



CAPITAL TESTING AND CERTIFICATION SERVICES

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TEST REPORT

Test Method: ASTM E662-21ae1, Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials

Rendered To: AHF Products
3840 Hempland Rd
Mountville, PA 17554
USA

Product Description: 4.5mm LVT

Report Number: S-2440

Original Issue Date: 09/19/2024

Test Date: 09/18/2024

Pages: 6



TL-224

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I. SCOPE

This report contains the results from a specimen tested in accordance with ASTM E662, *Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials*. This fire-test-response standard covers determination of the specific optical density of smoke generated by solid materials and assemblies mounted in the vertical position in thicknesses up to and including 1 inch.

II. SUMMARY OF TEST METHOD

The testing is conducted in an 18 ft³ chamber with a photometric system consisting of a light source mounted at the bottom of the chamber and a photocell mounted at the top of the chamber. Measurement is made of the attenuation of a light beam by smoke (suspended solid or liquid particles) accumulating within a closed chamber due to non-flaming pyrolytic decomposition and flaming combustion.

At the beginning of each testing day, the chamber is preheated and checked for airtightness. An electrically heated radiant-energy source is positioned to produce an irradiance level of 2.5 W/cm² averaged over the central 1.5 in. (38.1 mm) diameter area of a vertically mounted specimen that faces the radiant heater. The nominal 3 by 3 in. specimen is mounted within a holder which exposes an area measuring 2.56 by 2.56 in. This exposure provides the non-flaming mode of the test. For the flaming mode, the radiant energy source is utilized, and a six-tube multi-directional burner is added to apply a row of equidistant flames across the lower edge of the exposed specimen area and the trough on the specimen holder. The test specimens are exposed to the flaming and non-flaming conditions within a closed chamber for 20 minutes or until 3 minutes after the minimum light transmittance value has been reached.

III. TEST SPECIMENS

Test specimens should be representative of the material or system which the test is intended to examine. The test specimens should be 3 by 3 +0, -0.03 in. (76.2 by 76.2, +0, -0.8 mm) by the intended installation thickness up to and including 1 in. (25.4 mm).

Prior to testing, the specimens are placed into a 140 ± 5°F (60 ± 3°C) oven for 24 hours. After 24 hours have elapsed, the specimens are conditioned to constant weight at an ambient temperature of 73 ± 5°F (23 ± 3°C) and a relative humidity of 50 ± 5 %.

TEST SPECIMEN INFORMATION	
Product Description	4.5mm LVT. Nominal thickness: 4.5mm. LFP-081524.* Vinyl flooring. Wood patterned and textured.
Specimen Description / Mounting Method	Shape: Square. Flooring material was cut and adhered to the smooth side of ¼" cement board with S-995 flooring adhesive, 1/32" x 1/16" x 1/32" U-notch trowel. Specimens were weighted and cured for 3 days prior to pre-conditioning. Specimens were wrapped in aluminum foil with the dull side facing the specimen and backed by ½" millboard.
Orientation(s) Tested	Grain direction vertical
Color	Light brown
Samples Selected By	Client
Specimens Prepared By	Capital Testing
Date Received	09/05/2024
Conditioning Time (days)	1

* Information provided by the Client



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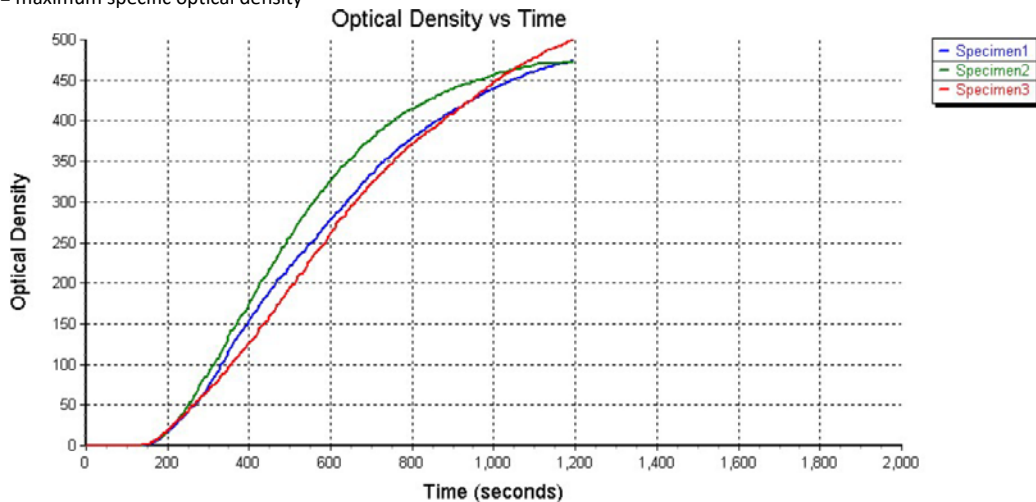
IV. NON-FLAMING MODE DATA AND RESULTS

