Designation: E2768 – 11

An American National Standard

Standard Test Method for Extended Duration Surface Burning Characteristics of Building Materials (30 min Tunnel Test)[1]

This standard is issued under the fixed designation E2768; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 The purpose of this fire-test-response standard is to evaluate the ability of a product to limit the surface spread of flame when evaluated for 30 min. This fire-test-response standard uses the apparatus and procedure of Test Method E84 with the total test period extended to 30 min.

1.2 Building applications affecting fire and life safety often require products with specific criteria for surface spread of flame and flame spread index. The resulting performance characteristics included in the conditions of classification for this fire-test-response standard are intended to be used for regulatory purposes to determine the suitability of materials or products for use in buildings under specified conditions where significantly reduced surface burning characteristics are required.

1.3 Materials and products that are beyond the scope of Test Method E84 are beyond the scope of this standard.

1.4 Materials or products which melt, drip or delaminate to the extent that the continuity of the flame front is destroyed are beyond the scope of this standard.

NOTE 1—Testing of materials that melt, drip, or delaminate to such a degree that the continuity of the flame-front is destroyed, results in low flame spread indices that do not relate directly to indices obtained by testing materials that remain in place. Materials or products that melt, drip, or delaminate, or that cannot support their own weight, have the potential for demonstrating reduced flame spread results as compared to the flame spread results where the materials or products remain in place during testing.

1.5 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.6 The text of this standard references notes and footnotes that provide explanatory information. These notes and footnotes, excluding tables and figures, shall not be considered as requirements of the standard.

1.7 *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 the materials, products, or assemblies under actual fire conditions*

1.8 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

1.9 *Fire testing is inherently hazardous. Adequate safeguards for personnel and property shall be employed in conducting these tests.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

E84 Test Method for Surface Burning Characteristics of Building Materials

E176 Terminology of Fire Standards

2.2 *ICC Codes*[3]

IBC International Building Code

IWUIC International Wildland Urban Interface Code

IRC International Residential Code

2.3 *NFPA Code*[4]

NFPA 101 Life Safety Code

2.4 *California Building Code*[5]

CBC California Building Code

3. Terminology

3.1 *Definitions*—For definitions of terms used in this test method, refer to Terminology E176 and Test Method E84. The terms *surface flame spread*, *flame spread index*, and *smoke*

[1] This test method is under the jurisdiction of ASTM Committee E05 on Fire Standards and is the direct responsibility of Subcommittee E05.22 on Surface Burning.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] ICC codes are available from International Code Council, 4051 W. Flossmoor Rd., Country Club Hills, IL 60478.

[4] NFPA Codes are available from National Fire Protection Association, 1 Batterymarch Park, Quincy, MA, 02269.

[5] CBC codes are available from http://publiccodes.citation.com/st/ca/st/CA-P-2007–999999.htm.

developed index are of particular interest to this standard.

4. Summary of Test Method

4.1 This test method is conducted using the same equipment, apparatus, calibration, and calculation of flame spread index and smoke developed index as Test Method E84.

4.2 Test Method E84 exposes a nominal 24-ft long by 20-in wide (7.32 m by 508 mm) specimen to a controlled air flow and flaming fire exposure adjusted to spread the flame along the entire length of the select grade red oak specimen in 5.5 min (±15 s). Test Method E84 measures the flame spread distance from a point beginning 4.5 ft (1.4 m) beyond the centerline of the burners.

4.3 The flame spread index is determined during the initial 10 min of the test period and calculated as described in Test Method E84.

4.4 In this test method, the Test Method E84 test is extended by 20 min to a 30 min test period. Determination is made of the distance traveled by the flame front (surface spread of flame) as measured from the centerline of the burners during the 30 min test period.

4.5 The test method has conditions for classification in Section 13.

5. Significance and Use

5.1 This standard is useful to establish the relative surface burning characteristics of materials or products under laboratory conditions for a 30 min test period.

5.2 The performance characteristics in the conditions of classification are intended to be used in specific applications as required by building codes or other regulatory requirements or specifications.

5.3 This test method does not provide the measurement of heat transmission through the tested surface.

5.4 This test method does not provide the classification or definition of a material or product as noncombustible, by means of the results from this standard test or flame spread index by itself.

