NFPA®

268

Standard Test Method for Determining Ignitability of Exterior Wall Assemblies Using a Radiant Heat Energy Source

2022

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2022 Edition

NFPA, 1 Batterymarch Park, Quincy, MA 02169-7471
An International Codes and Standards Organization

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NFPA® 268

Standard Test Method for

Determining Ignitability of Exterior Wall Assemblies Using a Radiant Heat Energy Source

2022 Edition

This edition of NFPA 268, *Standard Test Method for Determining Ignitability of Exterior Wall Assemblies Using a Radiant Heat Energy Source*, was prepared by the Technical Committee on Fire Tests. It was issued by the Standards Council on October 2, 2021, with an effective date of October 22, 2021, and supersedes all previous editions.

This edition of NFPA 268 was approved as an American National Standard on October 22, 2021.

Origin and Development of NFPA 268

The 1996 edition of NFPA 268 represented the first edition of a standard that addressed the determination of ignitability characteristics of exterior wall assemblies. The test method incorporated a radiant heat energy source. At the time this document was published, there were no standardized test methods available within the standards development organizations, and NFPA 268 complemented the fire test methods available within the NFPA standards. The results of this test could be used to measure and describe properties of materials in controlled laboratory conditions and also could be used as an element of a fire risk assessment.

The 2001 edition incorporated the new format and editorial changes as required to satisfy the *Manual of Style for NFPA Technical Committee Documents*. Revisions to 11.4.2, 11.4.2.1, and 12.1(10)(c) were made to incorporate the specific time period that was originally within the definition. No significant revisions were made in the 2007 edition.

The 2012 edition was revised editorially. Referenced publications were revised to reference the most up-to-date documents.

The 2017 edition was a reconfirmation of the 2012 edition with minor editorial corrections and reference updates.

The 2022 edition has been updated to address testing at different incident heat fluxes for larger fire separation distances.

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Committee Scope: This Committee shall have primary responsibility for documents on fire testing procedures, for reviewing existing fire test standards and recommending appropriate action to NFPA, for recommending the application of and advising on the interpretation of acceptable test standards for fire problems of concern to NFPA technical committees and members, and for acting in a liaison capacity between NFPA and the committees of other organizations writing fire test standards. This Committee does not cover fire tests that are used to evaluate extinguishing agents, devices, or systems.

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Standard Test Method for

Determining Ignitability of Exterior Wall Assemblies Using a Radiant Heat Energy Source

2022 Edition

NOTICE: An asterisk (*) following the number or letter designating a paragraph indicates that explanatory material on the paragraph can be found in Annex A.

A reference in brackets [ ] following a section or paragraph indicates material that has been extracted from another NFPA document. 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 and extracted publications can be found in Chapter 2 and Annex C.

Chapter 1 Administration

1.1 Scope.

1.1.1 This fire test response standard describes a method for determining the propensity of ignition of exterior wall assemblies from exposure to 12.5 kW/m^2 (1.10 Btu/ft^2-sec) radiant heat in the presence of a pilot ignition source.

1.1.2 This test method evaluates the propensity of ignition of an exterior wall assembly where subjected to a minimum radiant heat flux of 12.5 kW/m^2 (1.10 Btu/ft^2-sec). This method determines whether ignition of an exterior wall assembly occurs when the wall is exposed to a specified radiant heat flux, in the presence of a pilot ignition source, during a 20-minute period.

1.1.3 This test method utilizes a gas-fired radiant panel to apply a radiant heat flux of 12.5 kW/m^2 (1.10 Btu/ft^2-sec) to a representative sample of an exterior wall assembly while the test specimen is exposed simultaneously to a pilot ignition source.

1.1.4 This test method applies to exterior wall assemblies having planar, or nearly planar, external surfaces.

1.1.4.1 This method shall not be used to evaluate the fire resistance of wall assemblies, nor shall it be used to evaluate the effect of fires originating within the building or within the exterior wall assemblies.

1.1.4.2 This method shall not be used to evaluate surface flame spread, nor shall it be used to evaluate the influence of openings for their propensity of ignition.

1.2 Purpose. This test shall be used for code and other regulatory purposes, for specification and design purposes, and for research and development activities. (*Additional information can be found in Section B.1.*)

1.3 Application.

1.3.1 This fire test response standard measures and describes the properties of materials, products, or assemblies in response to heat and flame under controlled laboratory conditions and shall not be used to describe or appraise the fire hazard or fire risk of materials, products, or assemblies under actual fire conditions. However, results of this test shall be permitted to be used as an element of a fire risk assessment that takes into account all factors that are pertinent to an assessment of the fire hazard of a particular end use.

1.3.2 In this procedure, the specimens are subjected to one or more specific sets of laboratory test conditions. If different test conditions are substituted, or the end-use conditions are changed, it is not possible for this test to predict all changes in the fire test response characteristics measured. Therefore, the results are valid only for the fire test exposure conditions described in this procedure.

1.3.3 This fire test response standard involves hazardous materials, operations, and equipment. This standard does not address all of the safety problems associated with its applications. It is the responsibility of the user of the standard to establish appropriate safety and health practices and to determine the applicability of the regulatory limitations of the standard prior to use. Safety requirements for specific hazards are provided in Chapter 10.

1.3.4 Ignitability is the propensity of an assembly to ignite and burn with a sustained flame for at least 5 seconds and is further qualified by considering the length of time from time of initial exposure to occurrence of the sustained flaming.

1.4 Units and Formulas. The values stated in SI units are considered the required values. The values in parentheses are for information only.

1.5* Precision or Bias. This standard does not address either the precision or bias of this test method.

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 E511, *Standard Test Method for Measuring Heat Flux Using a Copper-Constantan Circular Foil, Heat-Flux Transducer*, 2007 (2020).

N **2.3.2 ISO Publications.** International Organization for Standardization, ISO Central Secretariat, BIBC II, Chemin de Blandonnet 8, CP 401, 1214 Vernier, Geneva, Switzerland.

ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*, 2017.

2.3.3 Other Publications.

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

2.4 References for Extracts in Mandatory Sections. (Reserved)

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. *Merriam-Webster's Collegiate Dictionary*, 11th edition, shall be the source for the ordinarily accepted meaning.

3.2 NFPA Official Definitions.

3.2.1 Shall. Indicates a mandatory requirement.

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

3.2.3 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 phrases "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 Heat Flux. The rate of heat transfer per unit area to a surface, typically expressed in kW/m^2 or Btu/ft^2-sec.

