

Exova  
2395 Speckman Dr.  
Mississauga  
Ontario  
Canada  
L5K 1B3

T: +1 (905) 822-4111  
F: +1 (905) 823-1446  
E: sales@exova.com  
W: www.exova.com



Testing. Advising. Assuring.

**UNCONTROLLED ELECTRONIC COPY**

**ASTM E 662 Rate of Smoke Generation  
of "PH-63 (6477-54) Item Number 1009-08151"**

A Report To: **Uniroyal Engineered Products LLC**  
501 South Water Street  
Stoughton, WI 53589  
USA

Phone: (608) 873-6631 ext.226

Attention: Raymond Venn  
E-mail: rvenn@nauga.com

Submitted By: Exova Warringtonfire North America

Report No. 15-002-781(B)  
3 pages + appendix

Date: December 18, 2015

**ACCREDITATION** To ISO/IEC 17025 for a defined Scope of Testing by the International Accreditation Service

**SPECIFICATIONS OF ORDER**

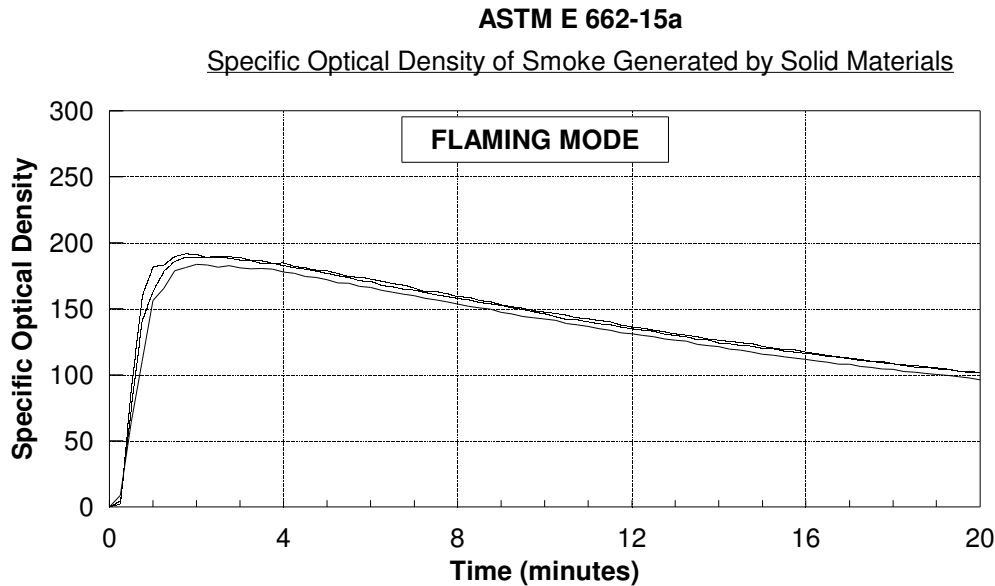
Determine rate of smoke generation according to ASTM E 662, as per Uniroyal Engineered Products Purchase Order No. 4500022560 and Exova Warringtonfire North America Quotation No. 15-002-390,235 RV1 accepted December 9, 2015.

**IDENTIFICATION**

Fabric-supported vinyl material, Naugahyde Phoenix Line, identified as "PH-63 (6477-54) Item Number 1009-08151".

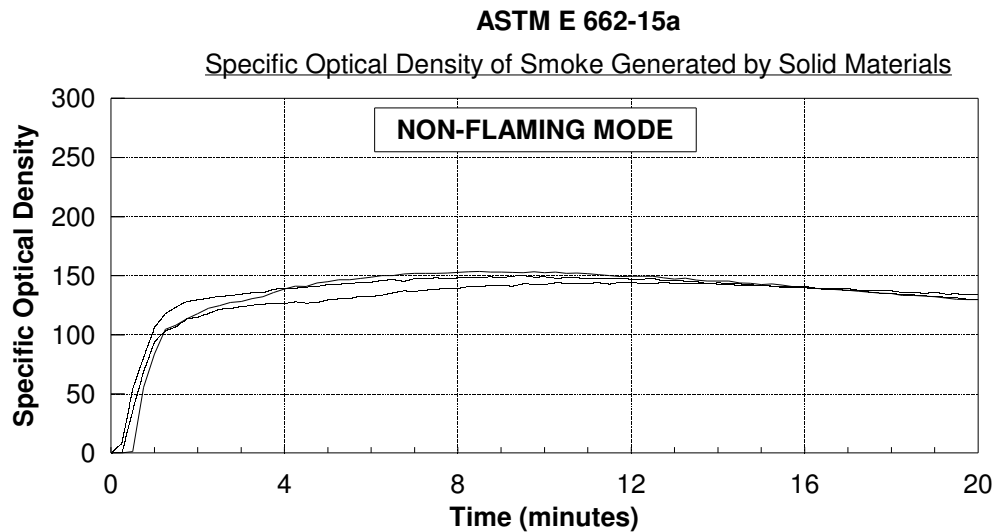
(Exova sample identification number 15-002-S0781)

