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FIRE PERFORMANCE EVALUATION OF *EL 80 WITH CERAMIC TILES*, IN ACCORDANCE WITH THE 2006 EDITION OF NATIONAL FIRE PROTECTION ASSOCIATION 286, STANDARD METHODS OF FIRE TESTS FOR EVALUATING CONTRIBUTION OF WALL AND CEILING INTERIOR FINISH TO ROOM FIRE GROWTH

FINAL REPORT
Consisting of 13 Pages

SwRI Project No. 01.13544.01.216a[1]
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Prepared for:
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INTRODUCTION

This report presents the results of a fire performance evaluation in accordance with the 2006 Edition of National Fire Protection Association (NFPA) Standard 286, *Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth*. Testing was conducted by Southwest Research Institute's (SwRI) Fire Technology Department, in San Antonio, TX. This report has been revised to document Florida Professional Engineer witness and seal.

This test method is intended for the evaluation of the flammability characteristics of wall and ceiling interior finish, other than textile wall coverings, where such materials constitute the exposed interior surfaces of buildings. It determines how much a material will contribute to a fire by measuring the amount of heat and smoke released, along with the combustion products released.

NFPA 286 does not have criteria for passing or failing a product due to performance during the fire test. In general, this test is used as a tool for ranking material performance in a standard configuration. However, a major event that this test can identify is the propensity of a material to cause a standard room to "flashover", which according to NFPA 286, is determined to have occurred when two of five specified conditions are attained. The material being tested may perform differently when it is placed in a room of a different size or shape, or in different environmental conditions. The test data cannot be generalized to apply to these different conditions.

The heat release rate (HRR) is measured using the oxygen consumption technique. This technique requires the measurement of gas concentrations in the exhaust duct, as well as the volumetric flow of these gases. The products of combustion and entrained air are collected in a hood and extracted through an exhaust duct by a fan. A gas sample is drawn from the exhaust duct and analyzed for oxygen, carbon dioxide, and carbon monoxide concentrations. The gas temperature and differential pressure across a bi-directional probe are measured for calculating the mass flow rate of the exhaust gases.

Smoke release rate (SRR) is determined based on the measured light obscuration in the exhaust duct, using a vertically-oriented white-light extinction photometer located close to the gas sampling point. Temperature measurements were recorded using thermocouples positioned according to NFPA 286. The results apply specifically to the specimens tested, in the manner tested, and not to similar materials, nor to the performance when used in combination with other materials.

NFPA 286 (2006)

Client: LUX ELEMENTS GmbH & Co. KG
Project No.: 01.13544.01.216a[1]
Material ID: *EL 80 with ceramic tiles*
Trade Name: *LUX ELEMENTS - Hardfoam support element*

Material Description:* Expanded Polystyrene (EPS) Foam with Coating of Mortar and Glass Fiber Mesh, Covered with Ceramic Tiles.

Table 1. Material Details.

Thickness (nominal)	Color	Weight (nominal)	Dimensions (nominal)	Density of EPS	Areal Weight* (nominal)
78 mm (EPS foam) 1 mm (mortar layers) 5 mm (tile adhesive) 9 mm (tile)	Light Blue (EPS core) Light Grey (coating) Beige (tiles)	49.5 kg Per Panel	0.6 m wide × 2.5 m long	30 kg/m ³	5.3 kg/m ²

*Client Provided Information.

Table 2. Material Preparation.

Received	Prepared	Conditioned
April 11, 2008	April 15 – 19, 2008	64 °F – 75 °F

Construction Details: SwRI constructed a 2 × 4-in. wood stud room with ½-in. thick gypsum wallboard on the walls and ceiling. Representatives of LUX ELEMENTS GmbH & Co. KG fastened *EL 80* panels to the ceiling of the test room using 4.75-in. screws and 2.75-in. washers, spaced every 21 in. around the perimeter. *EL 80* panels were also fastened to the back and side walls of the test room using 4.75-in. screws and 1.375-in. washers, placed 6 in. in from each corner, 6 in. in from mid-point of the side edges, and 30 in. from the top and bottom at the center of each panel. The joints were taped and floated with mortar. The ceramic tiles were then installed on the walls only, using approximately 5 mm of tile adhesive. See Figure 1 below, for a Client supplied diagram of *EL 80* panels with tiles.

Witnessed By: Under the supervision of Mr. Barry L. Badders (Professional Engineer, License No. 61907, registered in the state of Florida) of Southwest Research Institute

Comments: Test Notification Number from Miami-Dade County Florida for this test program is SwRI 08016.