3.3.2 Heat Flux Meter. An instrument used to measure the level of heat flux energy incident on a surface.

3.3.3 Ignitability. The propensity for ignition, as measured by the time to sustained flaming, in seconds, at a specified initial test heat flux.

3.3.4 Initial Test Heat Flux. Amount of heat received by a specimen surface per unit area and unit time at the initiation of a test.

3.3.5 Sustained Flaming. For the purposes of this standard, the uninterrupted existence of a flame on or over the surface of a test specimen for a specified time period.

Chapter 4 Summary of Method

4.1 Test Panel Orientation. The radiant panel and the test specimen shall be oriented in a parallel plane configuration, with the geometric centers of the radiant panel and the test specimen concurrent along a line perpendicular to their surfaces as shown in Figure 4.1.

4.2 Test Setup.

4.2.1 This method shall utilize a 0.91 m × 0.91 m (3 ft × 3 ft) propane-fired radiant panel and a minimum 1.22 m (4 ft) wide × 2.44 m (8 ft) high test specimen.

4.2.2 A spark igniter mounted on the vertical centerline of the test specimen at a point 460 mm (18 in.) above its horizontal centerline and 15.9 mm (⅝ in.) from its surface shall serve as the pilot ignition source.

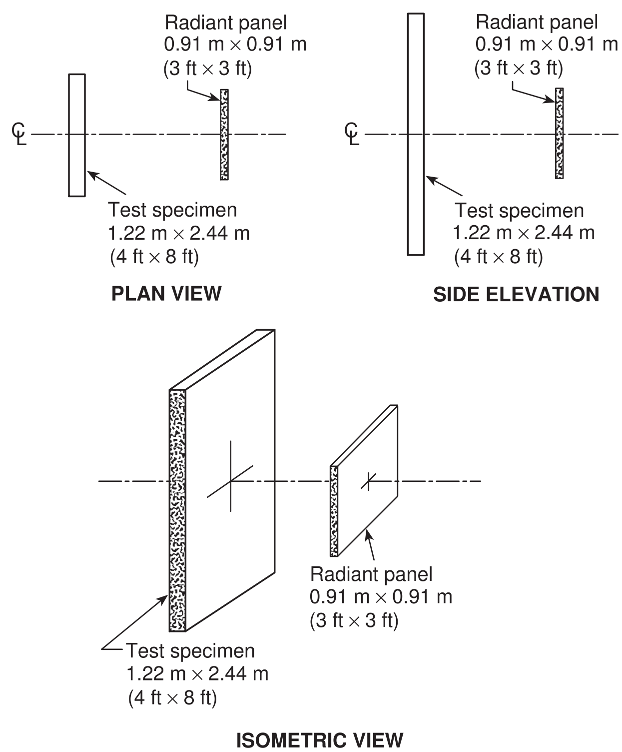

FIGURE 4.1 Spatial Relationship Between the Test Specimen and the Radiant Panel.

4.2.3 A radiation shield shall isolate the test specimen from the radiant source prior to the start of the test, during which the radiant panel is ignited and brought to a specified steady-state temperature of 871°C ± 27.8°C (1600°F ± 50°F).

4.2.4 The specified heat flux value shall be controlled by the spacing between the radiant panel and the test specimen.

4.2.5* The test specimen shall be exposed to a "square-wave" radiant heat versus time exposure for 20 minutes.

N **4.2.6** When the test is conducted with the same spacing between the exposed face of the calibration panel and the face of the radiant panel as determined during the calibration, the incident radiant heat flux at the test specimen surface shall be 12.5 kW/m^2.

N **4.2.7** The test equipment shall be suitable for use to assess ignitability at lower incident radiant heat fluxes *(see Section 11.6)*.

Chapter 5 Radiant Panel Apparatus and Specimen Mounting System

5.1 Radiant Panel.

5.1.1 Panel. The radiant panel shall have minimum face dimensions of 0.91 m × 0.91 m (3 ft × 3 ft) and shall consist of an array of individual burner heads, each measuring not less than 152.4 mm × 152.4 mm (6 in. × 6 in.).

5.1.2 Alternate Panel. Alternate radiant panels shall be permitted, provided the calibration criteria of Sections 8.3(1) and 8.3(2) are met.

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5.1.3* Burner Heads.

5.1.3.1 The individual burner heads shall consist of a porous ceramic plate covered by an Inconel™ mesh, or equivalent radiant panel burners.

5.1.3.2 The burner heads shall be fired by a premixed propane-air fuel mixture.

5.1.4 Zones. The gas supply to the burner heads shall be separated into three zones.

5.1.4.1 Each zone shall consist of two horizontal rows of six burner heads.

5.1.4.2 The zone arrangement shall allow the surface of the 0.91 m × 0.91 m (3 ft × 3 ft) radiator to be controlled to produce a relatively uniform temperature.

5.1.4.3 The temperature of each zone of burner heads shall be established by controlling the propane-air fuel mixture pressure supplied to each zone.

5.1.5 Control Equipment. Automatic controls shall be provided to ignite the radiant panel and to shut off the propane gas fuel flow in the event of a misfire.

5.1.6 Mounting. The burner heads and the associated propane and air plumbing and control equipment shall be mounted on a steel platform as shown in Figure 5.1.6(a) and Figure 5.1.6(b).

5.2 Test Specimen. A minimum 1.22 m (4 ft) wide × 2.44 m (8 ft) high test specimen shall be mounted on a steel frame trolley assembly as shown in Figure 5.2 or equivalent support system.

5.2.1 Mounting Frame. The mounting frame shall hold the test specimen securely in a vertical orientation and shall allow for the spacing between the test specimen and the radiant panel to be adjusted.

5.2.2 Trolley.

5.2.2.1 The specimen trolley shall consist of a 1.22 m × 1.22 m (4 ft × 4 ft) steel base mounted on steel V-groove wheels or an equivalent arrangement.

5.2.2.2 The V-groove wheels shall travel on angle-iron tracks that are mounted securely to the laboratory floor and that incorporate leveling adjusters.