6. Apparatus/Test Equipment

6.1 The apparatus, equipment, recording devices, and systems are to be the same as those detailed in Test Method E84.

7. Hazards

7.1 This test is conducted using the equipment, apparatus, and procedure of Test Method E84. The hazards described in Test Method E84 are applicable.

8. Sampling, Test Specimens and Test Units

8.1 The test specimens shall be representative of the material or product being evaluated.

8.2 Materials or products that are not homogeneous or are not symmetrical about their longitudinal axis shall have each surface evaluated separately.

8.2.1 Surfaces of the material or product that, due to their small surface area, are impractical to test in accordance with Test Method E84 (for example, the edges of a piece of plywood) are excluded from this requirement.

8.2.2 It shall be permissible to test and classify one or more surfaces of a material or product as meeting the conditions of classification of this standard and classify without testing the other surfaces as not meeting the conditions of classification of this standard.

8.3 *Test Specimens:*

8.3.1 The test specimen sizes shall comply with those described in Test Method E84.

8.3.2 Applicable practices listed in Test Method E84 and related provisions of Test Method E84 shall be used for specimen preparation and mounting.

9. Calibration and Standardization

9.1 The calibration and standardization of the apparatus and equipment for this standard shall be as described in Test Method E84.

10. Conditioning

10.1 Conditioning of test specimens shall be conducted as described in Test Method E84.

11. Procedure

11.1 Conduct the test in accordance with Test Method E84 with the following additional requirements:

11.1.1 The test shall be continued for a total period of 30 min.

11.2 During the initial 10 min of the test, record the times and extent of flame front advancement in accordance with Test Method E84. Observe and record the maximum flame front travel from the centerline of the burners during the 30-min period of the test. This method uses the recording devices of Test Method E84 (see Note 2).

NOTE 2—If for purpose of calculating the flame spread index the zero point of the recording equipment is at the base end of the ignition fire, the maximum flame front travel distance required in this standard shall be the recorded distance plus 4.5 ft. (1.4 m) In Test Method E84 and this standard, the calculation of the flame spread index is based on the flame spread distance measured from a point beginning 4.5 ft (1.4 m) beyond the centerline of the burners during the first 10 min.

11.3 Follow all other procedures described in Test Method E84 including those for determination of flame spread index during the initial 10 min.

11.4 The determination of the smoke developed index during the initial 10 min of this test is optional.

12. Interpretation of Results

12.1 Determine the following:

12.1.1 Flame spread index and smoke developed index (optional) during the initial 10 min in accordance with Test Method E84 (see Note 2).

12.1.2 The maximum distance of surface spread of flame as measured from the centerline of the burner during the 30 min test period.

12.2 Where separate tests are conducted on different surfaces of the test specimens (See 8.2) the information specified in 12.1.1 and 12.1.2 shall be determined for each tested surface.

13. Conditions of Classification

13.1 The test method has the following conditions of classification for a material or product to be classified as meeting the requirements of this standard:

13.1.1 The flame spread index shall be 25 or less as determined for the initial 10 min test period,

13.1.2 The flame front shall not progress more than 10.5 ft (3.2 m) beyond the centerline of the burners at any time during the 30 min test period. This is considered evidence of no significant progressive combustion in this test method.

13.2 For materials or products that are not homogeneous or symmetrical about their longitudinal axis, only surfaces that have been individually tested shall be eligible to be classified and reported as meeting the conditions of classification of this standard.

14. Report

14.1 The report shall clearly state that it applies to all surfaces of the material or product tested in accordance with the standard or, where the material or product is not homogeneous or symmetrical about its longitudinal axis, the report shall state that it only applies to those surfaces that have been tested and so classified in accordance with this standard.

14.2 The following shall be included in the test report:

14.2.1 Report the material (or product) or separate surfaces of the material (or product) as meeting the conditions of classification if the test results for the test specimens meet the conditions of classification of 13.1. Test results shall be reported for each surface tested.

14.2.2 Where a material or product is not homogeneous or symmetrical about its longitudinal axis and all surfaces have not been individually tested, those surfaces not tested shall be clearly identified and reported as unclassified in accordance with this standard.

14.2.3 Description of the material or product to include its thickness and the nominal width of the material or product used to construct the test specimens.

14.2.4 Non-proprietary information on the process, treatment, or surface condition which forms the basis of identifying the material or product. For a manufactured or treated product, the date of manufacture or treatment.

