

NFPA® 253

Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source

2015 Edition



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Standard Method of

Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source

2015 Edition

This edition of NFPA 253, *Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source*, was prepared by the Technical Committee on Fire Tests. It was issued by the Standards Council on November 11, 2014, with an effective date of December 1, 2014, and supersedes all previous editions.

This edition of NFPA 253 was approved as an American National Standard on December 1, 2014.

Origin and Development of NFPA 253

Experience suggests that during the early stages of a fire, floor covering systems seldom act as a fire-spread medium. However, in a few fires involving multiple-occupancy buildings, the floor covering materials in corridors were primarily responsible for fire spread over a considerable distance. Those situations caused grave concern and pointed to the need for a realistic test to evaluate the flame spread of floor covering systems.

The inception of the flooring radiant panel test was at the Armstrong Cork Company in 1966. In 1972, conceptualization of critical radiant flux (W/cm^2 at extinguishment) as a measure of flame spread hazard was underway at the National Bureau of Standards (NBS). It was determined in the course of NBS work on model corridor fire tests that the radiant energy levels incident on the floor covering had a considerable influence on whether or not flaming combustion would propagate. Accordingly, it was natural to apply the critical radiant flux concept, and, in 1973, the NBS prepared a draft of the flooring radiant panel test.

In 1975, the Technical Committee on Fire Tests began its evaluation of the proposed test methods, which culminated in the adoption of the test as an official NFPA standard in May 1978. The standard was revised in 1984 and 1990.

The 1995 edition included significant improvements based on work conducted by the National Institute of Standards and Technology (NIST) and the carpet industry. Those findings improved the overall application of the standard and provided measured improvement in test precision. Other changes included a new pilot burner and reduction of the variation in the airflow through the chamber, which reduced the variability of data. Revisions also were made to eliminate “permissive” language. The revisions created closer harmony with ASTM E648, *Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source*.

The 2000 edition was a reconfirmation of the 1995 edition.

The 2006 edition included a complete editorial rewrite for compliance with the *Manual of Style for NFPA Technical Committee Documents*. Further organizational and editorial changes were made to clarify the requirements of the test method. Provisions regarding safety precautions were moved to the annexes, and additional details were provided on simulating a concrete floor during the test.

The 2011 edition was revised to create uniformity with other fire test standards. Provisions for laminate floor mounting were added to Chapter 5.

The 2015 edition has been revised to provide clarity on airflow rates and provide updated examples of test apparatuses.

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A reference in brackets [] following a section or paragraph indicates material that has been extracted from another NFPA document. As an aid to the user, the complete title and edition of the source documents for extracts in mandatory sections of the document are given in Chapter 2 and those for extracts in informational sections are given in Annex G. Extracted text may be edited for consistency and style and may include the revision of internal paragraph references and other references as appropriate. Requests for interpretations or revisions of extracted text shall be sent to the technical committee responsible for the source document.

Information on referenced publications can be found in Chapter 2 and Annex G.

Chapter 1 Administration

1.1 Scope.

1.1.1* This fire test response standard describes a procedure for measuring critical radiant flux behavior of horizontally mounted floor covering systems exposed to a flaming ignition source in a graded, radiant heat energy environment within a test chamber.

1.1.2* This fire test response standard measures the critical radiant flux at flameout and provides a basis for estimating one aspect of fire exposure behavior for floor covering systems.

1.2 Purpose.

1.2.1* The standard was developed to simulate an important fire exposure component in fires that develops in corridors or exit enclosures of buildings and is not intended for routine use in estimating flame spread behavior of floor covering in building areas other than corridors or exit enclosures.

1.2.2 This fire test response standard is designed to provide a basis for estimating one aspect of the fire exposure behavior of a floor covering system installed in a building corridor.

1.2.3 The test environment simulates conditions that have been observed and defined in full-scale corridor experiments.

1.3 Application.

1.3.1 This standard is used to measure and describe the response of materials, products, or assemblies to heat and flame

under controlled conditions and is not to be used to describe or appraise the fire hazard or fire risk of materials, products, or assemblies under actual fire conditions.

1.3.2 The results of the test are permitted to be used as elements of a fire hazard assessment or a fire risk assessment that takes into account all factors that are pertinent to an assessment of the fire hazard or fire risk of a particular end use.

1.3.3* This standard does not purport to address all safety problems associated with its use.

1.3.4 The user of this standard is responsible for establishing appropriate safety and health practices and determining the applicability of regulatory limitations prior to use.

1.3.5 The fundamental assumption inherent in the test is that critical radiant flux is one measure of the sensitivity to flame spread of floor covering systems located in a building corridor.

1.3.6 The test is suitable for regulatory statutes, specification acceptance, design purposes, or development and research.

1.3.7 The test is applicable to floor covering system specimens that follow or simulate accepted installation practice.

1.3.8 Tests on the individual elements of a floor system are not valid for evaluation of the flooring system.

1.4 Summary of Test Method. The basic elements of the test chamber include an air-gas-fueled radiant heat energy panel inclined at 30 degrees to and directed at a horizontally mounted floor covering system specimen.

1.4.1 The radiant panel generates a radiant energy flux distribution along the 1000 mm length of the test specimen from a nominal maximum of 1.0 W/cm² to a minimum of 0.1 W/cm².

1.4.2 The test is initiated by open-flame ignition from a pilot burner.

1.4.3 The distance burned to flameout is converted to W/cm² from the flux profile graph shown in Figure 1.4.3 and is reported as critical radiant flux W/cm².

1.4.4 The specimen can be mounted over underlayment or over a simulated concrete structural floor, bonded to a simulated structural floor, or otherwise mounted in a typical and representative way.