5.2.2.3 A means shall be provided to prevent the trolley from overturning.

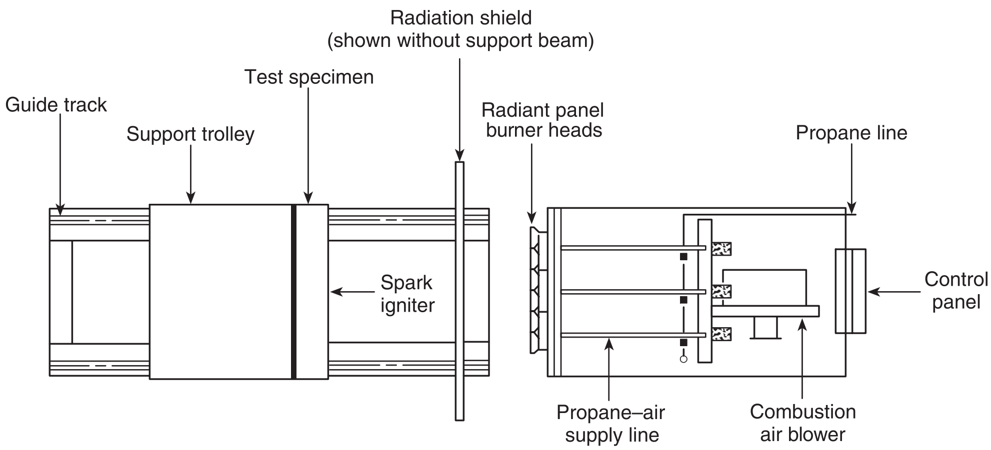

FIGURE 5.1.6(a) Plan View of the Test Apparatus.

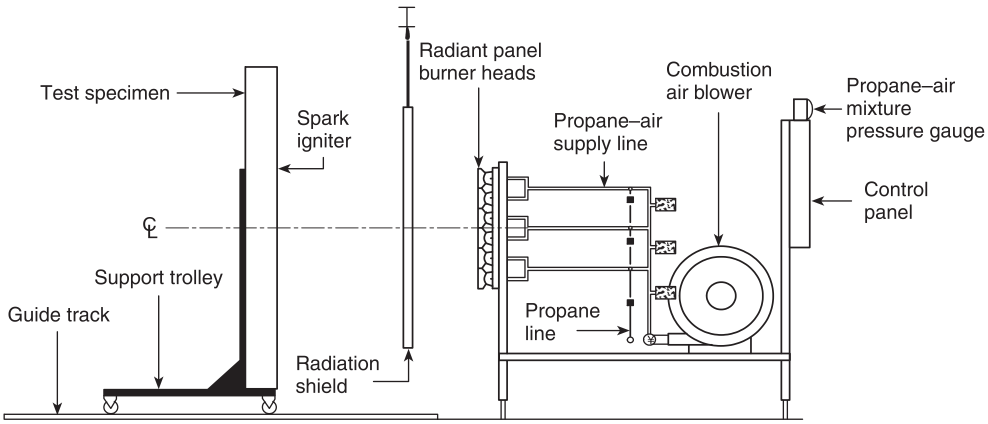

FIGURE 5.1.6(b) Side Elevation of the Test Apparatus.

5.3 Radiation Shield.

5.3.1 General.

5.3.1.1* A radiation shield shall be used to isolate the test specimen from the radiant panel both before and after the test period.

5.3.1.2 The radiation shield shall consist of a water-cooled panel or other construction that has been shown to have no effect on the specimen or radiator.

5.3.2 Water Coolant. Where a water-cooled shield is used, dual waterflow connections shall supply coolant water to the bottom of the radiation shield.

5.3.2.1 The coolant water shall exit along the top edge of the radiation shield.

5.3.2.2 The water coolant flow shall be either a closed loop or open loop system, depending on the conditions and preference of the individual laboratory.

5.3.2.3 The radiation shield shall be fitted with a pressure gauge and, in closed loop systems, a pressure relief valve.

5.3.2.4 The outlet of the pressure relief valve shall be piped to an area that prevents injury to test personnel in the event of the release of coolant or steam.

5.3.2.5 A thermocouple shall be mounted in the coolant discharge to monitor temperature increase in the coolant during tests.

5.3.2.6 Increases in coolant temperature during tests shall not exceed 56°C (133°F).

5.3.3* Mounting. The radiation shield shall be mounted so that it can be removed quickly or inserted.

5.3.3.1 Prior to the start of the test, the radiation shield shall be inserted between the radiant panel and the test specimen to prevent exposure of the test specimen until the start of the 20-minute exposure.

5.3.3.2 Once the radiant panel has attained its specified steady-state temperature, the radiation shield shall be removed in order to begin the radiant heat exposure period.

5.4 Spark Igniter.

5.4.1 General. The spark igniter shall consist of two electrodes connected to a nominal 6000-volt energy source.

5.4.2 Placement.

5.4.2.1 The spark igniter electrodes shall extend horizontally from the edge of the test specimen and shall be positioned so that the center of the spark gap is located along the vertical centerline of the test specimen at a location 460 mm ± 3.2 mm (18 in. ± 1⁄8 in.) above the horizontal centerline of the test specimen with respect to Figure 5.4.2.1(a) and Figure 5.4.2.1(b).

5.4.2.2 The center of the spark gap also shall be located 15.9 mm ± 1.6 mm (5⁄8 in. ± 1⁄16 in.) away from the surface of the test specimen.

5.4.2.3 Spacing.

5.4.2.3.1 The spark igniter electrodes shall be designed and mounted so that the 15.9 mm ± 1.6 mm (5⁄8 in. ± 1⁄16 in.) spacing is maintained throughout the test period by a spring tensioner or equivalent arrangement.

5.4.2.3.2 The spacing shall be maintained even if the test specimen surface deforms.

5.4.2.4 The spark igniter electrodes and support structure shall be designed so that the entire cross-sectional area of the design is contained within a 9.5 mm (3⁄8 in.) projected width.

5.4.2.5 The spark igniter shall be operated so that the duration of the "off" portion of the cycle is no greater than 2 seconds, and the duration of the "on" portion of the cycle is at least 5 seconds.

5.5 Ambient Conditions.

5.5.1 The test shall be conducted within a building vented to discharge combustion products and to intake fresh air so that oxygen-deficient air is not introduced during a test.

5.5.2 Ambient air temperature at the start of the ignitability test and the calibration test shall be 10°C to 32°C (50°F to 90°F).

5.5.3 The radiant panel apparatus shall be located in a draft-free environment so that volatiles evolving during the course of a test rise vertically adjacent to the surface of the test specimen.

