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INTERTEK ETL SEMKO

ASTM E84-05
SURFACE BURNING
CHARACTERISTICS OF
BUILDING MATERIALS

DECEMBER 22, 2006

“EPS FOAM”

STANDARD ICF CORPORATION
425 2ND AVE SW
ORONOCO, MN 55960

ASTM E84-05
SURFACE BURNING
CHARACTERISTICS OF
BUILDING MATERIALS*

“EPS FOAM”

Report No. 3111685SAT-001

December 22, 2006

* Modified to reflect Flame Spread and Smoke Developed Indices for both ceiling only and floor burning characteristics. A procedure for performing these calculations is not included in the ASTM E84-05 test method.

Prepared For:

Standard ICF Corporation
425 2nd Ave. SW
Oronoco, MN 55960

ABSTRACT

Test Material:	"EPS FOAM"		
Test Standard:	ASTM E 84-05 Standard Test Method for SURFACE BURNING CHARACTERISTICS OF BUILDING MATERIALS (ANSI 2.5, NFPA 255, UBC 8-1, UL 723)		
Test Date:	December 21, 2006		
Test Sponsor:	Standard ICF Corporation		
Test Results:	<u>Ceiling Only</u>	<u>Floor Only</u>	
	FLAME SPREAD INDEX	5	70
	SMOKE DEVELOPED INDEX	15	1200

The description of the test procedure and specimen evaluated, as well as the observations and results obtained, contained herein are true and accurate within the limits of sound engineering practice.

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Teodoro Alvarado Jr
Tunnel Operator

Date: December 21, 2006

Reviewed and approved:


C. Anthony Penalzoza
Flammability Testing Team Leader

Date: December 21, 2006

I. INTRODUCTION

This report describes the results of the ASTM E84-05 Standard Test Method for SURFACE BURNING CHARACTERISTICS OF BUILDING MATERIALS¹, a method for determining the comparative surface burning behavior of building materials. This test is applicable to exposed surfaces, such as ceilings or walls, provided that the material or assembly of materials, by its own structural quality or the manner in which it is tested and intended for use, is capable of supporting itself in position or being supported during the test period.

The purpose of the method is to determine the relative burning behavior of the material by observing the flame spread along the specimen. Flame spread and smoke density developed are reported, however, there is not necessarily a relationship between these two measurements.

"The use of supporting materials on the underside of the test specimen may lower the flame spread index from that which might be obtained if the specimen could be tested without such support... This method may not be appropriate for obtaining comparative surface burning behavior of some cellular plastic materials... Testing of materials that melt, drip, or delaminate to such a degree that the continuity of the flame front is destroyed, results in low flame spread indices that do not relate directly to indices obtained by testing materials that remain in place."

This test method is also published under the following designations:

ANSI 2.5
NFPA 255
UBC 8-1
UL 723

This standard should be used to measure and describe the properties of materials, products, or assemblies in response to heat and flame under controlled laboratory conditions and should not be used to describe or appraise the fire hazard or fire risk of materials, products, or assemblies under actual fire conditions. However, results of this test may be used as elements of a fire risk assessment which takes into account all of the factors which are pertinent to an assessment of the fire hazard of a particular end use.

¹ American Society for Testing and Materials (ASTM), Committee E-5 on Fire Standards.

II. PURPOSE

The ASTM E84-05 (25 foot tunnel) test method is intended to compare the surface flame spread and smoke developed measurements to those obtained from tests of mineral fiber cement board and select grade red oak flooring. The test specimen surface (18 inches wide and 24 feet long) is exposed to a flaming fire exposure during the 10 minute test duration, while flame spread over its surface and density of the resulting smoke are measured and recorded. Test results are presented as the computed comparisons to the standard calibration materials.

The furnace is considered under calibration when a 10 minute test of red oak decking will pass flame out the end of the tunnel in five minutes, 30 seconds, plus or minus 15 seconds. Glass fiber cement board forms the zero point, while the red oak flooring smoke developed rating is set as 100.

III. DESCRIPTION OF TEST SPECIMENS

Specimen Identification:	"EPS FOAM"
Date Received:	November 10, 2006
Date Conditioned:	November 10, 2006
Date Tested:	December 21, 2006
Conditioning (73°F & 50% r.h.):	41 days
Specimen Width (in):	24
Specimen Length (ft):	24
Specimen Thickness:	2.4560 Inches
Material Weight:	N/A
Total Specimen Weight (pounds):	26.7
Adhesive or coating application rate:	N/A

Mounting Method:

The expanded polystyrene panels were self-supporting.

