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**ASTM E 84 Surface Burning Characteristics  
of "Patina / Cembonit"**

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Submitted by: Exova Warringtonfire North America

Report No. 17-002-368(A1)  
4 Pages

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

### **SPECIFICATIONS OF ORDER**

Determine the Flame Spread and Smoke Developed Indices based upon a single test conducted in accordance with ASTM E 84-16, as per Exova Warringtonfire North America Quotation No. 17-002-480,398 RV1 dated April 20, 2017.

**SAMPLE IDENTIFICATION** (Exova sample identification number 17-002-S0368-1)

Rigid panel material, approximately 8 mm in thickness, identified as:  
"Patina / Cembonit"

### **TEST PROCEDURE**

The method, designated as ASTM E 84-16 "*Standard Method of Test for Surface Burning Characteristics of Building Materials*", is designed to determine the relative surface burning characteristics of materials under specific test conditions, where the material under test is mounted so that it forms the ceiling of a horizontal fire tunnel. A specified airflow is introduced through the tunnel and a specified flame is applied to one end. Observations are then made regarding the flame spread along the specimen. Results are expressed in terms of Flame Spread Index (FSI) and Smoke Developed Index (SDI). There is no established relationship between those two values.

*Although the procedure is applicable to materials, products and assemblies used in building construction for development of comparative surface spread of flame data, the test results may not reflect the relative surface burning characteristics of tested materials under all building fire conditions.*

### **SAMPLE PREPARATION**

The test specimen consisted of a total of 3 sections of material, each approximately 0.31 inches (8 mm) in thickness by 21 inches (533 mm) in width by 96 inches (2438 mm) in length. The sections were butted together to create the specimen length. Prior to testing, the specimen was conditioned to constant weight at a temperature of  $73 \pm 5^\circ\text{F}$  ( $23 \pm 3^\circ\text{C}$ ) and a relative humidity of  $50 \pm 5\%$ . During testing, the specimen was self-supporting.

The testing was performed on: 2017-06-27

### **SUMMARY OF TEST PROCEDURE**

The tunnel is preheated to  $150 \pm 5^\circ\text{F}$  ( $66 \pm 2.8^\circ\text{C}$ ), as measured by the floor-embedded thermocouple located 23.25 feet (7087 mm) downstream of the burner ports, and is allowed to cool to  $105 \pm 5^\circ\text{F}$  ( $40.5 \pm 2.8^\circ\text{C}$ ), as measured by the floor-embedded thermocouple located 13 feet (3962 mm) from the burners. The tunnel lid is then raised and the test sample is placed along the ledges of the tunnel so as to form a continuous ceiling 24 feet (7315 mm) long, approximately 12 inches (305 mm) above the floor. Three 8 foot (2438 mm) sections of 0.25 inch (6 mm) cement board are then placed on the back side of the sample and the lid is then lowered into place.

**SUMMARY OF TEST PROCEDURE (continued)**

Upon ignition of the gas burners, the flame spread distance is observed and recorded every second. Flame spread distance versus time is plotted. Calculations ignore all flame front recessions and Flame Spread Index (FSI) is determined by calculating the total area under the curve for the test sample. If the area under the curve (A) is less than or equal to 97.5 min-ft, then  $FSI = 0.515 \cdot A$ ; if greater,  $FSI = 4900 / (195 - A)$ . FSI is then rounded to the nearest multiple of 5.

Smoke Developed Index (SDI) is determined by dividing the total area under the obscuration curve by that of red oak, and multiplying by 100. SDI is then rounded to the nearest multiple of 5 if less than 200. SDI values over 200 are rounded to the nearest multiple of 50.

**TEST RESULTS**

| SAMPLE              | Flame Spread Index (FSI) | Smoke Developed Index (SDI) |
|---------------------|--------------------------|-----------------------------|
| "Patina / Cembonit" | 0                        | 10                          |

**Observations of Burning Characteristics**

The specimen did not ignite. Discoloration and cracking was observed in the area of test flame impingement. Partial collapse was also observed in the same area.

**Interpretation of Test Results**

Industry documents such as the International Building Code (IBC) or NFPA 101 Life Safety Code refer to ASTM E 84 (UL 723, NFPA 255) test results using the following material classification categories:

|   | Flame-Spread Index (FSI) | Smoke Development Index (SDI) |
|---|--------------------------|-------------------------------|
| Class 1 or Class A                      | 0 - 25                   | 450 Maximum                   |
| Class 2 or Class B                      | 26 - 75                  | 450 Maximum                   |
| Class 3 or Class C                      | 76 - 200                 | 450 Maximum                   |
| Results Classification (if applicable): |                          | Class 1 or Class A            |

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

Francis Williams,  
Technician.