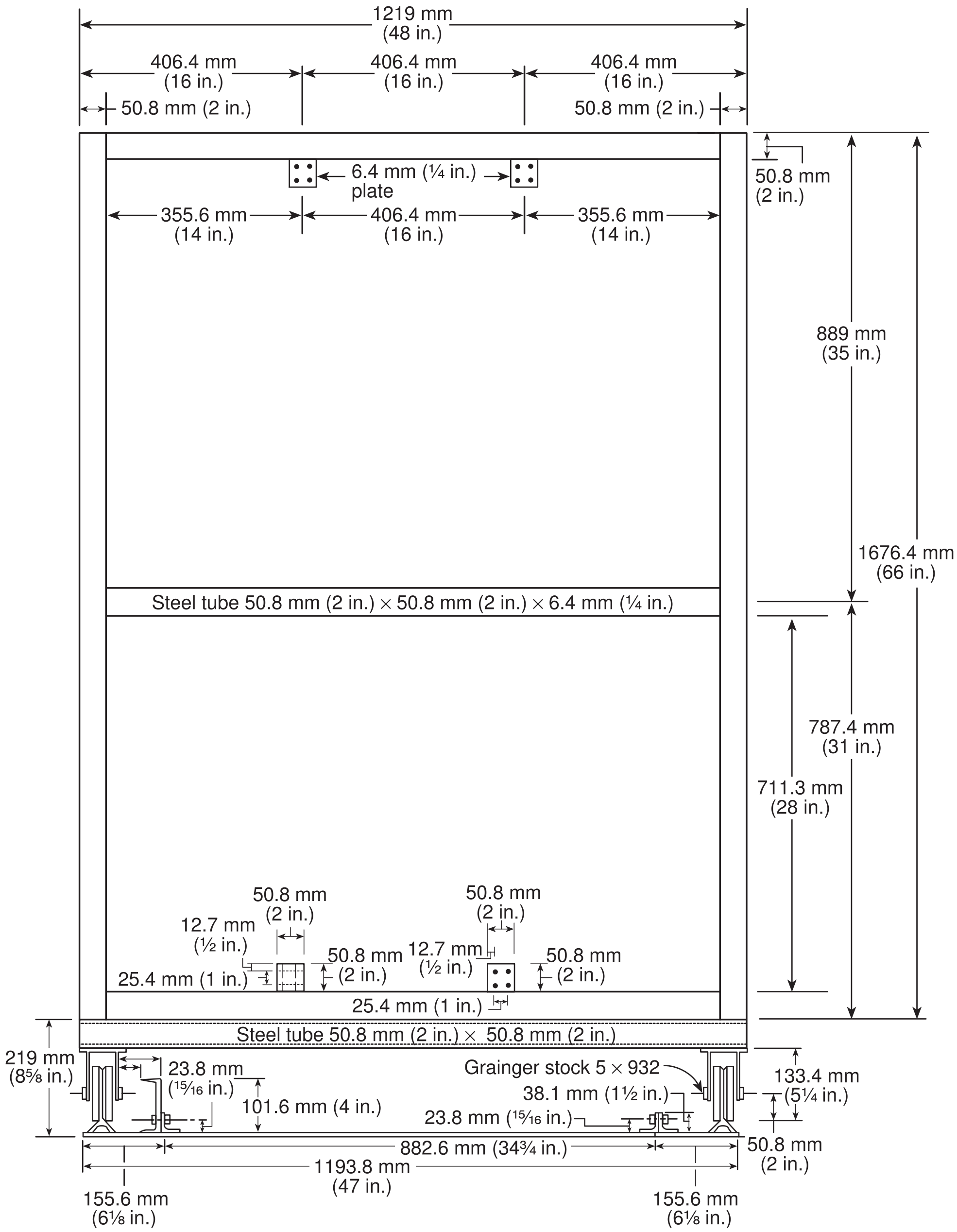

FIGURE 5.2 Front Elevation of the Specimen Trolley and Frame.

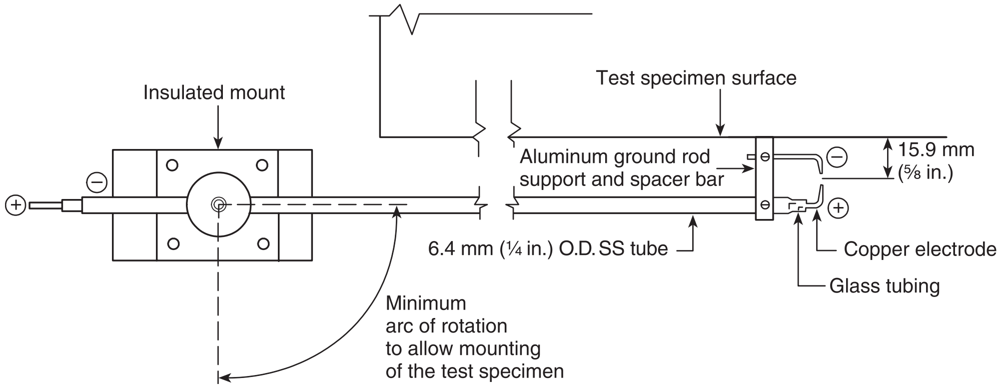

FIGURE 5.4.2.1(a) Plan View of the Spark Igniter.

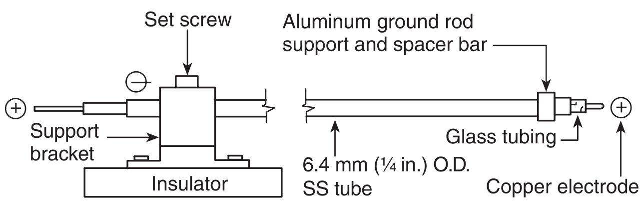

FIGURE 5.4.2.1(b) Side Elevation of the Spark Igniter.

Chapter 6 Instrumentation and Documentation

6.1 Heat Flux Meter.

6.1.1 Locations During Calibration and Product Tests.

6.1.1.1 A heat flux meter for reference use shall be located within 127 mm (5 in.) of the vertical edge of the test specimen on a line along the horizontal centerline of the test specimen, as shown in Figure 6.1.1.1.

6.1.1.2 The exact distance of the heat flux meter from the vertical edge of the test specimen shall be the same as that used for the calibration test.

6.1.1.3 The front face of the heat flux meter shall be in the same plane as the exposed face of the test specimen and shall be parallel to the face of the radiant panel.

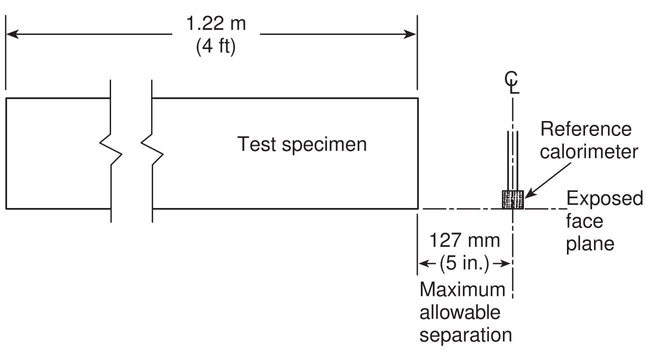

FIGURE 6.1.1.1 Plan View of Reference Calorimeter Location.

