286	1,000 kW	20 kW/m <sup>2</sup>	600°C	Not Allowed	Not Allowed

Based on the test results, the material identified as “Sample 6EFWT Low E” did not cause the test room to flash over.

## **1.0 INTRODUCTION**

This report presents the results of a fire performance evaluation of a nominal 1/4-in. thick Scrimless Foil/Polyethylene Foam/White Scrimless Foil material identified as “Sample 6EFWT Low E,” for Environmentally Safe Products, Inc., of New Oxford, PA. Testing was conducted in general accordance with the 2006 Edition of National Fire Protection Association (NFPA) Standard 286, *Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth*. The test standard requires the material tested to be installed on the interior of the test room frame. At the Client’s request, a metal frame was constructed to simulate an actual metal building installation according to Environmentally Safe Products, Inc.’s Low-E installation instructions. The test material was installed behind the frame, on the walls and ceiling. Testing was conducted on June 6, 2006, by Southwest Research Institute’s® (SwRI®) Fire Technology Department, located in San Antonio, Texas.

## **2.0 OBJECTIVE**

This test method is intended for the evaluation of the flammability characteristics of wall and ceiling interior finish, other than textile wall coverings, where such materials constitute the exposed interior surfaces of buildings. It determines how much a material will contribute to a fire by measuring the amount of heat and smoke released, along with the combustion products released.

NFPA 286 does not have criteria for passing or failing a product due to performance during the fire test. In general, this test is used as a tool for ranking material performance in a standard configuration. However, a major event that this test can identify is the propensity of a material to cause a standard room to “flash over,” which according to NFPA 286, is determined to have occurred when two of five specified conditions are attained. The material being tested may perform differently when it is placed in a room of a different size or shape, or in different environmental conditions. The test data cannot be generalized to apply to these different conditions.

The results apply specifically to the specimens tested, in the manner tested, and not to similar materials, nor to the performance when used in combination with other materials.

## **3.0 TEST ASSEMBLY**

Environmentally Safe Products, Inc., provided a material identified as “Sample 6EFWT Low E” for testing in general accordance with NFPA 286. The material consisted of a nominal 1/4-in. thick Scrimless Foil/Polyethylene Foam/White Scrimless Foil with a nominal density of 1.1 pcf. One roll of the material, measuring 72 in. wide x 1008 in. long with a nominal unit weight of 5.73 oz per sq yd, was received at SwRI

on June 2, 2006. The samples were placed in a conditioning room maintained at 72°F and 50% relative humidity until the day of testing.

“Sample 6EFWT Low E” was attached to a skeletal metal room fabricated by SwRI staff according to drawings supplied by the Client (see Appendix D). Construction of the test room consisted of 3-5/8 x 1-5/8-in. x 16-ga. galvanized metal C-studs as main vertical corner supports. Zee-purlins measuring 6 x 2 x 1/2 in. x 14 ga. were used as the main horizontal supports and were spaced 32 in., on center. The bases of the walls were formed using 2 x 4-in. x 14-ga. base metal angle. The ceiling consisted of four zee-purlin supports placed 4 ft apart, on center. The outside dimensions of the skeletal room were 8 x 12 x 8 1/2 ft high. The test material was attached to the exterior side of the structure forming the test walls and ceiling and secured together with one layer of 0.004-in. thick aluminum foil tape on all joints and seams. The 1/2-in. thick type X gypsum board was attached over the test material, thus completing the assembly. “Sample 6EFWT Low E” and the gypsum board were secured using standard drywall screws backed with 1-1/4-in. fender washers every 24 in. on center to the zee-purlins.

#### **4.0 INSTRUMENTATION**

The rate of heat release is measured using the oxygen consumption technique. This technique requires the measurement of gas concentrations in the exhaust duct, as well as the volumetric flow of these gases. The products of combustion and entrained air are collected in a hood and extracted through an exhaust duct by a fan. A gas sample is drawn from the exhaust duct and analyzed for oxygen, carbon dioxide and carbon monoxide concentrations. The gas temperature and differential pressure across a bi-directional probe are measured for calculating the mass flow rate of the exhaust gases.

Smoke release rate is determined based on the measured light obscuration in the exhaust duct using a vertically-oriented white-light extinction photometer located close to the gas sampling point.

#### **5.0 TEST RESULTS**

The test was conducted at SwRI’s Fire Technology Department on June 6, 2006. The test room and building were at 75°F and 65% relative humidity during the test. Test results are summarized in graphical form in Appendix A. Relevant photographic documentation is provided in Appendix B, and visual observations can be found in Appendix C. A summary of the test results is given in Table 1 below.

