



CURRENT TESTS	TEST STANDARD	RESULTS	
FOAM			
Compressive Strength & Modulus	ASTM D-1624-00	Strength	35 psi
Compressive Strength & Modulus	ASTM D-1624-00	Modulus	790 psi
Density	ASTM D-1622-98		2.5 pcf
Dimensional Stability	ASTM D-2126-99		
Flammability	ASTM E-84-01 (Tunnel Test)		<400
Flammability	ASTM E-162-90 (Radiant Panel)		<25
Foam Core Fire Rating		*** Integrity	CLASS 1
Linear Coefficient of Thermal Expansion	ASTM D-696-98		
Closed Cell Content by Air Pycnometer	ASTM D-2856-87		>96%
Shear Strength and Modulus	ASTM C-273-61 (1985)	Strength	26 psi
Shear Strength and Modulus	ASTM C-273-61 (1988)	Modulus	325 psi
Resistance to Solvent	ASTM D-543-95 (2001)		Excellent
Resistance to Mold/Mildew	ASTM D-543-95 (2001)		Excellent
Sound Transmission	see sound test chart		
Thermal Conductivity	ASTM C-518-91	K-factor	0.14(Btu-in/ft ² hr°F)
Thermal Conductivity	ASTM C-518-91	R-Value	7.25 per inch
Tensile Strength and Modulus	ASTM D-1623-78 (1995)	Strength	16 psi
Tensile Strength and Modulus	ASTM D-1623-78 (1995)	Modulus	325 psi
Water Absorption	ASTM D-2842-01		2.40%
Vapor Permeability	ASTM D-2842-01		2 perm/in

*** Polyurethane foam is a "thermo-set" plastic. It retains its structural integrity until completely consumed by fire. Melting does NOT occur.

CURRENT TESTS	TEST STANDARD	RESULTS	
Structural Panel***			
Compression	ASTM E-72-98 section 9	Surfaces	Max load (Avg)
Transverse	ASTM E-72-98 section 11	*OSB/OSB	50624
Racking	ASTM E-72-98 section 14	*OSB/OSB	6734
		*OSB/OSB	4897
Compression	ASTM E-72-98	**GALV/GALV	13366
Transverse	ASTM E-72-98	**GALV/GALV	4900
Racking	ASTM E-72-98	**GALV/GALV	6723
* 7/16" OSB both surfaces			
** 24 GA Galvanized both surfaces			
*** Panel Size = 4-1/2" X 48" X 96"			

NCFI/ICS FOAM TESTING

CURRENT TEST METHODS FOR RIGID URETHANE FOAM

1.	Compressive Strength & Modulus	ASTM D-1621-00
2.	Density	ASTM D-1622-98
3.	Dimensional Stability	ASTM D-2126-99
4.	Flammability	ASTM E-84-01 (Tunnel Test) ASTM E-162-90 (Radiant Pa
5.	Linear Coefficient of Thermal Expansion	ASTM D-696-98
6.	Open Cell Content by Air Pycnometer	ASTM D-2856-87
7.	Shear Strength and Modulus	ASTM C-273-61 (1988)
8.	Solvent Resistance	ASTM D-543-95 (2001)
9.	Thermal Conductivity	ASTM C-518-91
10.	Tensile Strength and Modulus	ASTM D-1623-78 (1995)
11.	Water Absorption	ASTM D-2842-01

ASTM E84-00a
SURFACE BURNING
CHARACTERISTICS
NCFI 34-135

Report No. 15383 - 110337

January 3, 2002

Prepared For:

North Carolina Foam Industries
Division of Barnhardt Mfg. Co.
1515 Carter Street
Mount Airy, NC 27030, U.S.A.