6.1.2 Flux Meters. Heat flux meters shall be located in the calibration panel at the five locations specified in Figure 6.1.2.

6.1.3 Specification.

6.1.3.1 The heat flux meters shall be of the Gardon or Schmidt-Boetler type with a flat black surface and a nominal 180 degree view angle.

6.1.3.2 The heat flux meters shall be operated at the manufacturer's recommended coolant temperature, and the flow rate for the flux levels shall be measured in accordance with ASTM E511, *Standard Test Method for Measuring Heat Flux Using a Copper-Constantan Circular Foil, Heat-Flux Transducer*.

6.1.3.3 For Schmidt-Boetler heat flux meters, the zero off-set of the heat flux meters at ambient temperature, due to the temperature of the coolant water, shall be added to or subtracted from the heat flux data collected during the calibration tests and the product tests before calculations are made to determine compliance with this test method.

6.2 Thermocouples.

6.2.1 Locations. A minimum of eight thermocouples shall be installed on the face of the radiant panel, with the termination bead of each thermocouple mounted so that the bead is in contact with the burner screen at the locations specified in Figure 6.2.1.

6.2.2 Specifications. The thermocouples shall be Type K, no smaller than 24 AWG, and no larger than 14 AWG. The thermocouples shall be insulated and capable of continuous operation at a temperature of at least 982°C (1800°F).

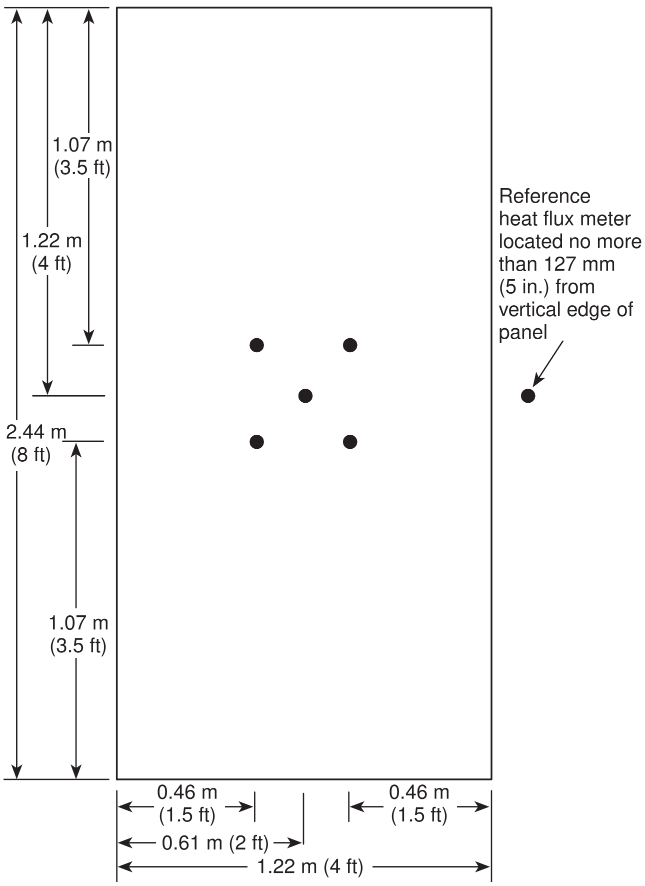

FIGURE 6.1.2 Calibration Panel Heat Flux Meter Locations.

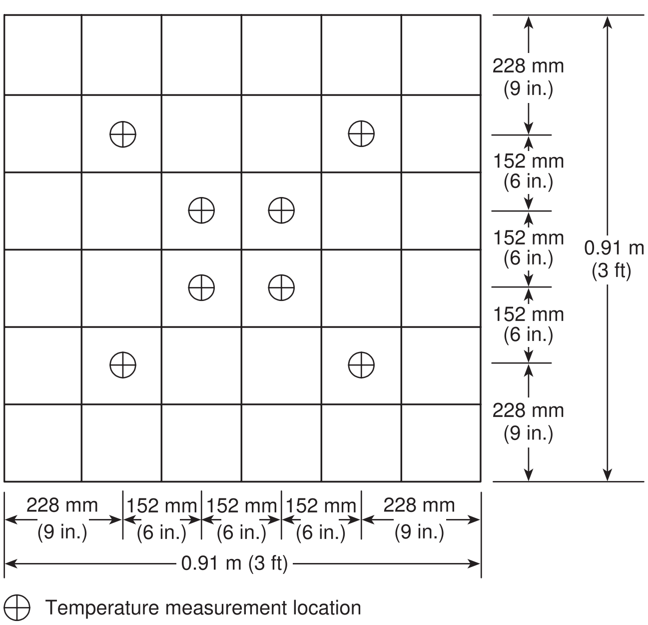

FIGURE 6.2.1 Temperature Measurement Locations on the Face of the Radiant Panel.

6.3 Photographic Documentation.

6.3.1 Photographic or video equipment shall be used to record the performance of the test specimen throughout the test period.

6.3.2 The exterior surface of the test specimen shall be marked clearly with a 0.3 m × 0.3 m (1 ft × 1 ft) grid using a contrasting color.

6.3.3 Clock.

6.3.3.1 A clock or other suitable timing device shall be used for photographic records.

6.3.3.2 This clock or timing device shall be synchronized accurately with all other measurements, or other provisions shall be made to correlate the photo record with time.

6.3.4 Film.

6.3.4.1 Color photographs shall be taken at regular intervals for the duration of the test, or a continuous video or film recording shall be made.

6.3.4.2 The camera view area shall include the entire 1.22 m × 2.44 m (4 ft × 8 ft) specimen.

Chapter 7 Test Specimen and Mounting

7.1* Specimen Detail. Test specimens shall be a minimum of 1.22 m × 2.44 m (4 ft × 8 ft) and shall be representative of the overall wall system construction, including finish details, joints, if any, attachments, and support structure.

7.2 Mounting.

7.2.1 Test specimens shall be mounted securely on the trolley assembly with their 2.44 m (8 ft) dimension in a vertical orientation.

7.2.2 The exterior face of the test specimen shall be parallel to the face of the radiant panel and the geometric center of the test specimen.

7.2.3 The geometric center of the radiant panel shall be concurrent with respect to a line drawn perpendicular to the faces of the test specimen and the radiant panel.