**Table 1. Summary of Test Results and Flashover Limits.**

<b>Material ID</b>	<b>Maximum Rate of Heat Release (Total)</b>	<b>Total Heat Flux to the Floor</b>	<b>Maximum Average Upper Layer Temperature</b>	<b>Flames Exiting Doorway</b>	<b>Auto-Ignition of Paper Target</b>
"Sample 6EFTW Low E" Scrimless Foil/Polyethylene Foam/White Scrimless Foil	261 kW	2.1 kW/m <sup>2</sup>	280°C	No	No
Flashover Limits Per Section 1.3.11 of NFPA 286	1,000 kW	20 kW/m <sup>2</sup>	600°C	Not Allowed	Not Allowed

## 6.0 CONCLUSION

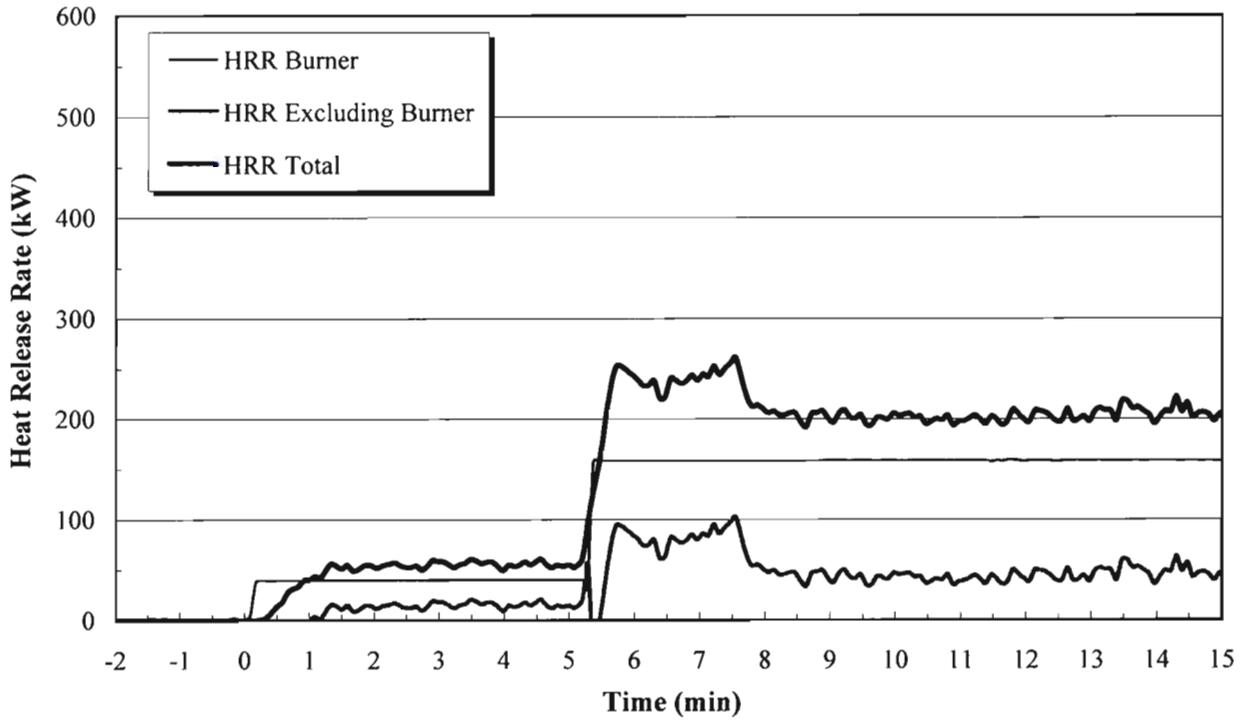
Based on the test data, "Sample 6EFTW Low E" of Environmentally Safe Products, Inc., did not cause the room to flash over.

