Designation: E970 – 23

An American National Standard

Standard Test Method for Critical Radiant Flux of Exposed Attic Floor Insulation Using a Radiant Heat Energy Source[1]

This standard is issued under the fixed designation E970; 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 This fire-test-response standard describes a procedure for measuring the critical radiant flux of exposed attic floor insulation subjected to a flaming ignition source in a graded radiant heat energy environment in a test chamber. The specimen is any attic floor insulation. This test method is not applicable to those insulations that melt or shrink away when exposed to the radiant heat energy environment or the pilot burner.

1.2 This fire-test-response standard measures the critical radiant flux at the point at which the flame advances the farthest. It provides a basis for estimating one aspect of fire exposure behavior for exposed attic floor insulation. The imposed radiant flux simulates the thermal radiation levels likely to impinge on the floors of attics whose upper surfaces are heated by the sun through the roof or by flames from an incidental fire in the attic. This fire-test-response standard was developed to simulate an important fire exposure component of fires that develop in attics, but is not intended for use in estimating flame spread behavior of insulation installed other than on the attic floor.

1.3 The values stated in SI units are to be regarded as standard. The values given in parentheses are for information only.

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

1.5 *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.*

1.6 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.7 The text of this standard references notes and footnotes which provide explanatory material. These notes and footnotes (excluding those in tables and figures) shall not be considered as requirements of the standard.

1.8 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

C167 Test Methods for Thickness and Density of Blanket or Batt Thermal Insulations

C665 Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing

C739 Specification for Cellulosic Fiber Loose-Fill Thermal Insulation

C764 Specification for Mineral Fiber Loose-Fill Thermal Insulation

E84 Test Method for Surface Burning Characteristics of Building Materials

E122 Practice for Calculating Sample Size to Estimate, With Specified Precision, the Average for a Characteristic of a Lot or Process

E176 Terminology of Fire Standards

E177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods

E631 Terminology of Building Constructions

E648 Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source

[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.

E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method
E2653 Practice for Conducting an Interlaboratory Study to Determine Precision Estimates for a Test Method with Fewer Than Six Participating Laboratories

2.2 *Federal Specifications:*

HH-I-515 Insulation Thermal (Loose Fill for Pneumatic or Poured Application), Cellulosic or Wood Fiber[3]
HH-I-521, Insulation Blankets, Thermal (Mineral Fiber, for Ambient Temperature)[3]
HH-I-1030 Insulation, Thermal (Mineral Fiber, for Pneumatic or Poured Application)[3]

3. Terminology

3.1 For definitions of terms used in this test method and associated with fire issues refer to the terminology contained in Terminology E176.

3.2 *Definitions:*

3.2.1 *attic, n*—an accessible enclosed space in a building immediately below the roof and wholly or partly within the roof framing.

3.2.2 See Terminology E631 for additional definitions of terms used in this test method.

3.3 *Definitions of Terms Specific to This Standard:*

3.3.1 *critical radiant flux, n*—the level of incident radiant heat energy on the attic floor insulation system at the most distant flame-out point. It is reported as W/cm^2 (or Btu/ft^2·s).

3.3.2 *radiant flux profile, n*—the graph relating incident radiant heat energy on the specimen plane to distance from the point of initiation of flaming ignition, that is, 0 mm.

3.3.3 *total flux metre, n*—the instrument used to measure the level of radiant heat energy incident on the specimen plane at any point.

4. Summary of Test Method

4.1 A horizontally mounted insulation specimen is exposed to the heat from an air-gas radiant heat energy panel located above and inclined at 30° ± 5° to the specimen. After a short preheat, the hottest end of the specimen is ignited with a small calibrated flame. The distance to the farthest advance of flaming is measured, converted to kilowatts per square meter from a previously prepared radiant flux profile graph, and reported as the critical radiant flux.

5. Significance and Use

5.1 This fire-test-response standard is designed to provide a basis for estimating one aspect of the fire exposure behavior to exposed insulation installed on the floors of building attics. The test environment is intended to simulate conditions that have been observed and defined in full-scale attic experiments.

5.2 The test is intended to be suitable for regulatory statutes, specification acceptance, design purposes, or development and research.

5.3 The fundamental assumption inherent in the test is that critical radiant flux is one measure of the surface burning characteristics of exposed insulation on floors or between joists of attics.

5.4 The test is applicable to attic floor insulation specimens that follow or simulate accepted installation practice.

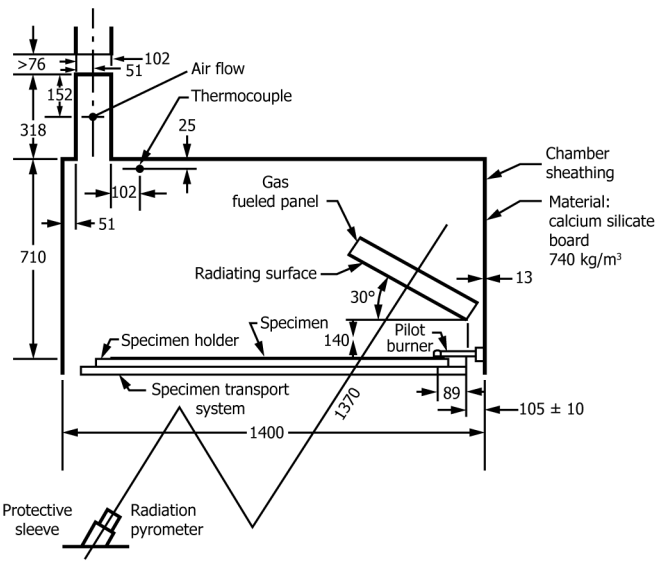
5.5 In this procedure, the specimens are subjected to one or more specific sets of laboratory fire test exposure conditions. If different test conditions are substituted or the anticipated end-use conditions are changed, caution should be used to predict changes in the performance characteristics measured by or from this test. Therefore, the results are strictly valid only for the fire test exposure conditions described in this procedure.

5.5.1 If the test results obtained by this test method are to be considered in the total assessment of fire hazard in a building structure, then all pertinent established criteria for fire hazard assessment developed by Committee E-5 must be included in the consideration.

6. Apparatus

6.1 The apparatus shall be as shown in Fig. 1, located in a draft-protected laboratory that maintains a temperature from 10.0 °C to 26.7 °C (50 °F to 80 °F) and a relative humidity from 30 % to 70 %:

6.1.1 The radiant panel test chamber (Fig. 1 and Fig. 2) shall consist of an enclosure 1400 mm (55 in.) long by 500 mm (19½ in.) deep by 710 mm (28 in.) above the test specimen. The sides, ends, and top shall be of 13 mm (½-in.) calcium silicate, 740 kg/m^3 (46-lb/ft^3) nominal density, insulating material with a thermal conductivity at 177 °C (350 °F) of 0.128 W/(m·K) (0.89 Btu · in./(h·ft^2·°F)). One side shall be provided with an approximately 100 mm by 1100 mm (4 in. by 44 in.) draft-tight fire-resistant glass window so that the entire length of the test specimen is visible from outside the fire test chamber. On the same side and below the observation window is a door which, when open, allows the specimen platform to be



NOTE 1—All dimensions in millimetres. 1 in. = 25.4 mm.

FIG. 1 Flooring Radiant Tester Schematic, Side Elevation

[3] Available from Standardization Documents Order Desk, DODSSP, Bldg. 4, Section D, 700 Robbins Ave., Philadelphia, PA 19111-5098, http://www.dodssp.daps.mil.