Specimen Description:

The specimen consisted of (6) 4-ft. long x 24-in. wide 2.4560-in. thick, White Expanded Polystyrene Panels. The Expanded Polystyrene Panels were a nominal 2.5-in. thick. The panels were received by our personnel in good condition. The specimen was identified by the client as "EPS FOAM".

IV. TEST RESULTS & OBSERVATIONS

The test results, computed on the basis of observed flame front advance and electronic smoke density measurements are presented in the following table. In recognition of possible variations and limitations of the test method, the results are computed to the nearest number divisible by five, as outlined in the test method.

While no longer a part of this standard test method, the Fuel Contributed Value has been computed, and may be found on the computer printout sheet in the Appendix.

Test Specimen	Flame Spread Index	Smoke Developed Index
Mineral Fiber Cement Board	0	0
Red Oak Flooring		100
"EPS FOAM"		
Ceiling Burning Only*	5	15
Floor Burning Only*	70	1200

* The practice of separating the Flame Spread and Smoke Developed Indices for floor and ceiling burning is not described in any of the standard test methods. This practice has apparently been established by Underwriters Laboratories even though not included in their UL 723 standard. Due to the acceptance of this practice by the U.S. model building code evaluation services, it has been included in this document. The calculations have been made by determining the maximum flame front progression on the ceiling at any point prior to the occurrence of floor ignition and using that time*distance value to calculate $A_{T(\text{ceiling only})}$. The Flame Spread Index given as "Floor Burning" has been calculated using the same procedure as for the "Ceiling Only", except that the ceiling portion of the flame front progression has been removed and the floor burning calculations start when the material on the tunnel floor ignited. The smoke developed index for each has been calculated by considering the area under the %T*time curve. The "Ceiling Only" index has been calculated using the area under the curve up to the point of ignition on the floor. The "Floor Only" index has been calculated using the area under the curve after ignition of the material on the tunnel floor. The Smoke Developed Index on the data sheet is that calculated in accordance with the ASTM E84 standard for the total test.

The data sheets are included in Appendix A. These sheets are actual print-outs of the computerized data system which monitors the ASTM E84 apparatus, and contain all calibration and specimen data needed to calculate the test results.

V. OBSERVATIONS

The expanded polystyrene panels ignited at 0:06 (min:sec.). Flaming drops began to fall from the specimen at 0:08 (min:sec.). The floor of the apparatus ignited at 0:40 (min:sec). Flames reached the end of the tunnel at 6:16 (min:sec.). The test continued for the 10:00 duration. After the test burners were turned off, a 60 second afterflame was observed. .

After cooling, lifting the tunnel lid and removing the tunnel board backing, the specimen was observed to be consumed from 0-ft. – 24-ft.

APPENDIX

ASTM E84-05

DATA SHEETS

ASTM E84-05

Client: STANDARD ICF CORPORATION
Date: 12/21/2006
Project Number: 3111685SAT-001
Test Number: 6
Operator: TA/EA
Specimen ID:

TEST RESULTS

FLAMESPREAD 70
SMOKE DEVELOPED INDEX: 1200

SPECIMEN DATA . . .

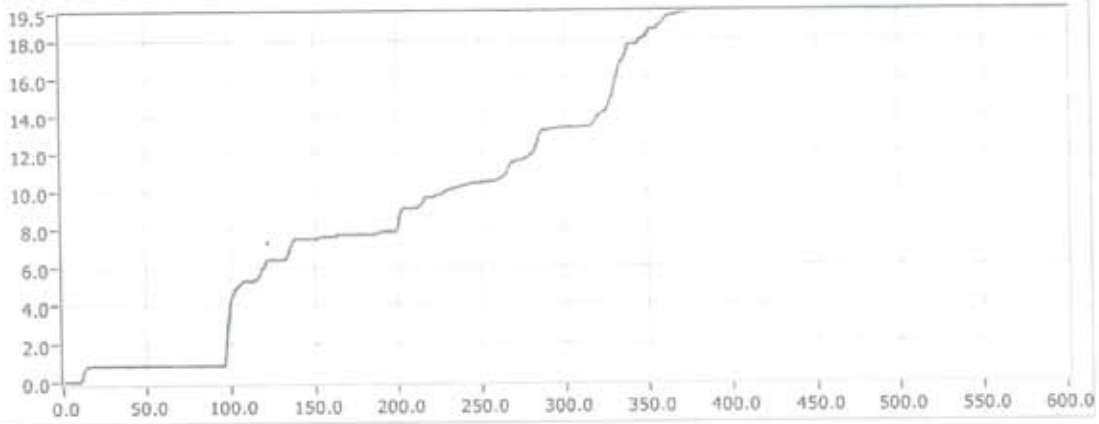
Time to Ignition (sec): 6
Time to Max FS (sec): 372
Maximum FS (feet): 19.5
Time to 980 F (sec): 377
Time to End of Tunnel (sec): 376
Max Temperature (F): 1186
Time to Max Temperature (sec): 527
Total Fuel Burned (cubic feet): 50.51