**APPENDIX A**  
**TEST DATA**  
**(Consisting of 5 Pages)**

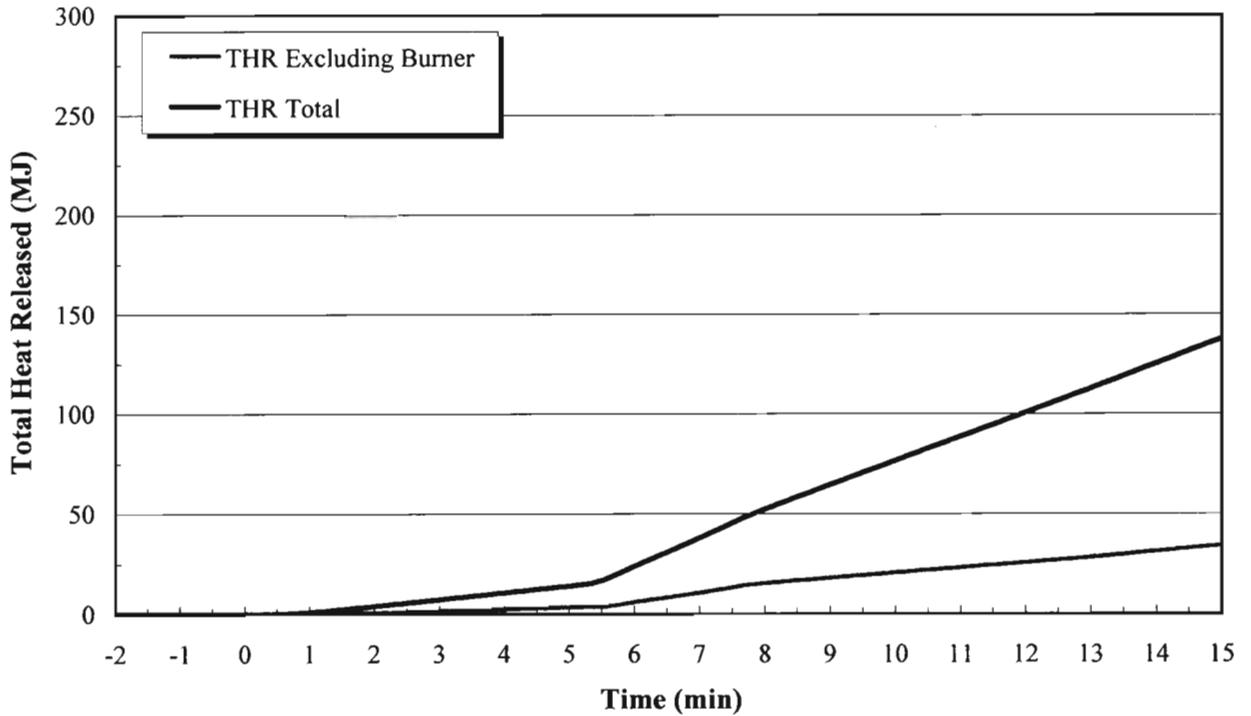
**SUMMARY OF  
 TEST RESULTS**

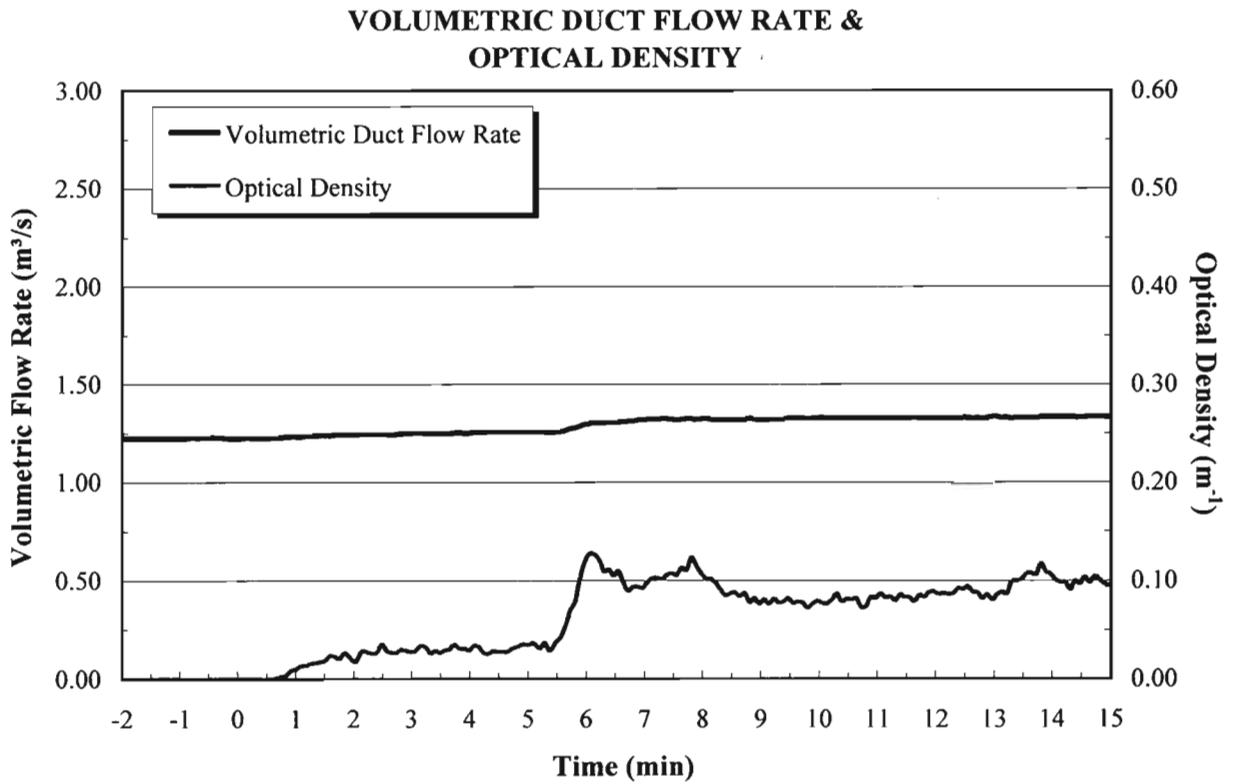
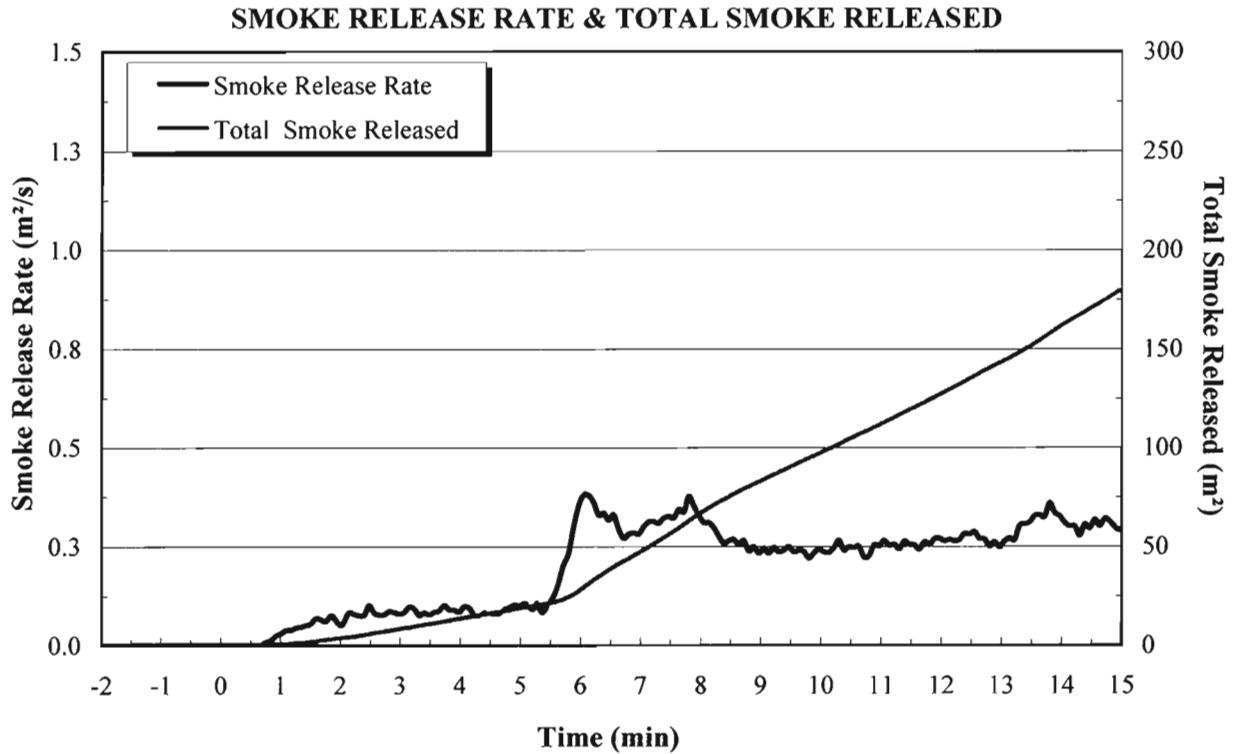
Maximum $HRR_{total}$	261 kW	at	7 min 33 sec
Average $HRR_{total}$	158 kW		
Total Heat Released	142 MJ		
Maximum $HRR_{excl. burner}$	103 kW	at	7 min 33 sec
Average $HRR_{excl. burner}$	39 kW		
Total Heat Released (Excluding Burner)	35 MJ		
Maximum Smoke Release Rate	0.38 m <sup>2</sup> /s	at	6 min 3 sec
Average Smoke Release Rate	0.20 m <sup>2</sup> /s		
Total Smoke Released	181 m <sup>2</sup>		
Maximum Optical Density	0.13 1/m	at	6 min 3 sec
Maximum Duct Flow Rate	1.30 m <sup>3</sup> /s		
Average Optical Density	0.069 1/m		
Average Volumetric Duct Flow Rate	1.30 m <sup>3</sup> /s		
Total Heat Flux to the Floor	2.1 kW/m <sup>2</sup>	at	13 min 18 sec
Max. Average Upper Layer Temperature	280°C 535°F	at	7 min 48 sec
Maximum Doorway Temperature	246°C 475°F	at	7 min 43 sec