NON-FLAMING MODE

	Unit	Specimen 1	Specimen 2	Specimen 3	Average
Room Temp.	°F	71.8	70.8	72.2	71.6
Room Humidity	%RH	57.0	59.6	61.7	59.4
Chamber Temp.	°F	97.7	96.5	97.2	97.1
Exposure Time	s	1200	1200	1200	1200
Length	in	3.000	2.996	3.000	2.999
Width	in	2.997	2.999	3.000	2.999
Thickness	in	0.465	0.461	0.484	0.470
Weight	g	102.46	102.14	102.30	102.30
Ds (1.5)	-	0	0	0	0
Ds (4.0)	-	37	41	38	39
Dm	-	473	473	499	482
Dm (corr)	-	453	461	476	463
t _{Dm}	s	1195	1190	1195	1193

Ds (1.5) = specific optical density at 1.5 minutes
 Ds (4.0) = specific optical density at 4 minutes
 Dm = maximum specific optical density

Dm (corr) = corrected maximum specific optical density
 t_{Dm} = time to maximum specific optical density



V. NON-FLAMING MODE OBSERVATIONS

All: Split along grain. Adhered to holder. Black after testing. Expanded.

1: Began splitting 82s, darkening and expanding 110s, smoking, peeling, and bubbling at 127s. 136 – 152s shot smoke into furnace. Flattened 152s, then continued expanding. Cracking 199s. Viewing door closed 650s.

2: Began splitting 61s, darkening and expanding 109s, smoking, peeling, and bubbling at 132s. 132 – 156s shot smoke into furnace. Flattened 156s, then continued expanding. Cracking 179s. Viewing door closed 578s.

3: Began splitting 76s, darkening and expanding 114s, smoking, peeling, and bubbling at 133s. Flattened 160s, then continued expanding. Cracking 180s. Viewing door closed 668s.

Smoke Color: White Grey Black Other: _____



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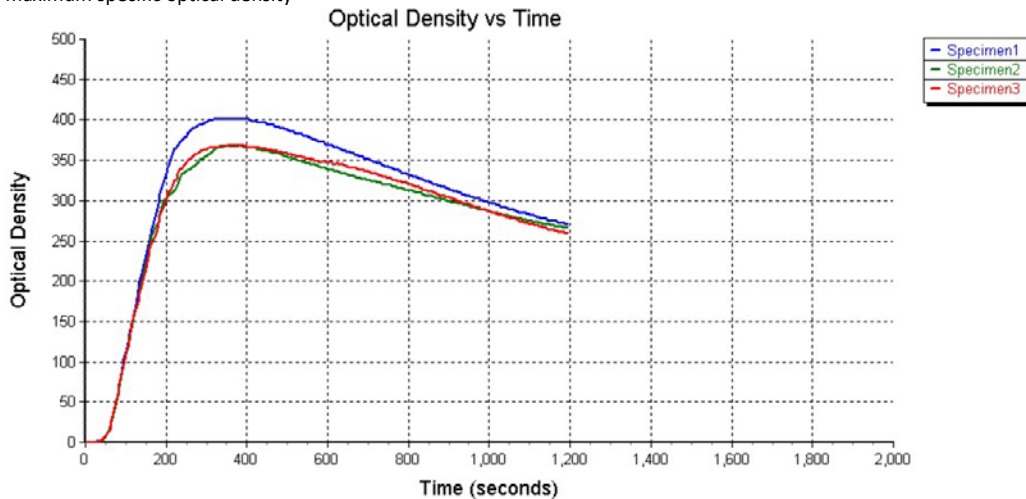
VI. FLAMING MODE DATA AND RESULTS