FS*Time Area (ft*min): 124.5
Smoke Area (%A*min): 878.4
Unrounded FSI: 69.5

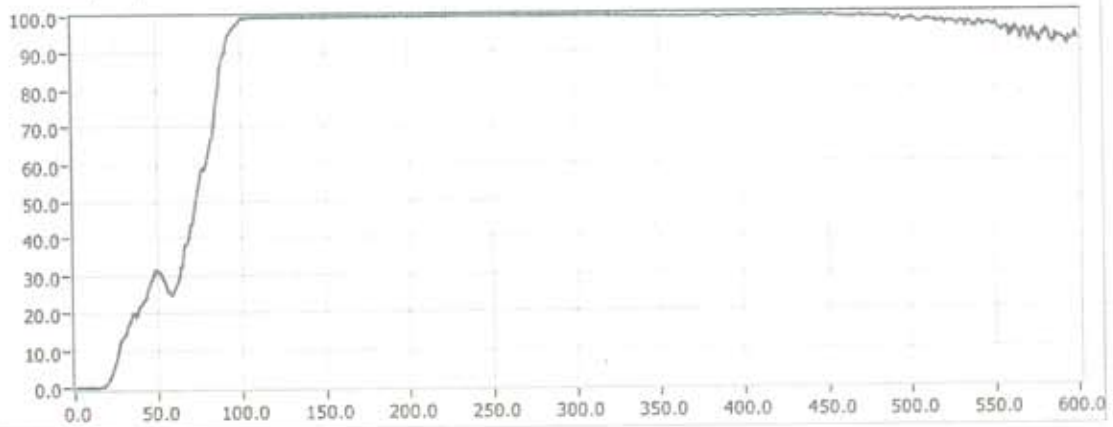
CALIBRATION DATA . . .

Time to Ignition of Last Red Oak (Sec): 46.0
Red Oak Smoke Area (%A*min): 72.8

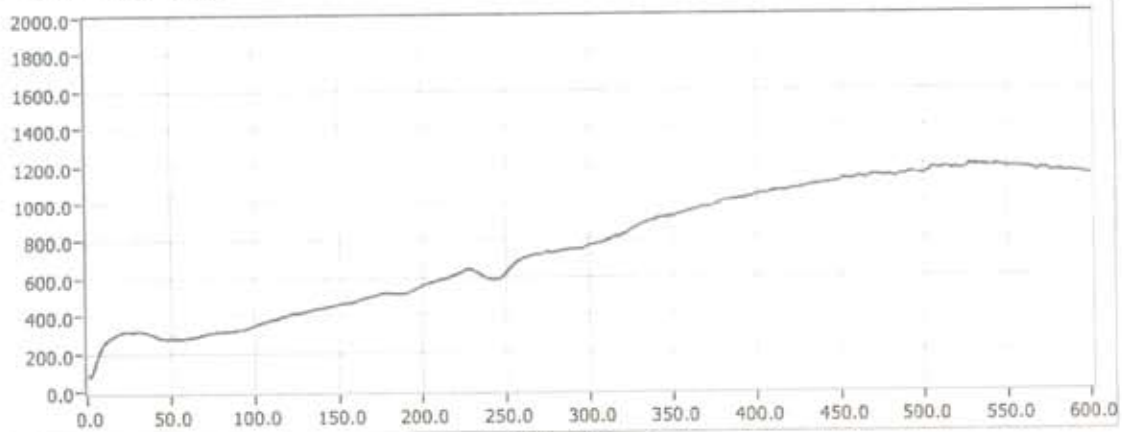
FLAME SPREAD (ft)



Smoke (%A)



Temperature (°F)



Time (sec)

600