ASTM E162 TESTING
FOR TPR^2
ON
FLEXIBLE FIRESHELL™
MASTIC AFES-M1
VTEC #100-2432
TESTED: JUNE 19, 2006

VTEC Laboratories Inc.

June 19, 2006

Client: TPR[2]
161 Interstate Lane
Waterbury, CT 06705

Attention: Mr. Rick Barone

I. SCOPE:

This report contains the reference to the test method, purpose, limitation, test procedure notes, preparation, and conditioning of specimens, calibration and reference samples, description of materials, operating data, and test results.

II. TEST METHOD:

The test was conducted in accordance with ASTM Designation E-162, "Standard Method of Test for Surface Flammability of Materials Using a Radiant Heat Energy Source".

III. PURPOSE:

The purpose of the test is to determine the relative surface flammability performance of various materials under specific test conditions when using a radiant heat source. The results are recorded as a Flamespread Index.

The surface flammability results of the radiant panel are sometimes used by building code authorities and the regulatory agencies for the acceptance of interior finish, kitchen cabinet materials, and products for various applications.

III. PURPOSE(con't)

The flamespread classification system used by most of the model building codes and the National Fire Protection Association Life Safety Code, NFPA No.101, encompasses the following:

Class A	(I)	0	to	25	Flamespread
Class B	(II)	26	to	75	Flamespread
Class C	(III)	76	to	100	Flamespread

IV. LIMITATIONS:

The Flamespread Classification system outlined above was based on the premise that the higher the flamespread numbers, the greater the fire hazard. The relationship between the numbers developed under ASTM E-162 and other surface flammability tests and life safety from fire has not been adequately established. The phenomenon of a destructive fire is very complicated and probably precludes the use of a single index to describe the level of fire hazard.

While existing flamespread test methods are useful tools, caution should be exercised in the use and interpretation of the numbers resulting; linearity should not be assumed: a material with a flamespread of 150 is not necessarily twice as hazardous as a material with a flamespread of 75.

V. TEST PROCEDURE NOTES:

A radiant panel 12" wide by 18" high of porous refractory material mounted vertically is preheated with a gas-air mixture to a radiant output equal to that obtained from a black body of the same dimensions operating at a temperature of 1238 +/- 7°F. (670 +/- 4°C).

A test specimen 6 inches wide by 18 inches high, suitably mounted in a frame is placed facing the radiant panel, but inclined at an angle of 30 degrees from top downward. A pilot burner adjusted to provide a 6" to 7" flame serves to ignite the sample at the top. The material under test burns downward. The operator records the flame

V. TEST PROCEDURE NOTES (con't)

progression time at 3, 6, 9, 12, and 15 inch interval marks measured from the top of the sample. The operator records the maximum temperature increase resulting from the burning sample measured by 8 thermocouples connected in parallel and located in the sheet metal stack above the tested sample. The Flamespread Index is derived by the following formula:

$$Is = Fs \times Q$$

where.... **Is** is the Flamespread Index
Fs is the Flamespread Factor
Q is the Heat Evolution Factor

The following provides a description of the two factors from which the Flamespread Index is calculated:

1) **Fs** - Flamespread Factor is determined by the speed at which the flame front burns down the specimen. The higher the value, generally the faster the specimen burns.

Specifically, the Fs is the sum of: one, plus the reciprocal of the times in minutes that the flame front burns from each of the three inch intervals down the specimen:

$$Fs = 1 + \frac{1}{t3} + \frac{1}{t6-t3} + \frac{1}{t9-t6} + \frac{1}{t12-t9} + \frac{1}{t15-t12}$$

Where **t3** equals the time at 3", **t6** the time at 6", and so on. Excluding the first term, **1**, when the value of any term exceeds the value of any of the preceding terms, a special calculation procedure is used as outlined in E-162.

2) **Q** - Heat Evolution Factor is determined by the maximum temperature developed in the stack above the burning sample as a result of the burning characteristics of the material under test. Generally, the higher the value, the larger and/or hotter the flame during burning.

$$Q = \frac{5.7 \times T}{B}$$

where.....
5.7 is an arbitrary constant used to keep the results of this test consistent with results obtained prior to the metrification of this test.

V. TEST PROCEDURE NOTES(con't)

T is the maximum stack temperature rise in Celsius over that obtained with an asbestos board specimen.

B is a constant for each test apparatus derived from relating stack thermocouple temperature rise in degrees C to heat input in kilowatts.

VI. PREPARATION AND CONDITIONING OF TEST SAMPLES:

The 6" by 18" specimens are predried for 24 hours at 140°F (60°C) and then conditioned to equilibrium at a controlled temperature of 73°F (23 +/- 3°C), and a relative humidity of 50 +/- 5 percent.

Occasionally for research and development informational purposes, fewer than four determinations are conducted on a given sample.

VII. CALIBRATION AND REFERENCE STANDARD:

The VTEC radiant panel has been calibrated using the procedures as outlined in ASTM E-162 and in the Appendix to the standard. In addition to the periodic recalibration, VTEC from time to time checks procedural details and testing techniques by the use of surface flammability standard reference material #1002 (1/4" hardboard) obtained from the National Bureau of Standards.

VIII. DISCLAIMER:

This is a factual report of the results obtained from the laboratory tests of sample products. The results may be applied only to the products tested and should not be construed as applicable to other similar products of the manufacturer. The report is not a recommendation or a disapprobation by VTEC Laboratories Inc. of the material tested. While this report may be used for obtaining product acceptance, it may not be used in advertising.

E162 FLAME SPREAD DATA

COMPANY:	TPR^2 Corporation	VTEC #	100-2432
PRODUCT:	Flexible Fireshell™ Mastic AFES-M1		
COLOR:	White	AL FOIL ?	YES
DIMENSIONS:	6" X 18"	EXP TIME:	15 MIN.
THICKNESS:	0.500"	DATE:	6/19/2006
SPECIAL PREPARATION:			
OBSERVATIONS:	No unusual observations.		

TIME TO...	3 INCHES min.	6 INCHES min.	9 INCHES min.	12 INCHES min.	15 INCHES min.
SPECIMEN#					
1	4.87	-	-	-	-
2	5.50	-	-	-	-
3	-	-	-	-	-
4	-	-	-	-	-

SPECIMEN#	Fs	Q	Sample Wt KG	Base Temp deg C	Max Temp deg C	Is INDEX
1	1.21	4.69	1.097	209.0	233.9	5.65
2	1.18	5.15	1.093	211.5	238.8	6.09
3	1.00	6.54	1.074	214.0	248.7	6.54
4	1.00	5.61	1.076	216.5	246.2	5.61
AVERAGE :	1.10	5.50	1.085	212.8	241.9	5.97

TEST RESULTS:

AVG. FLAMESPREAD FACTOR (FS) =	1.10		
AVERAGE HEAT OF EVOLUTION (Q) =	5.50		
AVERAGE FLAMESPREAD INDEX (Is) =	**5.97**		
FLAMESPREAD INDEX RANGE (Is) =	5.61	TO	6.54

Neil Schultz
Executive Director

Amirudin Rahim
Technical Director