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## **FIRE PERFORMANCE EVALUATION OF *DRAGONBOARD* SHEATHING TESTED IN ACCORDANCE WITH ASTM E 136, STANDARD TEST METHOD FOR BEHAVIOR OF MATERIALS IN A VERTICAL TUBE FURNACE AT 750 °C**


**FINAL REPORT**  
Consisting of 6 Pages

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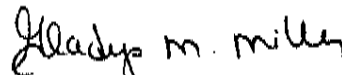
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## 1.0 INTRODUCTION

This report describes a small-scale fire test conducted in accordance with ASTM E 136, *Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 °C* (1999), for DragonBoard, located in Scranton, Pennsylvania. Testing was conducted on December 5 and 6, 2007, at the Fire Technology Department of Southwest Research Institute (SwRI), located in San Antonio, Texas.

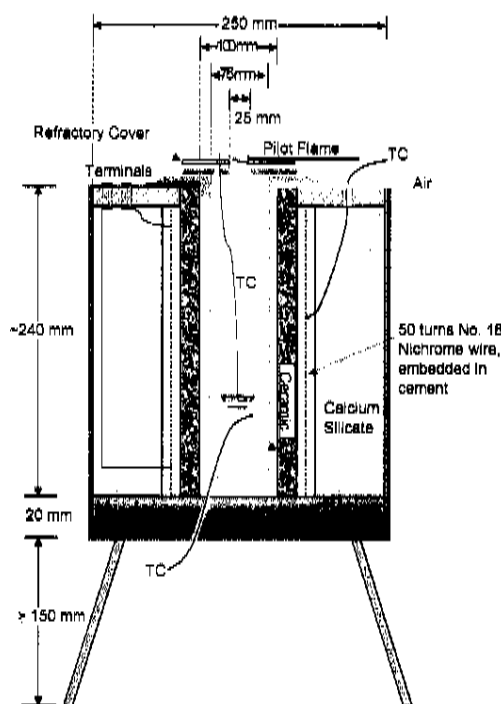
The test method described in ASTM E 136 is intended to measure and describe the properties of materials or products in response to heat and flame under controlled laboratory conditions. The results should not be used alone to describe or appraise the fire hazard or the fire risk of materials, products, or assemblies under actual fire conditions. However, results of this test may be used as elements of a complete fire hazard for fire risk assessment, which takes into account all the factors that are pertinent to an assessment of the fire hazard or risk of a particular end-use.

The results presented in this report apply specifically to the specimens tested, in the manner tested, and not to the entire production of these or similar materials, nor to the performance when used in combination with other materials.

## 2.0 DESCRIPTION OF TEST APPARATUS AND PROCEDURE

The ASTM E 136 hot-air ignition furnace consists primarily of an electrical heating unit and specimen holder. The furnace tube is a vertical tube, with an inside diameter of  $100 \pm 5$  mm and a length of  $230 \pm 20$  mm, made of ceramic that will withstand at least 750 °C. The inner ceramic tube, with an inside diameter of  $75 \pm 5$  mm, a length of  $230 \pm 20$  mm, and a thickness of approximately 3 mm, is placed inside the furnace tube and positioned  $20 \pm 2$  mm above the furnace floor on spacer blocks. The test apparatus is shown in Figure 1.

The air temperature inside the furnace is stabilized to 750 °C prior to testing. Sheathed thermocouples are used to measure the temperature of the furnace air ( $T_f$ ), specimen surface ( $T_s$ ), and specimen interior ( $T_e$ ). The duration of flaming is recorded during the test, and specimen mass loss is determined based on weight measurements before and after testing. ASTM E 136 requires that a series of four tests be conducted for each sample.



**Figure 1. Schematic of SwRI's Hot-Air Furnace.**

A material passes if at least three of the four specimens tested meet the following criteria:

1. When the weight loss is 50% or less:
  - a. The surface and interior thermocouples cannot have a temperature rise of more than 30 °C from the stabilized temperature measured by the interior thermocouple before testing.
  - b. No sustained flaming during the first 30 s of the test.
2. When the weight loss is 50% or more:
  - a. The surface and interior thermocouples cannot exhibit any temperature rise from the stabilized temperature measured by the interior thermocouple before testing.
  - b. No flaming at any time during the test.

The three specimens do not need to meet the same condition.

### 3.0 DESCRIPTION OF TEST SPECIMENS

DragonBoard provided four pieces of the material, identified as *DragonBoard Sheathing*. One sample measured 29 × 34 × 180 mm from which three samples 38 mm long were cut. Three additional pieces measuring 38 × 33 × 13mm were also received and layered together to form the fourth test sample. All sections were received by SwRI on December 4, 2007. A description of

the material provided by the client can be found in Table 1. The samples were placed in a controlled environment maintained at  $23\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$  ( $73\text{ }^{\circ}\text{F} \pm 5\text{ }^{\circ}\text{F}$ ) and  $50\% \pm 5\%$  relative humidity from the time they were received until just prior to testing.

**Table 1. Test Sample Description Provided by the Client.**

<b>Material ID</b>	<b>Description of Material</b>	<b>Nominal Thickness*</b>	<b>Nominal Density*</b>	<b>Color *</b>
<i>DragonBoard Sheathing</i>	Proprietary Magnesium Oxide Based Sheathing	38 mm	935 kg/m <sup>3</sup>	White

\* Measured by SwRI personnel.

#### 4.0 TEST RESULTS

Testing was conducted on December 5 and 6, 2007. During test runs 1, 2, and 4, no smoking, flames, or other signs of combustion were observed at anytime throughout the test. During test run 3 glowing ignition was visible beginning at 25 min 30 s and continued for the duration of that run. Tabular test data and graphs of the measured temperatures plotted with respect to time are presented in Appendix A.

#### 5.0 CONCLUSIONS

The *DragonBoard Sheathing* tested meets the performance criteria presented in ASTM E 136.