Chapter 2 Referenced Publications

2.1 General. The documents or portions thereof listed in this chapter are referenced within this standard and shall be considered part of the requirements of this document.

2.2 NFPA Publications. (Reserved)

2.3 Other Publications.

2.3.1 ASTM Publications. ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959.

ASTM C1186, *Standard Specification for Flat Fiber-Cement Sheets*, 2008 (2012).

ASTM E136, *Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C*, 2012.



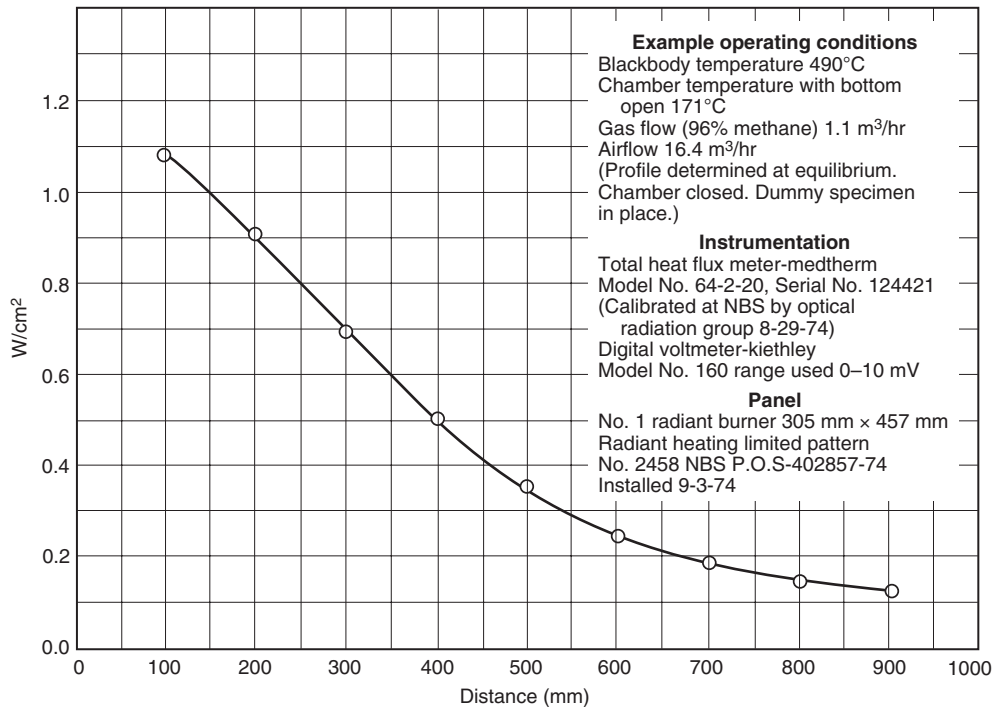


FIGURE 1.4.3 Standard Radiant Heat Energy Flux Profile.

2.3.2 Other Publications.

Meriam-Webster's Collegiate Dictionary, 11th edition, Merriam-Webster, Inc., Springfield, MA, 2003.

2.4 References for Extracts in Mandatory Sections.

NFPA 101®, *Life Safety Code*®, 2015 edition.

Chapter 3 Definitions

3.1 General. The definitions contained in this chapter shall apply to the terms used in this standard. Where terms are not defined in this chapter or within another chapter, they shall be defined using their ordinarily accepted meanings within the context in which they are used. *Meriam-Webster's Collegiate Dictionary*, 11th edition, shall be the source for the ordinarily accepted meaning.

3.2 NFPA Official Definitions.

3.2.1* Approved. Acceptable to the authority having jurisdiction.

3.2.2 Shall. Indicates a mandatory requirement.

3.2.3 Should. Indicates a recommendation or that which is advised but not required.

3.2.4 Standard. An NFPA Standard, the main text of which contains only mandatory provisions using the word “shall” to indicate requirements and that is in a form generally suitable for mandatory reference by another standard or code or for adoption into law. Nonmandatory provisions are not to be considered a part of the requirements of a standard and shall be located in an appendix, annex, footnote, informational note, or other means as permitted in the NFPA Manuals of Style. When used in a generic sense, such as in the phrase “standards development process” or

“standards development activities,” the term “standards” includes all NFPA Standards, including Codes, Standards, Recommended Practices, and Guides.

3.3 General Definitions.

3.3.1 Blackbody Temperature. The temperature of a perfect radiator having a surface with an emissivity of unity and, therefore, a reflectivity of zero (0).

3.3.2 Critical Radiant Flux. The level of incident radiant heat energy in units of W/cm² on a floor covering system at the most distant flameout point [101, 2015].

3.3.3* Flameout. The time period measured from the point in time identified as time zero at which the specimen is moved into the chamber and the door is closed to the point in time at which the last vestige of flame or glow disappears from the surface of the test specimen, frequently accompanied by a final puff of smoke.

3.3.4 Floor Covering. An essentially planar material with a small thickness in comparison to its length or width, which is laid on a floor to enhance the beauty, comfort, and utility of the floor.

3.3.5 Floor Covering System. A single material, composite, or assembly composed of the floor covering and related installation components such as adhesive or cushion, if any.

3.3.6 Flooring. A primary floor surface or a final floor surface.

3.3.7 Flux Profile. The curve of incident radiant heat energy on the specimen plane relative to the distance from the point of initiation of flaming ignition (i.e., 0 mm).

3.3.8 Standard Simulated Concrete Subfloor. Uncoated fiber-reinforced cement board with a nominal thickness of 6.3 mm and a density of 1442 kg/m³ ±160 kg/m³.