### HEAT RELEASE RATE

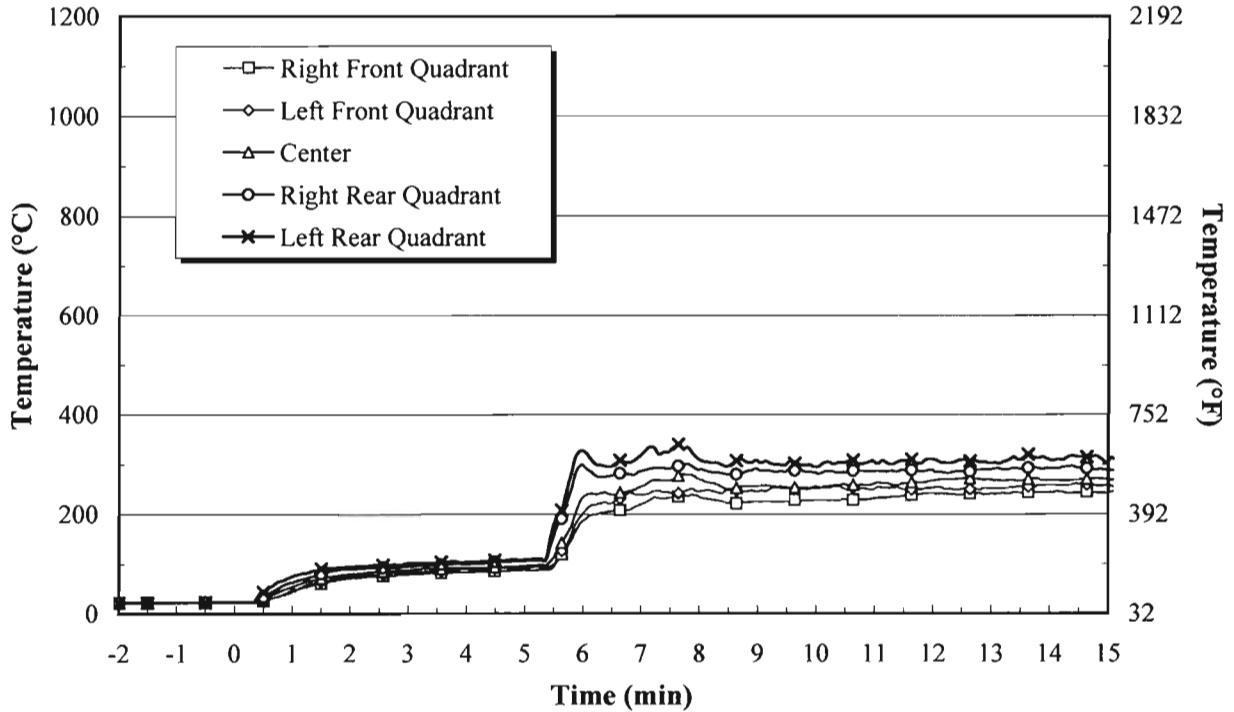


### TOTAL HEAT RELEASED

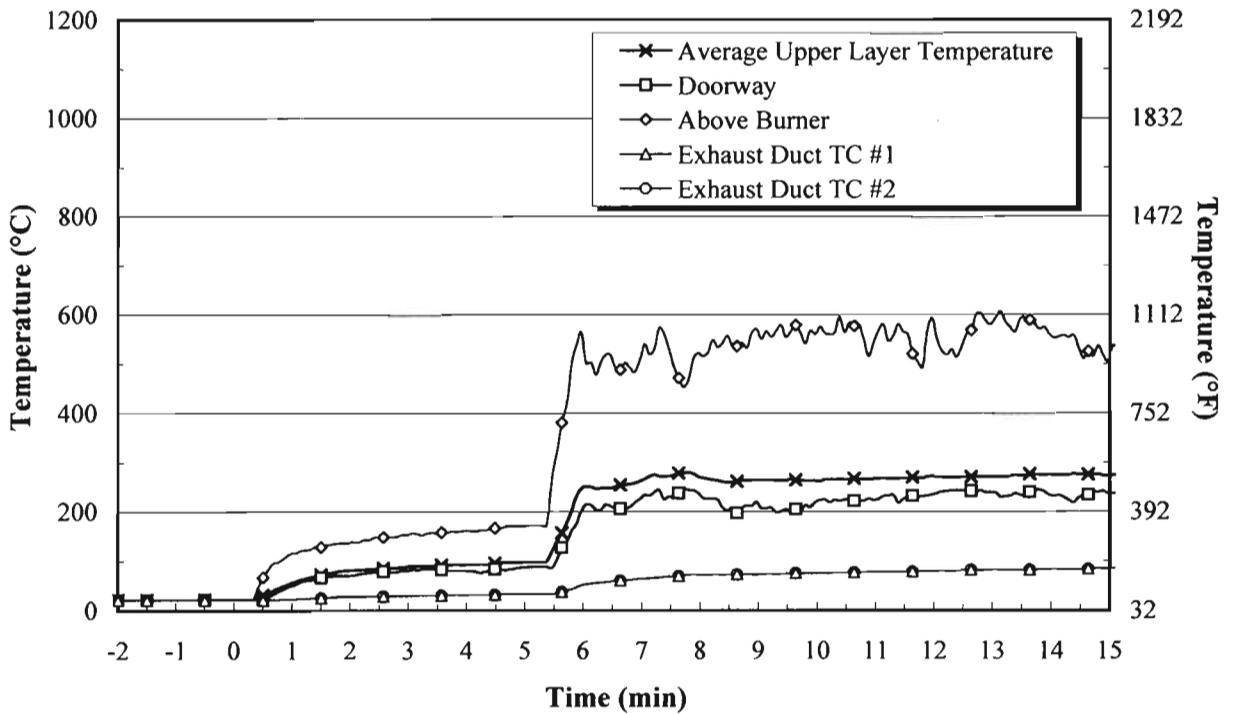


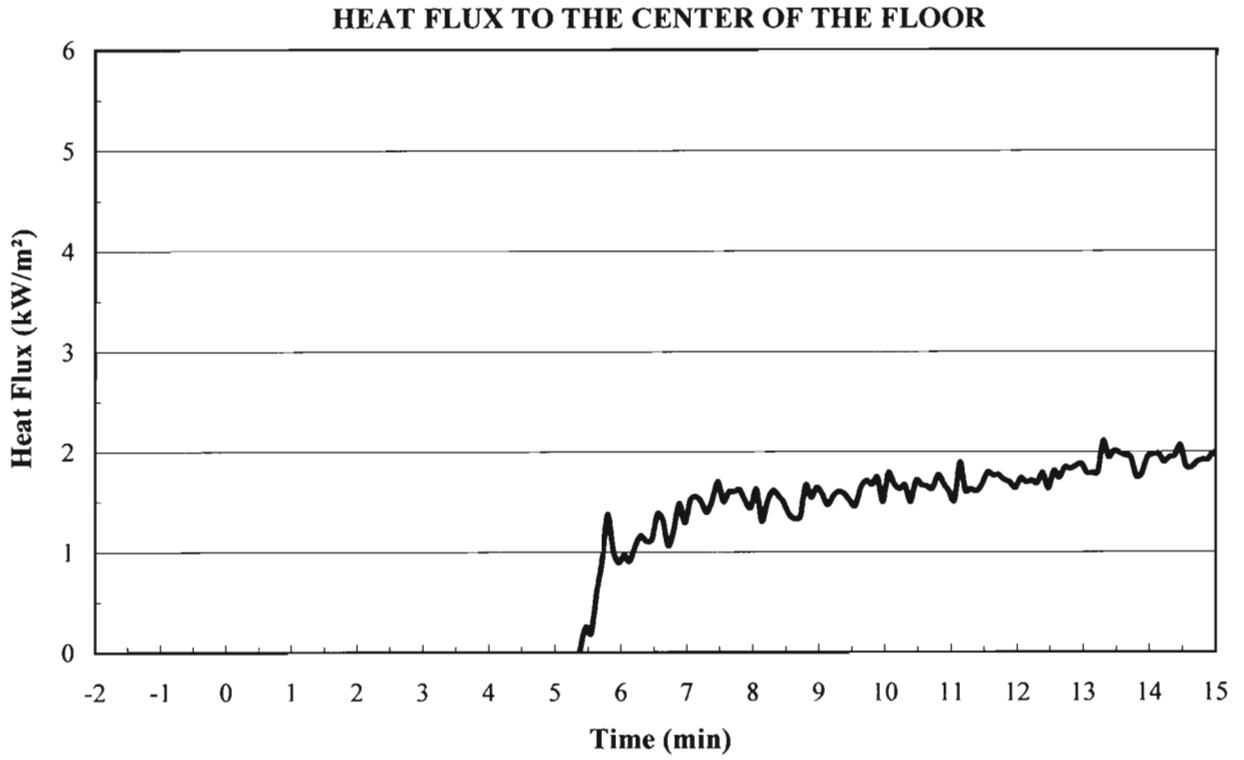


### UPPER LAYER TEMPERATURES

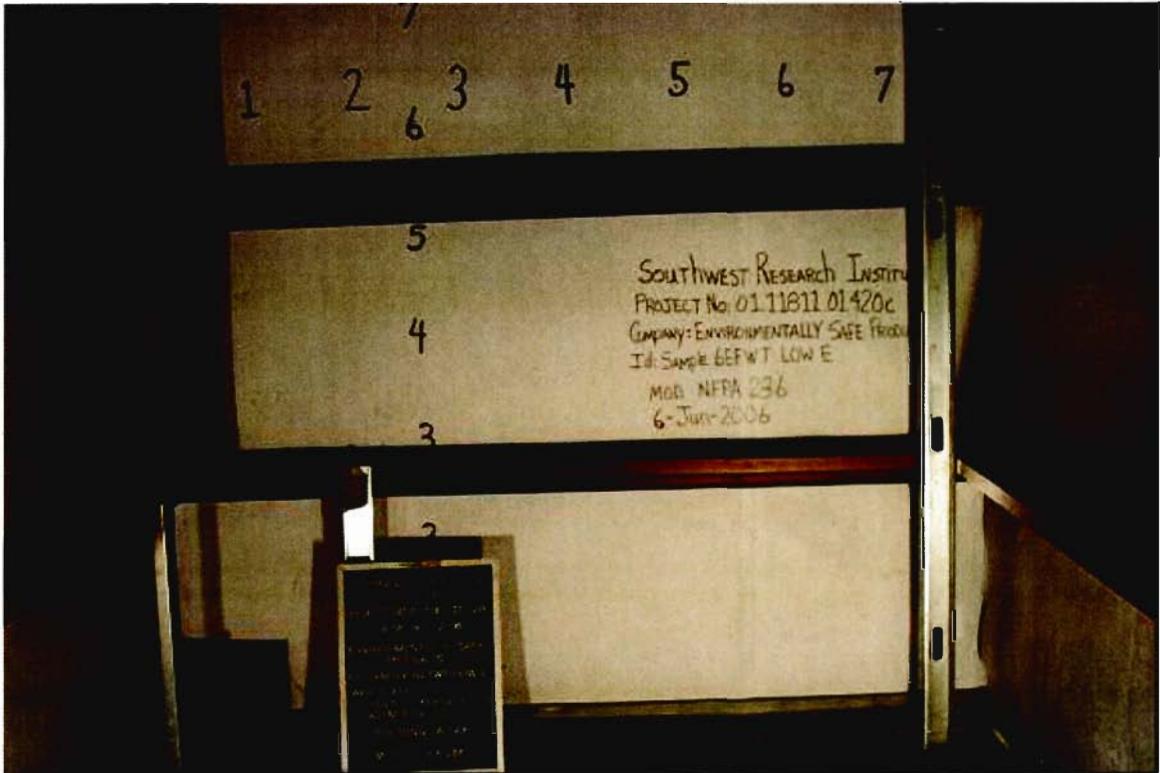


### DOORWAY, ABOVE BURNER, AND DUCT TEMPERATURES

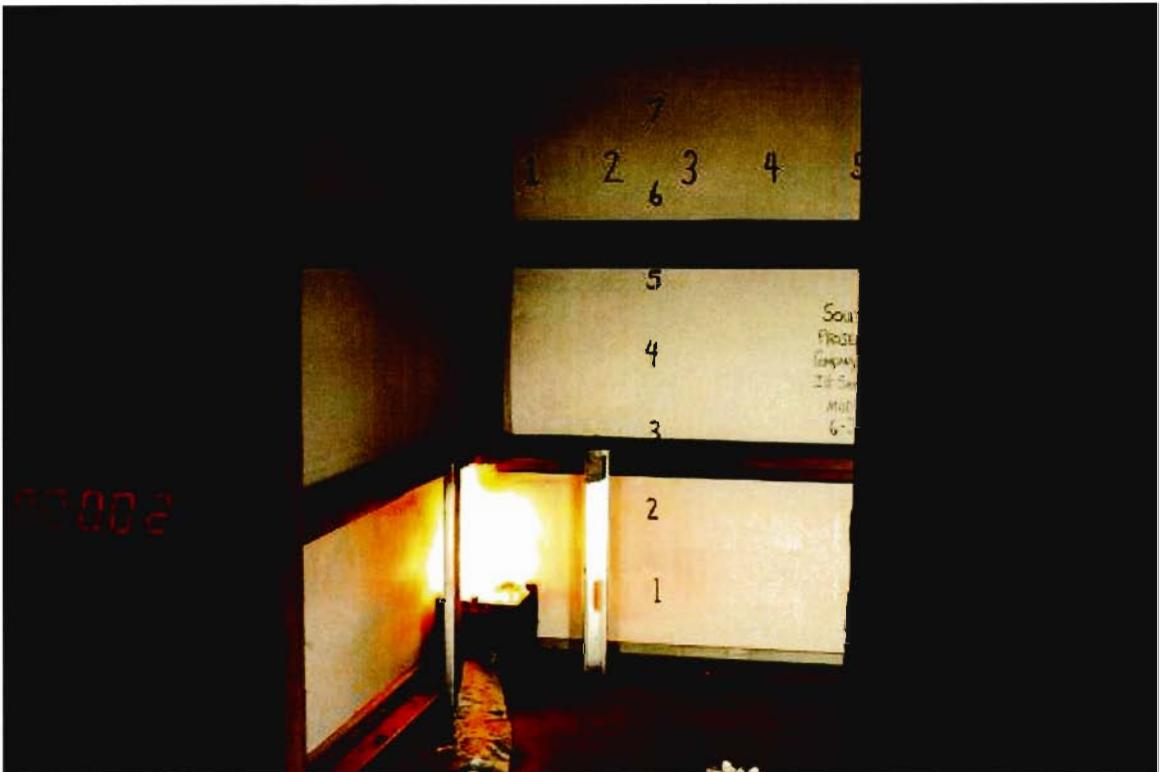




**APPENDIX B**  
**PHOTOGRAPHIC DOCUMENTATION**  
**(Consisting of 4 Pages)**



**Figure B-1. Pre-Test Conditions. Vertical Corner Support Studs Were Cut Away and Moved to Allow Placement of Burner Against Vertical Plane of Zee-Purlins.**





**Figure B-3. Approximately 4 Min Into Test.**



**Figure B-4. Burner Increased to 160 kW.**



**Figure B-5. Approximately 9 Min Into Test.**



**Figure B-6. Approximately 10 Min Into Test.**



**Figure B-7. Test Terminated. View of Room Interior, Back Wall and Ceiling.**



**Figure B-8. Test Terminated. View of Room Interior, Back Corner.**

**APPENDIX C**  
**VISUAL OBSERVATIONS**  
**(Consisting of 1 Page)**

Southwest Research Institute  
Project No. 01.11811.01.420c  
June 6, 2006  
Environmentally Safe Products, Inc.  
Material I.D.: "Sample 6EFTW Low E"  
Scrimless foil/polyethylene foam/White scrimless foil