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ASTM E 84-16 Test Charts

Sample: "Patina / Cembonit"

Chart 1. FLAME SPREAD

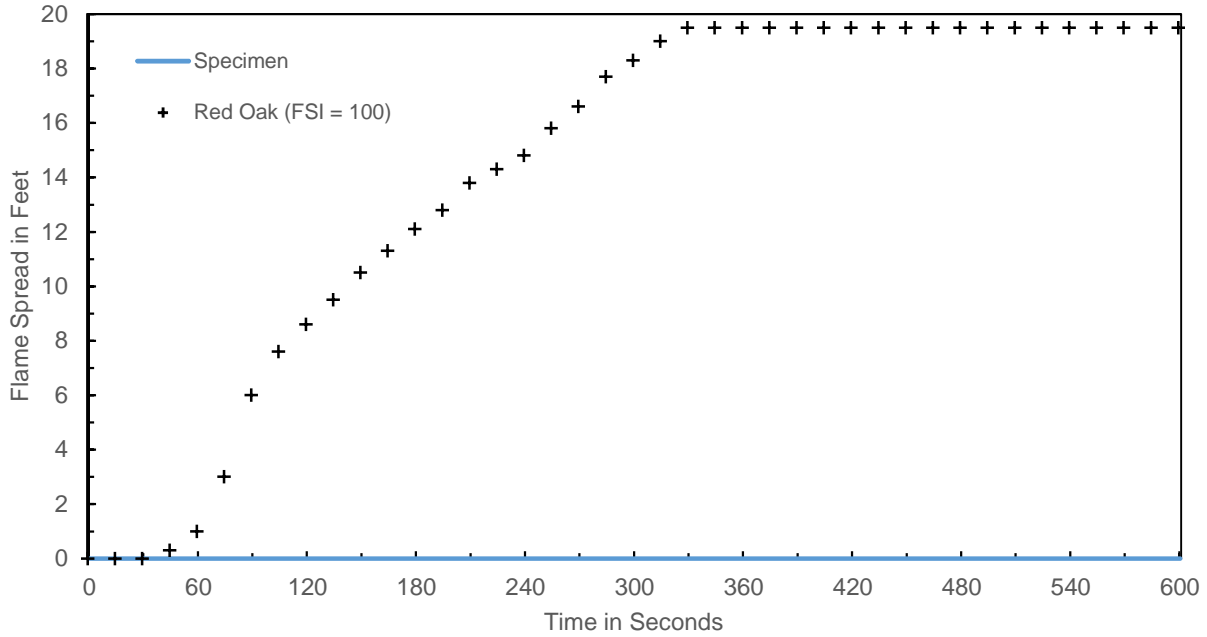
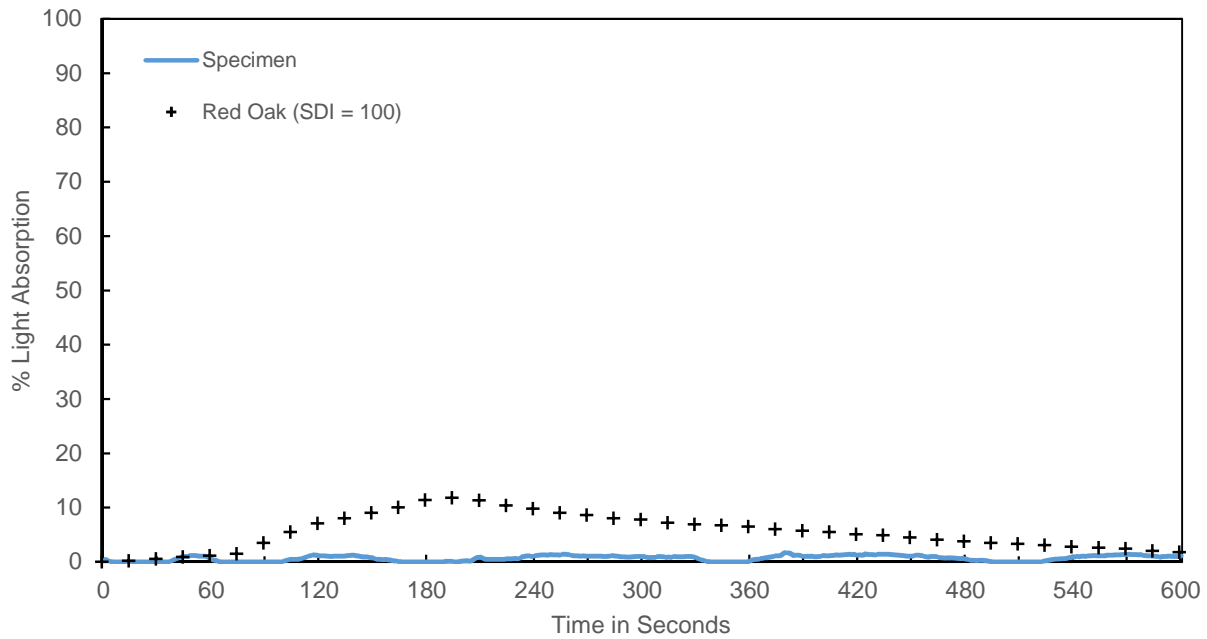


Chart 2. SMOKE DEVELOPED



| Calculated Flame Spread (CFS) | Rounded Flame Spread Index (FSI) | Calculated Smoke Developed (CSD) | Rounded Smoke Developed Index (SDI) | Maximum 23' Air Temperature (°F) |
|-------------------------------|----------------------------------|----------------------------------|-------------------------------------|----------------------------------|
| 0.0                           | <b>0</b>                         | 9.6                              | <b>10</b>                           | 541                              |