14.2.5 Date of test specimen construction and the construction details including the number of sections, methods of joining, and any deviations from construction details specified in any applicable Practice on the mounting of the test specimen.

14.2.6 Conditioning of test specimens prior to evaluation.

14.2.7 Description of the mounting method.

14.2.7.1 If there is an applicable Practice (see Test Method E84) for the mounting of the test specimen, state the Practice designation and any deviations from the applicable Practice.

14.2.8 The maximum measurement of surface spread of flame and time of occurrence for each test.

14.2.9 The flame spread index for each test.

14.2.10 If recorded, the smoke developed index for each test.

14.2.11 Observation of the specimen during the total test period for factors which influence the interpretation of results including, but not limited to, delamination, sagging, shrinkage, fallout, disruption of the continuity of the flame front or smoldering.

14.2.12 Graphical plots of the flame spread versus time for the test duration and if recorded, the smoke developed versus time for the initial 10 min of the test period. The distance axis of the flame spread graph shall be labeled to indicate the origin (either the burner centerline or +4.5 ft (1.4 m)).

15. Precision and Bias

15.1 The precision and bias of this test method for measuring flame spread and smoke developed index are as specified in Test Method E84.

15.2 No information is presented about either the precision or the bias for observing the occurrence of flame front progressing beyond 10.5 ft (3.2 m) since the test result is determinate.

16. Keywords

16.1 flame spread index; surface burning characteristics; smoke develop index

APPENDIX

(Nonmandatory Information)

X1. COMMENTARY

X1.1 Introduction

X1.1.1 This commentary has been prepared to provide the user of this test method with background information on the standard.

X1.1.2 This standard is based on a modification of Test Method E84 that has been used for many years in provisions in the building codes and related specifications pertaining to fire-retardant-treated wood. Such codes include the International Building Code (IBC) and International Residential Code (IRC) as well as other documents. The test requirement is only one of the performance requirements for fire-retardant-treated wood in the building codes. There are other performance requirements and inherent characteristics of fire-retardant-treated wood that were considered relevant when provisions in

the codes were approved to allow the use of fire-retardant-treated wood in specific applications.

X1.1.3 It was commonly referred to as the "30-minutes E84 tunnel test." However, Test Method E84 has no provisions for extending the test to the 30 min duration.

X1.1.4 The "Extended Test Method E84 test" is increasingly being used in requirements that are not limited to fire-retardant-treated wood. For example, the International Wildland Urban Interface Code (IWUICIWUIC) and California Building Code (CBCCBC) use the test for assessing materials and products that can be designated as ignition-resistant materials.

X1.2 Development of this Standard

X1.2.1 At the time this standard was initially prepared, the existing requirements for fire-retardant-treated wood included a requirement that there be "no evidence of significant progressive combustion" when the Test Method E84 test was extended to 30 min. This requirement was also part of other applications of the test to other materials or products. The questions as to what constitutes "significant progressive combustion" and how one makes that determination had not been interpreted or otherwise clarified in the codes or in any other known document. In the development of this ASTM standard, it was concluded that no significant progressive combustion is evident if the flame front does not progress more than 10.5 ft (3.2 m) beyond the centerline of the burners at any time during the 30-min exposure. This evidence had been used by laboratories involved in testing fire-retardant-treated wood for many years. As a result, a statement to that effect was added to 13.1.2 of the standard.

X1.3 Continued Progressive Combustion and Continued Propagation of Fire in NFPA 101

X1.3.1 In some editions of the NFPA Life Safety Code (NFPA 101), requirements for "no continued progressive combustion" or for "no continued propagation of fire" are for the end of the 10-min test period of Test Method E84. They are not for the 30-min test period of this standard. Such provisions include:

X1.3.1.1 The 2003 and 2006 editions of the NFPA Life Safety Code (NFPA 101) required that there be no continued propagation of fire for materials or products tested in accordance with Test Method E84 in order to achieve a Class A interior finish classification.

X1.3.1.2 Recent editions of the NFPA Life Safety Code (NFPA 101) require a lack of evidence of continued progressive combustion for materials or products tested in accordance with Test Method E84. This requirement in the NFPA Life Safety Code (NFPA 101) is for the concept of limited combustible material.