**TEST RESULTS**



Relative Room Humidity: 33%	Test Duration: 20 min.			Chamber Wall Temp: 35 °C		
Flaming Mode	Test	#1	#2	#3	Average	Specified Maxima
Specific Optical Density at 1.5 minutes		186	190	179	185	-
Specific Optical Density at 4.0 minutes		190	192	184	188	200
Maximum Specific Optical Density		190	192	184	188	-
Maximum Corrected Optical Density		174	177	169	173	-

**TEST RESULTS (continued)**



Relative Room Humidity: 33%	Test Duration: 20 min.			Chamber Wall Temp: 35 °C		
Non-Flaming Mode	Test	#1	#2	#3	Average	Specified Maxima
Specific Optical Density at 1.5 minutes		124	107	108	113	-
Specific Optical Density at 4.0 minutes		139	127	139	135	200
Maximum Specific Optical Density		150	145	153	150	-
Maximum Corrected Optical Density		145	139	146	143	-

**Observations**

In the flaming mode, the sample ignited approximately 2 seconds into the test with smoking observed. Flameout was observed at approximately 70 seconds. In the non-flaming mode, smoke was observed approximately 10 seconds into the test with venting and surface charring.

**CONCLUSIONS**

The fabric-supported vinyl material identified in this report, when tested at an approximate thickness of 1 mm, meets The Federal Railroad Administration requirements as they pertain to rate of smoke generation (ASTM E 662).

**Note: This is an electronic copy of the report. Signatures are on file with the original report.**

Mel Garces,  
Senior Technologist.

Ian Smith,  
Technical Manager.

*Note: This report and service are covered under Exova Canada Inc. Standard Terms and Conditions of Contract which may be found on the Exova website (www.exova.com), or by calling 1-866-263-9268.*

**APPENDIX**

(1 Page)

**Summary of Test Procedure**

## ASTM E 662-15a

### Specific Optical Density of Smoke Generated by Solid Materials

This method of test covers a procedure for measuring the smoke generated by solid materials and assemblies in thickness up to and including 1 inch (25.4 mm). Measurement is made of the attenuation of a light beam by smoke (suspended solid or liquid particles) accumulating within a closed chamber due to nonflaming pyrolytic decomposition and flaming combustion. Results are expressed in terms of specific optical density (Ds), which is derived from a geometrical factor and the measured optical density (absorbance).

As specified, the test samples are pre-dried for 24 hours at 60°C. Section 9.1 of ASTM E 662-15a states to then condition the specimens to "equilibrium (constant weight)" but does not specify a definition or procedure with respect to establishing the "constant weight". Therefore, prior to testing, the specimens are then conditioned for a minimum period of 24 hours at 50 ± 5% relative humidity and 23 ± 3°C.

Three specimens, 3" square, are exposed to each mode of combustion. Prior to test initiation, the chamber wall temperature is established in the range of 33 to 37°C. The % light transmittance during the course of the combustion is recorded. These data are used to express the quantity of smoke in the form of Specific Optical Density based on the following formula, which assumes the applicability of Bouguer's law:

$$D_s = (V/AL) \cdot \log(100/T) = G \cdot \log(100/T) = 132 \cdot \log(100/T)$$

Where: Ds = Specific Optical Density

T = % Transmittance

V = Chamber Volume (18 ft<sup>3</sup>)

A = Exposed Area of the Sample (0.0456 ft<sup>2</sup>)

L = Length of Light Path in Chamber (3.0 ft)

G = Geometric Factor

Among the parameters normally reported are:

Ds		
1.5	- specific optical density after 1.5 minutes	
Ds		
4.0	- specific optical density after 4.0 minutes	
Dm		
	- maximum specific optical density at any time during the 20 minute test	
Dm		
(corr)	- Dm corrected for incidental deposits on the optical surfaces	

Transit authorities generally specify a maximum Ds 1.5 of 100 and a maximum Ds 4.0 of 200 in either flaming or non-flaming test mode.

For fabrics, the Federal Railroad Administration specifies a maximum Ds 4.0 of 200 in either flaming or non-flaming test mode.