Chapter 8 Calibration of the Test Equipment

8.1 Calibration.

8.1.1 A successful calibration test shall have been performed prior to and within 30 days of any ignitability test.

8.1.2 The calibration test shall last for 20 minutes and shall use the radiant panel to expose a standard calibration panel as detailed in Figure 6.1.2.

8.1.3* The calibration panel shall meet the requirements of 8.1.3.1 and 8.1.3.2.

8.1.3.1 The calibration panel shall consist of two layers having a total thickness of 31.8 mm (1¼ in.).

8.1.3.2 A 12.7 mm (½ in.) low-density, rigid thermal insulation board having a nominal density of 0.23 g/cm^3 to 0.28 g/cm^3 (15 lb/ft^3 to 18 lb/ft^3) shall be mounted to the test frame and covered with one layer of 19.1 mm (¾ in.), 0.74 g/cm^3

(44 lb/ft^3) nominal density calcium silicate 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).

8.1.4 The data specified in 8.1.4(1) through 8.1.4(4) shall be recorded at intervals no greater than 15 seconds as follows:

(1) The heat flux versus the time curve at each of the five specified heat flux meter locations on the calibration panel surface and the reference heat flux meter at the side-mounted locations *(see Figure 6.1.2)*
(2) The heat flux versus the time curve obtained by averaging the four heat flux meters located at the corners of the central square foot of the calibration panel
(3) The temperatures versus the time on the surface of the radiant panel at the specified locations *(see Figure 6.2.1)*
(4) The average of the temperatures on the surface of the radiant panel at each of the specified locations

8.2 Spacing. The spacing between the exposed face of the calibration panel and the face of the radiant panel shall be recorded.

8.3 Validation. The calibration test shall be considered valid, provided the values specified in 8.3(1) through 8.3(3) are as follows:

(1) The heat flux obtained by averaging the four heat flux meters located at the corners of the central square foot of the calibration panel shall be 12.5 kW/m^2 ± 5 percent (1.10 Btu/ft^2-sec ± 5 percent).
(2) The heat flux at the center of the calibration panel shall not exceed 15 kW/m^2 (1.32 Btu/ft^2-sec) or shall be not less than 12.5 kW/m^2 (1.10 Btu/ft^2-sec).
(3) The average surface temperature of the radiant panel shall be 871°C ± 27.8°C (1600°F ± 50°F) for each thermocouple.

Chapter 9 Test Specimen Conditioning

9.1 Conditioning.

9.1.1 Specimens shall be conditioned to a constant weight at 21.1°C ± 5.6°C (70°F ± 10°F) and a relative humidity of 50 percent ± 10 percent.

9.1.2 The constant weight shall be considered to have been achieved where less than a 0.1 percent change in the measured weight of the test specimen undergoing conditioning is recorded for each of three successive measurements taken three days apart, prior to testing.

Chapter 10 Safety Precautions

10.1 Gas Hazard.

10.1.1 The possibility of a gas–air–fuel explosion in the test apparatus shall be recognized.

10.1.2 Suitable safeguards consistent with sound engineering practice shall be installed in the panel fuel supply system.

10.1.3 These safeguards shall include one or more of the following, as appropriate:

(1) A gas feed cutoff that activates when the air supply fails
(2) A fire sensor directed at the panel surface that stops fuel flow when the panel flame goes out
(3) A commercial gas water heater or gas-fired furnace pilot burner control thermostatic shutoff that activates when the gas supply fails, or other suitable and approved device
(4) A manual reset for any safeguard system used

10.2 High Temperature and Pressure.

10.2.1 The possibility of excess pressure and high temperatures involving the fluid (water) of the heat exchanger used as a radiation shield as detailed in Section 5.3 shall be recognized.

10.2.2 Pressure relief valves piped to a safe location shall be provided.

10.2.3 The design and operation of the radiation shield shall be consistent with sound engineering practice.

10.3 Products of Combustion.

10.3.1 In view of the potential hazard from products of combustion, other laboratory equipment shall be protected from smoke and gas.

10.3.2 Laboratory operators shall be instructed to minimize exposure to combustion products by following sound safety practice (which includes wearing appropriate protective clothing and using insulated gloves).

Chapter 11 Test Procedure

11.1 Conditioning. The specimen shall be tested within 1 hour from the time the specimen is removed from the conditioning room.

11.2 Specimen and Test Equipment. Prior to the start of the test, the status of the following items shall be verified:

(1) The test specimen shall be mounted securely to the trolley assembly and oriented properly with respect to the radiant panel.
(2) The trolley assembly shall be moved to the proper location to provide the required separation distance between the face of the test specimen and the face of the radiant panel, as determined from the most recent calibration test.
(3) The side-mounted reference heat flux meter shall be mounted in its proper orientation and shall be operated at the manufacturer's recommended coolant temperature, and flow rate for the flux levels shall be measured in accordance with ASTM E511, *Standard Test Method for Measuring Heat Flux Using a Copper-Constantan Circular Foil, Heat-Flux Transducer*. The coolant temperature shall be set high enough to prevent condensation on the sensor prior to the start of the test.
(4) The spark igniter shall be in place and operational.
(5) The radiation shield shall be in place and shall be operated at the proper waterflow rate.
(6) The propane gas supply to the radiant panel shall be of quantity sufficient for the test duration and shall be connected properly.

11.3 Radiant Panel Preheat.

11.3.1 Ten minutes prior to the start of the test period, the radiant panel shall be ignited.

11.3.2 During the 10-minute warm-up period, the radiant panel shall function properly, and its average surface temperature shall be 871°C ± 27.8°C (1600°F ± 50°F).

11.3.3 Data shall be recorded for the surface temperature of the radiant panel and the reference heat flux meter beginning 1 minute prior to the start of the test and shall be continued until the end of the test period.

11.3.4 Thirty seconds prior to the test, the spark igniter shall be turned on and videotaping or photographing of the test assembly shall commence and continue for the test period.

11.4 Specimen Exposure.

11.4.1 Test Start. At time zero, the radiation shield shall be removed and the radiant heat exposure of the test specimen shall begin.

11.4.2 Test Duration. The test shall be continued for 20 minutes unless sustained flaming (ignition) for a period greater than 5 seconds of the test specimen occurs.

11.4.2.1 If sustained flaming (ignition) for a period greater than 5 seconds of the test specimen occurs, the test shall be terminated by inserting the radiation shield between the radiant panel and the test specimen, turning off the spark igniter, extinguishing the test specimen, and interrupting the flow of gas to the radiant panel.

11.4.2.2 If the specimen does not ignite, the test shall be terminated after 20 minutes by inserting the radiant shield between the radiant panel and the test specimen, turning off the spark igniter, and interrupting the flow of gas to the radiant panel.