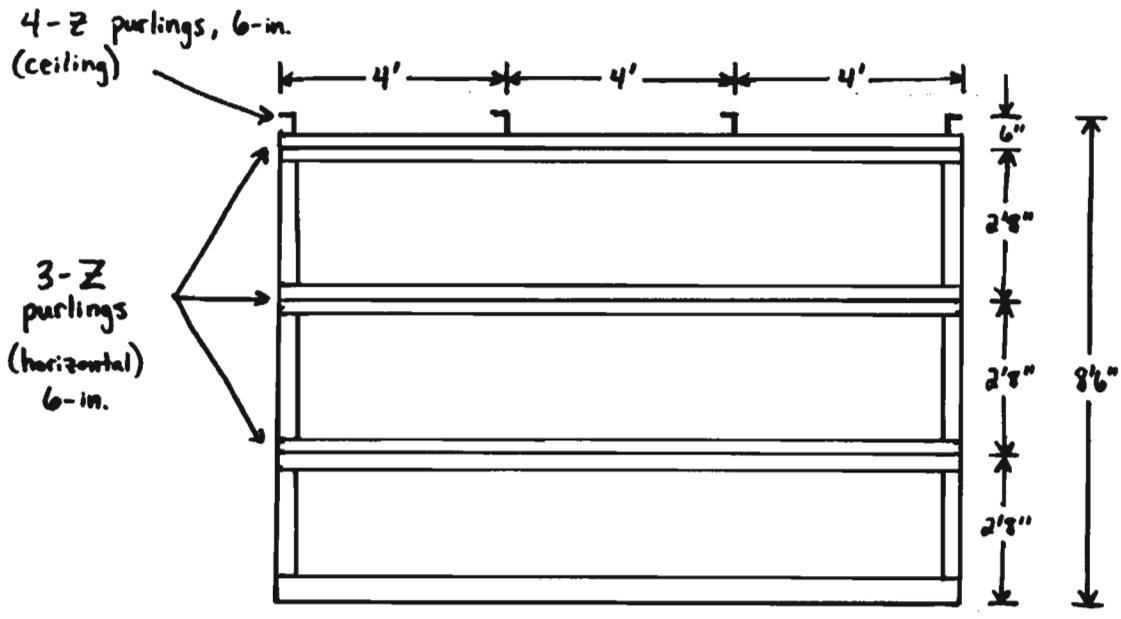
## OBSERVATIONS

TIME  
MIN:SEC

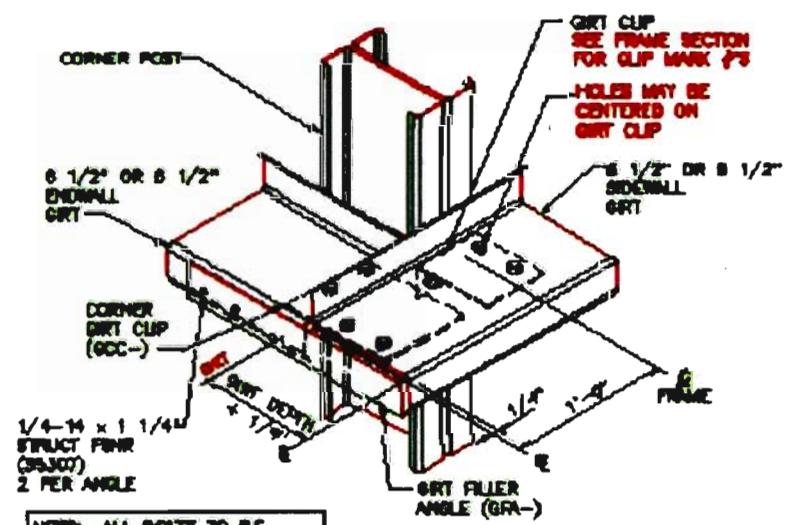
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- 00:00 Start of Test, **burner set at 40 kW.**
- 00:05 Flames from the burner up to the first horizontal zee-purlin.
- 00:30 Flames from the burner are 3 to 3 1/2 ft from the floor. Scorching on the building wrap at direct flame impingement from the burner on the left wall.
- 00:35 Ignition of the building wrap at direct flame impingement, from the top of the burner to the underside of the first zee-purlin.
- 01:45 Flames are 3 to 3 1/2 ft in height with flames to the underside of the first zee-purlin 2 to 3 ft laterally in both directions, smoke is light grey in color and down to 5 1/2 ft from the floor.
- 02:20 Ignition of the building wrap from the top of the burner to the underside of the first zee-purlin. No ignition or damage to the building wrap between the first to second zee-purlin.
- 04:00 Flames are 3 to 3 1/2 ft in height with flames to the underside of the first zee-purlin 2 to 3 ft laterally in both directions, smoke is light grey in color and down to 5 1/2 ft from the floor. Flames are burning on the left wall but not the back wall. No damage to the ceiling wrap.
- 05:00 **Burner increased to 40 kW.** Flames are up 7 to 7 1/2 ft in height in the burner corner. Flames are impinging on the ceiling from the burner.
- 05:10 Ignition of the building wrap on both walls up to 5 ft from the floor.
- 05:55 Flaming on the building wrap from the floor to the first zee-purlin and from the first to the second zee-purlin approximately 18 in. in width. No flaming between the second to the underside of the ceiling.
- 06:15 Flames are burning up to the first zee-purlin and spreading out to 3 ft along the underside of the zee-purlin. Flames are jumping from the underside of the first zee-purlin to the underside of the second zee-purlin and approximately 18 in. laterally away from the test corner. Flames then jump from the underside of the second zee-purlin to the ceiling building wrap.
- 09:00 Flaming on the building wrap from the top of the burner to the underside of the second zee-purlin. Light grey smoke in the room interior down to 5 1/2 ft above the floor.
- 09:51 All surface ignition of the building wrap has gone out.
- 13:00 Flames in the burner corner are intermittently touching the ceiling. Damage to the building wrap is approximately 18 in. in width from the top of the burner to the underside of the first zee-purlin and approximately 24 in. in width between the first and second zee-purlin and scorching from the second zee-purlin to the underside of the ceiling.
- 14:15 Light grey smoke down to 5 1/2 ft above the floor.
- 15:00 **End of Test,** burner extinguished.

**APPENDIX D**  
**CLIENT-SUPPLIED CONSTRUCTION DRAWING**  
**(Consisting of 1 Page)**



TEST ROOM FOR ENVIRONMENTALLY SAFE PRODUCTS, INC  
(side view)



NOTE: ALL BOLTS TO BE  
1/2" X 1 1/2" A325 (40000)  
TWENTY BOLTS TO "PLUS TEN"  
CONDITION AS DEFINED BY THE  
AISC/RISC SPECIFICATION FOR  
STRUCTURAL JOINTS USING A514  
325 OR A490 BOLTS

NOTE: GIRT CLIPS MAY BE SHOPWELDED.

GIRT CONN. AT CORNER POST  
ANY OUTSET GIRT AT EW, ANY GIRT AT SW

WS12B2