



# COMMERCIAL TESTING COMPANY

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Standard Method of Test for  
Surface Burning Characteristics of Building Materials

ASTM E 84-06

**Aqua Plus Pigment 650**

*Fire Retardant HK-105 PK*  
Report Number 07-03175

Test Number 3870-6159  
March 8, 2007

Vitrulan Corporation  
Waynesboro, Virginia

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(Authorized Signature)

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## INTRODUCTION

This report is a presentation of results of a surface flammability test on a material submitted by Vitruvan Corporation, Waynesboro, Virginia.

The test was conducted in accordance with the ASTM International fire test response standard E 84-06, *Surface Burning Characteristics of Building Materials*, sometimes referred to as the Steiner tunnel test. This test is applicable to exposed surfaces such as walls and ceilings. The test is conducted with the specimen in the ceiling position with the surface to be evaluated exposed face down to the ignition source. The ASTM E 84 test method is technically identical to NFPA No. 255 and UL No. 723.

This standard is used to measure and describe the response of materials, products, or assemblies to heat and flame under controlled conditions, but does not by itself incorporate all factors required for fire-hazard or fire-risk assessment of materials, products, or assemblies under actual fire conditions.

## PURPOSE

The purpose of the test is to provide only the comparative measurements of surface flame spread and smoke development of materials with that of select grade red oak and fiber-reinforced cement board, Grade II, under specific fire exposure conditions. The test exposes a nominal 24-foot long by 20-inch wide test specimen to a controlled air flow and flaming fire adjusted to spread the flame along the entire length of a red oak specimen in 5.50 minutes. During the 10-minute test duration, flamespread over the specimen surface and density of the resulting smoke are measured and recorded. Test results are calculated relative to red oak, which has an arbitrary rating of 100, and fiber-reinforced cement board, Grade II, which has a rating of 0.

The test results are expressed as Flame Spread Index and Smoke Developed Index. The Flame Spread Index is defined in ASTM E 176 as "a number or classification indicating a comparative measure derived from observations made during the progress of the boundary of a zone of flame under defined test conditions." The Smoke Developed Index, a term specific to ASTM E 84, is defined as "a number or classification indicating a comparative measure derived from smoke obscuration data collected during the test for surface burning characteristics." There is not necessarily a relationship between the two measurements.

The method does not provide for measurement of heat transmission through the surface tested, the effect of aggravated flame spread behavior of an assembly resulting from the proximity of combustible walls and ceilings, or classifying a material as noncombustible solely by means of a Flame Spread Index.

The zero reference and other parameters critical to furnace operation are verified on the day of the test by conducting a 10-minute test using 1/4-inch fiber-reinforced cement board, Grade II. Periodic tests using NOFMA certified 23/32-inch select grade red oak flooring provide data for the 100 reference.

## TEST SAMPLE

The test sample, selected by the client, was identified as **Aqua Plus Pigment 650**, a pre-pasted glass textile wallcovering with a total weight of 7.6 ounces per square yard. Three test panels, each measuring two feet wide by eight feet in length, were prepared by adhering the material to 1/4-inch thick fiber-reinforced cement board, Grade II. After soaking the wallcovering in water to activate the adhesive, the material was booked 5 to 7 minutes, then placed onto the smooth side of the cement board and smoothed with a brush and roller. After drying overnight, one coat of an interior latex flat paint was rolled onto the wallcovering using a 3/8" napped roller at the manufacturers recommended coverage rate of 400 square feet per gallon. After a second overnight drying period, one coat of JFB Hart Coatings Special Fire Retardant AP-110-1225 polyurethane coating was rolled onto the wallcovering using a 3/8" napped roller. The prepared panels were transferred to storage racks and conditioned to

equilibrium in an atmosphere with the temperature maintained at  $71 \pm 2^\circ\text{F}$  and the relative humidity at  $50 \pm 5$  percent. For testing, the panels were placed end-to-end on the ledges of the tunnel furnace and tested with no auxiliary support mechanism. This method of sample preparation is described in Appendix X1 of the E 84 standard, Guide to Mounting Methods, Section X1.9.3.

### TEST RESULTS

The test results, calculated on the basis of observed flame propagation and the integrated area under the recorded smoke density curve, are presented below. The Flame Spread Index obtained in E 84 is rounded to the nearest number divisible by five. Smoke Developed Indices are rounded to the nearest number divisible by five unless the Index is greater than 200. In that case, the Smoke Developed Index is rounded to the nearest 50 points. The flame spread and smoke development data are presented graphically on Page 4 of this report.

Test Specimen	Flame Spread Index	Smoke Developed Index
Fiber-Reinforced Cement Board, Grade II	0	0
Red Oak Flooring	100	100
Aqua Plus Pigment 650	35	30

### OBSERVATIONS

Specimen ignition over the burners occurred at 0.28 minute. Surface flame spread was observed to a maximum distance of 7.62 feet beyond the zero point at 1.08 minutes. The maximum temperature recorded during the test was  $606^\circ\text{F}$ .

### CLASSIFICATION

The Flame Spread Index and Smoke Developed Index values obtained by ASTM E 84 tests are frequently used by code officials and regulatory agencies in the acceptance of interior finish materials for various applications. The most widely accepted classification system is described in the National Fire Protection Association publication NFPA 101 *Life Safety Code*, where:

Class A	0 - 25 Flame Spread Index	0 - 450 Smoke Developed Index
Class B	26 - 75 Flame Spread Index	0 - 450 Smoke Developed Index
Class C	76 - 200 Flame Spread Index	0 - 450 Smoke Developed Index

Class A, B, and C correspond to Type I, II, and III respectively in other codes such as SBCCI, BOCA, and ICBO. They do not preclude a material being otherwise classified by the authority of jurisdiction.

## ASTM E 84 TEST DATA

Client: Vitruan Corporation  
Test Number: 3870-6159  
Material Tested: Aqua Plus Pigment 650  
Date: March 8, 2007

### Test Results:

Time to Ignition = 00.28 minutes  
Maximum Flamespread Distance = 07.62 feet  
Time to Maximum Spread = 01.08 minutes

Flame Spread Index = 35  
Smoke Developed Index = 30