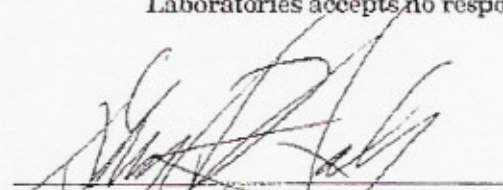
ABSTRACT

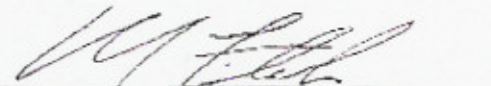
Test Material:	NCFI 34-135		
Test Standard:	ASTM E84-00a Standard Test Method for SURFACE BURNING CHARACTERISTICS OF BUILDING MATERIALS (ANSI 2.5, NFPA 255, UBC 8-1, UL 723)		
Test Date:	December 21, 2001		
Test Sponsor:	North Carolina Foam Industries		
Test Results:	FLAME SPREAD INDEX	=	25
	SMOKE DEVELOPED INDEX	=	400

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. These results are valid only for the specimen(s) tested and may not represent the performance of other specimens from the same or other production lots.

Omega Point Laboratories, Inc. authorizes the client named herein to reproduce this report only if reproduced in its entirety.

The test specimen identification is as provided by the client and Omega Point Laboratories accepts no responsibility for any inaccuracies therein.



Guy A. Haby
Fire Test TechnologistDate: January 3, 2002

William E. Fitch, P.E. No. 55296
Executive Vice PresidentDate: January 3, 2002

I. INTRODUCTION

This report describes the results of the ASTM E84 Standard Test Method for SURFACE BURNING CHARACTERISTICS OF BUILDING MATERIALS (1), 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 (42-1)
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 (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. Mineral fiber cement board forms the zero point for both flame spread and smoke developed indexes, while the red oak flooring smoke developed index is set as 100.

III. DESCRIPTION OF TEST SPECIMENS

Specimen Identification: NCFI 34-135

Date Received: 12/13/01
Date Prepared: December 13, 2001
Conditioning (73°F & 50% R.H.): 8 days
Specimen Width (in): 24
Specimen Length (ft): 24
Specimen Thickness: 4-in. nominal
Material Weight: N/A oz./sq. yd.
Total Specimen Weight: 31.23-lbs.
Adhesive or coating application rate: N/A

Mounting Method:

The specimen was self-supporting and was placed directly on the inner ledges of the tunnel.

Specimen Description:

The specimen was described by the client as "NCFI 34-135, 4" polyurethane foam". The specimen consisted of (3) 24" wide x 8' long x 4" thick rigid foam insulation panels. The testing was witnessed by Sr. Chemist, John Oliver.

IV. TEST RESULTS

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
Mineral Fiber Cement Board	0	0
Red Oak Flooring	n/a	100
NCFI 34-135	25	400

The data sheets are included in the Appendix. 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

During the test, the specimen was observed to behave in the following manner: Steady ignition began at 0:02 (min:sec). The test continued for the 10:00 duration. Upon completion of the test, the methane test burners were turned off and an afterflame continued for 0:60+.

After the test, the specimen was observed to be damaged in the following manner: The specimen had a heavy black discoloration from 0-ft. - 24-ft. The foam was charred from 0-ft. - 10-ft. The foam was swollen approximately 3-in. thick from 1-ft. - 4-ft. and blistered from 17-ft. - 20-ft.



APPENDIX

DATA SHEETS



ASTM E84 DATASHEETS

Client: NCFI

Date: 12/21/01

Time: 9:56 AM

Test Number: 1

Project Number: 15383-110337

Operator: CH/EH

Specimen ID: "NCFI 34-135, 4" POLYURETHANE FOAM". THE SPECIMEN WAS SELF-SUPPORTING.

TEST RESULTS

FLAMESPREAD INDEX: 25
SMOKE DEVELOPED INDEX: 400

SPECIMEN DATA . . .