EL 80 with tiles

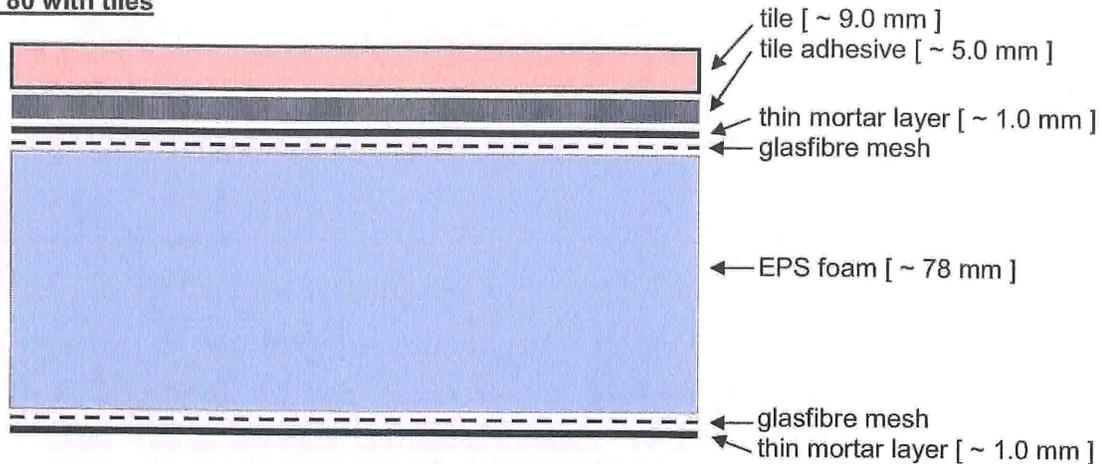


Figure 1. Material Layers in EL 80 Panel with Ceramic Tiles.

The test room and building were at approximately 64 °F and 70% relative humidity during the test. A summary of the test results is given in Table 3 below. Selected photographic documentation is provided in Figures 2 through 8, and visual observations can be found in Table 4. The test results are summarized in Appendix A.

Table 3. Summary of Test Results and Flashover Limits.

Material ID	Maximum Heat Release Rate (Total)	Total Heat Flux to the Floor	Maximum Average Upper Layer Temperature	Flames Exiting Doorway?	Auto-Ignition of Paper Target?
<i>EL 80 with Ceramic Tiles</i>	177 kW	1.8 kW/m ²	302 °C	No	No
Flashover Limits Per Section 1.4.2 of NFPA 286	1,000 kW	20 kW/m ²	600 °C	Not Allowed	Not Allowed

The 2006 International Building Code (IBC) has acceptance criteria for interior wall or ceiling finishes tested in accordance with NFPA 286. The criteria as contained in the 2006 IBC, Section 803.2, is as follows:

1. During the 40-kW exposure, flames shall not spread to the ceiling.
2. During the 160-kW exposure, the interior finish shall comply with the following:
 - a. Flame shall not spread to the outer extremity of the sample on any wall or ceiling.
 - b. Flashover, as defined in NFPA 286, shall not occur.
3. The peak rate of heat release throughout the NFPA 286 test shall not exceed 800 kW.
4. The total smoke released throughout the NFPA 286 test shall not exceed 1,000 m².

Based on the test results, the material identified as *EL 80 with ceramic tiles*, did not cause the test room to flashover. The Client’s material meets the acceptance criteria for interior wall or ceiling finishes as described in the 2006 IBC.

Table 4. Test Observations.

Time (min:s)	Observations
00:00	Start of Test, burner set at 40 kW.
00:10	Flames from burner are 3 to 3½ ft in height.
01:00	Discoloration on the tile surface on both walls forming on the burner corner from 1 to 2 ft.
03:00	Discoloration with scorching along both walls starting at the top of the burner up to 2½ ft and approximately 6 in. in width.
04:30	Very light grey layer of smoke in the room interior down to 5½ ft above the floor. Flames from burner are 3 to 3½ ft in height from floor.
05:00	Burner increased to 160 kW. Flames from burner are up to the ceiling and flashing 1 ft along both walls at the ceiling.
06:00	Discoloration with scorching on the tiles is approximately 12 in. in width along both walls from top of burner to the ceiling.
07:00	Flames from burner are up to the ceiling and flashing 1 to 2 ft along both walls at the ceiling. No surface ignition on the wall or ceiling panels.
10:00	No change.
11:00	Intermittent flashing on the ceiling panel in the burner corner at direct flame impingement from the burner flames.
13:00	Intermittent flashing on ceiling panels is confined to the 12-in. radius away from both walls forming burner corner.
14:30	No surface flaming on wall panels, intermittent flaming on ceiling panel at direct flame impingement from burner.
15:00	End of Test, burner extinguished. No afterflaming on walls or ceiling.



Figure 2. Ceiling Panels Installed, and Wall Panels Partially Installed.



Figure 3. Walls Taped and Floated.



Figure 4. Tile Installation.



Figure 5. Pre-Test View of Completed Room.



Figure 6. 4 min 50 s into Test; Burner at 40 kW.



Figure 7. 14 min 48 s into Test; Burner at 160 kW.



Figure 8. Post-Test View of Burn Corner.

APPENDIX A
TEST DATA
(Consisting of 5 Pages)

**SUMMARY OF
 TEST RESULTS**

Maximum HRR_{total}	177 kW	at 10 min 11 s
Average HRR_{total}	121 kW	
Total Heat Released	109 MJ	
Maximum $HRR_{excl. burner}$	17 kW	at 10 min 11 s
Average $HRR_{excl. burner}$	4 kW	
Total Heat Released (Excluding Burner)	4 MJ	
Maximum Smoke Release Rate	0.40 m ² /s	at 14 min 59 s
Average Smoke Release Rate	0.09 m ² /s	
Total Smoke Released	78 m ²	
Maximum Optical Density	0.13 1/m	at 14 min 59 s
Maximum Duct Flow Rate	1.28 m ³ /s	
Average Optical Density	0.030 1/m	
Average Volumetric Duct Flow Rate	1.26 m ³ /s	
Total Heat Flux to the Floor	1.8 kW/m ²	at 14 min 28 s
Max. Average Upper Layer Temperature	302 °C 575 °F	at 14 min 28 s
Maximum Doorway Temperature	254 °C 488 °F	at 13 min 58 s