Δ **11.5 Heat Flux Variation During a Test.** During a test, if the heat flux measured by the reference heat flux meter varies more than ±2.5 percent from the average value recorded during the most recent calibration test, the results shall be invalid.

N **11.6 Testing at Different Incident Heat Fluxes for Larger Fire Separation Distances.**

N **11.6.1** Testing for different fire separation distances shall be conducted by varying the distance between the test specimen and the radiant panel.

N **11.6.2*** The larger separation distance for testing at a reduced incident heat flux shall be calculated by assuming that the spacing between the exposed face of the calibration panel and the face of the radiant panel at the end of the calibration corresponds to a fire separation distance of 1.524 m (5 ft) and use a spacing based on a proportional increased distance, as shown in the following formula:

[11.6.2]

Larger separation distance = Calibration spacing × [intended fire separation distance in m/1.524 m (ft/5 ft)]

Chapter 12 Report

12.1 Information. The report shall include the information specified in 12.1(1) through 12.1(12) as follows:

(1) The name, thickness, density, and size of all materials used in the wall construction, along with any other identifying characteristics or labels that are significant in order to identify the construction completely
(2) The construction of the full wall assembly, including finish details, joints, if any, attachments, support structure, and any other details necessary to fully describe the test assembly
(3) A description of the material conditioning
(4) The relative humidity and temperature of the test building prior to and during both the test and the most recent calibration test
(5) The time histories of the eight individual thermocouples mounted on the surface of the radiant panel and the average of the eight thermocouples
(6) The time history of the reference heat flux meter
(7) The distance from the edge of the test specimen to the centerline of the side-mounted reference heat flux meter during both the test and the most recent calibration test
(8) The separation distance between the exposed face of the test specimen and the face of the radiant panel in both the calibration test and the product test
(9) A transcript of the visual observations recorded during the test
(10) A statement regarding flaming or ignition of the specimen, or both, that includes the following:
 (a) The time to sustained flaming, if any
 (b) Observations and the time of occurrence of any transient flaming on or near the surface of the specimen
 (c) If appropriate, a statement indicating that no ignition (sustained flaming) for a period greater than 5 seconds occurred during the 20-minute test period
(11) The average heat flux value recorded at the reference heat flux meter during both the test and the most recent calibration test
(12) When the separation distance [12.1(8)] during the test is different from that during calibration, the expected incident heat flux, and the intended fire separation distance being modeled

Chapter 13 Calibration

13.1 Heat Flux Meters.

13.1.1* Heat flux meters shall be calibrated at least annually by a laboratory accredited to ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*.

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Annex A Explanatory Material

Annex A is not a part of the requirements of this NFPA document but is included for informational purposes only. This annex contains explanatory material, numbered to correspond with the applicable text paragraphs.

A.1.5 Due to the fact that results are not being expressed numerically, a precision and bias statement is not applicable.

A.3.3 ASTM E176, *Standard Terminology of Fire Standards,* should be referenced for definitions of terms used in this test method not defined in Section 3.3.

A.4.2.5 The method determines whether the test specimen ignites during the 20-minute test period. When sustained flaming for longer than 5 seconds is observed on or near the surface of the test specimen, ignition has occurred.

• *N* **A.5.1.3** Subsections 5.1.3 through 5.1.6 refer to the panel in 5.1.1.

A.5.3.1.1 Figure A.5.3.1.1 shows one possible arrangement.

A.5.3.3 Figure A.5.3.3 shows one possible arrangement.

A.7.1 The following information is being provided for informational purposes only and has not been independently verified, certified, or endorsed by NFPA or any of its technical committees. Fiberflax Duraboard™ or the equivalent can be considered acceptable for low-density rigid thermal insulation board.