Time to Ignition (sec): 2
Time to Max FS (sec): 32
Maximum FS (feet): 5.1
Time to 980 °F (sec): Never Reached
Max Temperature (°F): 668
Time to Max Temperature (sec): 404
Total Fuel Burned (cubic feet): 43.89

FS*Time Area (ft²*min): 502
Smoke Area (%A*min): 378.9
Fuel Area (°F*min): 5932.9
Fuel Contributed Value: 19
Unrounded FSI: 25.8

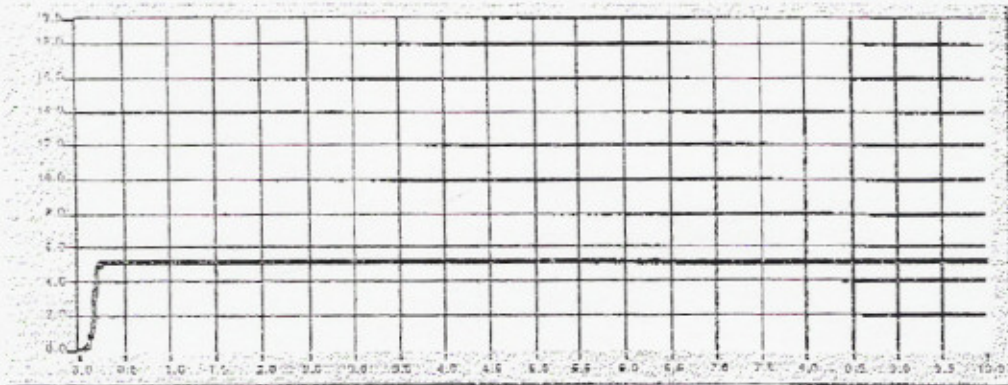
CALIBRATION DATA . . .

Time to Ignition of Last Red Oak (sec): 60
Red Oak Smoke Area (%A*min): 100.00
Red Oak Fuel Area (°F*min): 8548
Glass Fiber Board Fuel Area (°F*min): 5311

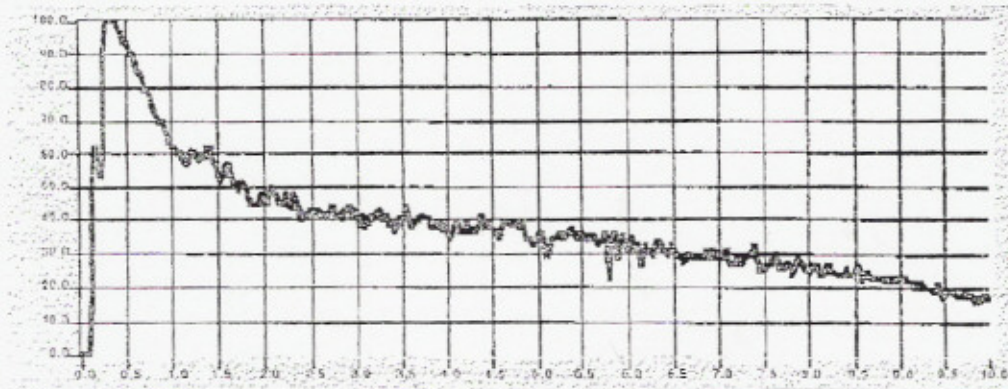


Project No: 15383-110337

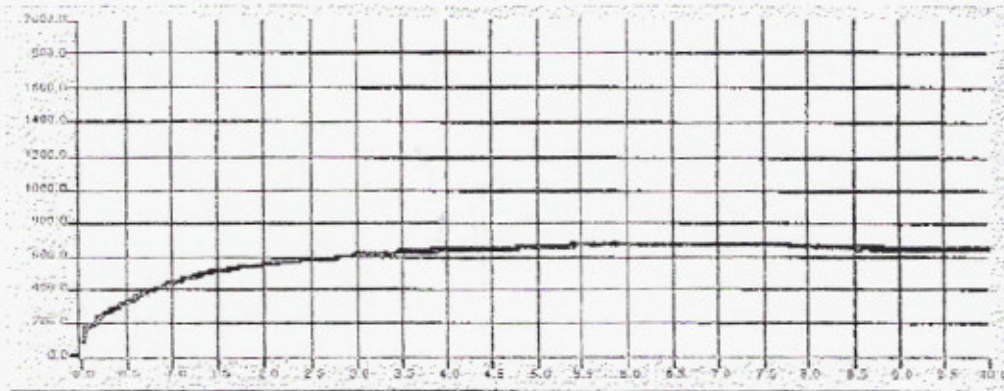
FLAME SPREAD (ft)



Smoke (%A)



Temperature (°F)



Time (min)