FLAMING MODE

	Unit	Specimen 1	Specimen 2	Specimen 3	Average
Room Temp.	°F	71.6	70.8	72.2	71.5
Room Humidity	%RH	60.9	60.1	60.7	60.6
Chamber Temp.	°F	94.9	93.6	97.8	95.4
Exposure Time	s	1200	1200	1200	1200
Length	in	3.000	3.000	2.999	3.000
Width	in	2.998	2.999	3.000	2.999
Thickness	in	0.476	0.462	0.474	0.471
Weight	g	102.59	102.00	102.30	102.30
Ds (1.5)	-	86	82	84	84
Ds (4.0)	-	376	333	341	350
Dm	-	401	369	368	379
Dm (corr)	-	360	335	331	342
t _{Dm}	s	659	614	616	630

Ds (1.5) = specific optical density at 1.5 minutes
 Ds (4.0) = specific optical density at 4 minutes
 Dm = maximum specific optical density

Dm (corr) = corrected maximum specific optical density
 t_{Dm} = time to maximum specific optical density



VII. FLAMING MODE OBSERVATIONS

All: Mostly black after testing with some white areas on face. Expanded.

- 1: Began darkening at 5s. Ignited and began expanding at 7s. Viewing door closed at 186s.
- 2: Began darkening at 4s. Ignited and began expanding at 6s. Viewing door closed at 197s.
- 3: Began darkening at 5s. Ignited and began expanding at 7s. Viewing door closed at 205s.

Smoke Color: White Grey Black Other: _____



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VIII. REMARKS

Reported weights and thicknesses include the flooring material, adhesive, and cement board.

Orientation screening was not performed at the request of the client. All specimens were tested with the grain pattern vertical.

Smoke was ejected into the furnace for non-flaming specimens 1 and 2. Measured smoke values for these specimens may be lower than actual.

IX. DISCUSSION

Interpreting Results

ASTM E662 results are frequently used by code officials and regulatory agencies to determine whether a product is suitable for its intended application. The test standard itself does not establish specific performance criteria or contain a classification system. Check appropriate regulations and consult the authority having jurisdiction (AHJ) to determine the suitability of a material for the intended application.

ASTM E662 Standard Language and Disclaimers

The following language was taken directly from the ASTM E662 standard. It has been included for informational purposes.

ASTM E662-21ae1, Section 1.5 - This standard measures and describes 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 the materials, products or assemblies under actual fire conditions.

ASTM E662-21ae1, Section 5.1 - This test method provides a means for determining the specific optical density of the smoke generated by specimens of materials and assemblies under the specified exposure conditions. Values determined by this test are specific to the specimen or assembly in the form and thickness tested and are not to be considered inherent fundamental properties of the material tested. Thus, it is likely that closely repeatable or reproducible experimental results are not to be expected from tests of a given material when specimen thickness, density, or other variables are involved.

ASTM E662-21ae1, Section 5.2 - The photometric scale used to measure smoke by this test method is similar to the optical density scale for human vision. However, physiological aspects associated with vision are not measured by this test method. Correlation with measurements by other test methods has not been established.

ASTM E662-21ae1, Section 5.4 - The test method is of a complex nature and the data obtained are sensitive to variations which in other test methods might be considered to be insignificant.

ASTM E662-21ae1, Section 6.3 - The results of the test apply only to the thickness of the specimen as tested. There is no common mathematical formula to calculate the specific optical density of one thickness of a material when the specific optical density of another thickness of the same material is known.

ASTM E662-21ae1, Section 13 Note 6 - Prior to the adoption of this test method, it was customary to report the maximum smoke accumulated as D_m (corr), and for that reason it has been included as a part of the test report. Subsequently, a statistical analysis of the round-robin data upon which the precision statement is based, showed that the D_m values were more uniform. Therefore, it is required that both D_m and D_m (corr) be reported.



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X. AUTHORIZED SIGNATURES

Report Written By:

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09/18/2024

Date

Reviewed and Approved By:

Chris Palumbo
Sr. Manager of Product Testing

09/19/2024

Date

XI. REVISION HISTORY

Revision Number	Date	Summary
0	09/19/2024	Original Report Issued

XII. ACREDITATION

Capital Testing and Certification Services is an ISO/IEC 17025 accredited testing laboratory whose scope includes ASTM E662. Accrediting Body: International Accreditation Service, Inc. (IAS). Testing Laboratory TL-224.