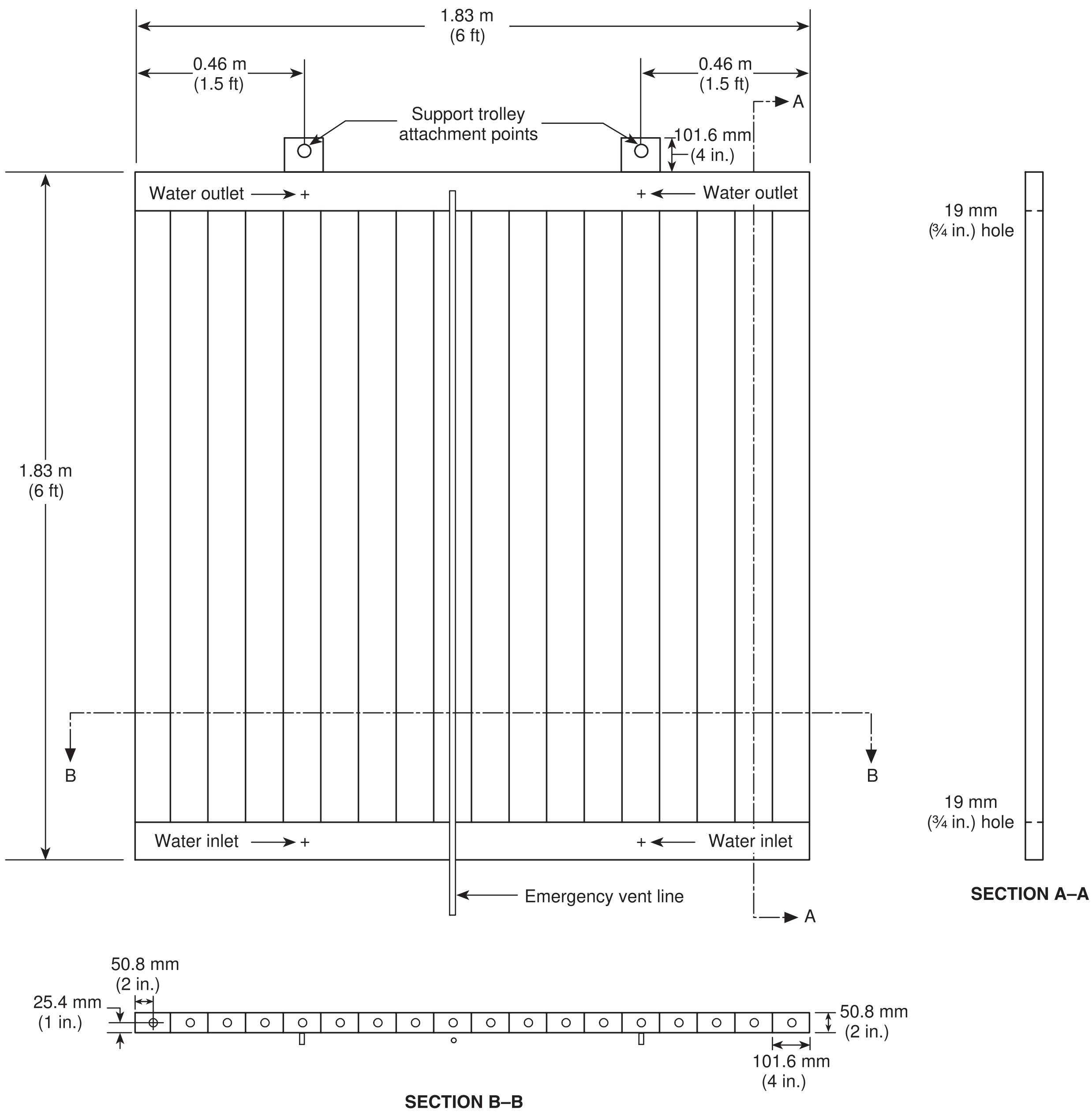

FIGURE A.5.3.1.1 Radiation Shield.

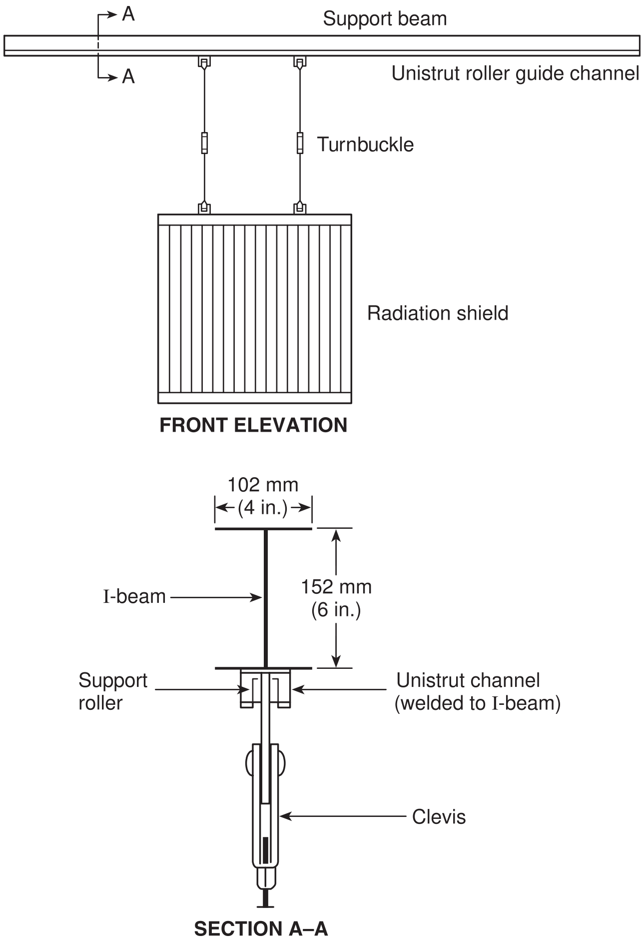

FIGURE A.5.3.3 Radiation Shield Support Trolley.

A.8.1.3 The following information is being provided for informational purposes only and has not been independently verified, certified, or endorsed by NFPA or any of its technical committees. An acceptable rigid thermal insulation board is Fiberflax Duraboard or the equivalent.

N **A.11.6.2** See B.3.7 for information on estimated equivalent heat fluxes at larger fire separation distances.

A.13.1.1 Examples of recognized accreditation bodies are the National Institute of Standards and Technology (NIST) and calibration laboratories accredited to ISO/IEC 17025, *General requirements for the competence of testing and calibration*, by an accreditation body complying with ISO/IEC 17011, *Conformity assessment—Requirements for accreditation bodies accrediting conformity assessment bodies*. Calibration laboratories should be accredited by an accreditation body recognized by the International Laboratory Accreditation Cooperation (ILAC). For additional information, see ASTM E511, *Standard Test Method for Measuring Heat Flux Using a Copper-Constantan Circular Foil, Heat-Flux Transducer*.

Annex B Commentary on Radiant Ignition Test

This annex is not a part of the requirements of this NFPA document but is included for informational purposes only.

B.1 Introduction.

B.1.1 Historically, the exterior walls of buildings of large area or of multi-story buildings have been constructed using noncombustible materials. In recent years, the model building codes of the United States have been revised to recognize the use of limited quantities of combustible materials in the exterior walls of buildings traditionally required to use noncombustible materials. The use of combustible materials in exterior walls has raised concerns regarding the possibility of fire spreading from building to building by radiant heat transfer and ignition of the exterior facades.

B.1.2 Model codes contain fire resistance ratings and opening limitations for the exterior walls of buildings, based upon the concept of limiting radiant heat transfer to adjacent buildings. The commonly accepted threshold for piloted ignition of wood is 12.5 kW/m^2 (1.10 Btu/ft^2-sec). The exterior walls of a building should be designed to limit the radiant heat transfer to adjacent structures to 12.5 kW/m^2 (1.10 Btu/ft^2-sec) or less. The basis of the concept is that radiant heat transfer should be limited to values that do not ignite combustible architectural trim, veneer, or exterior facades on adjacent buildings.

B.2 U.S. Building Codes. Both *NFPA 5000* and the *International Building Code (IBC)* use NFPA 268 to regulate the ignitability of exterior walls. *NFPA 5000* requires that exterior walls should not produce sustained flaming when tested in accordance with NFPA 268. The *IBC* requires fire testing in accordance with NFPA 268 for combustible exterior wall coverings of Types I, II, III, and IV construction. These combustible exterior wall coverings are regulated as a function of the distance from the exterior wall to the property line and on the basis of the radiant heat flux necessary to cause ignition of the combustible exterior wall covering under test conditions.

B.3 Ignitability Research.

B.3.1 A research project, sponsored by the Exterior Insulation Manufacturers Association, was conducted to develop a laboratory-scale, radiant heat ignitability test procedure. The research program consisted of two phases. In the first phase, large-scale tests were run at the Southwest Research Institute to develop a database to be used to judge the reliability of data from laboratory-scale tests of similar specimens.

Large-scale tests used 2.44 m × 3.66 m (8 ft × 12 ft) exterior wall panels that were exposed to radiant heat from a 1.83 m × 2.44 m (6 ft × 8 ft) radiant panel (Beitel, 1991). The radiator and product sizes are believed to be adequate to predict product behavior in actual fires. However, large-scale testing can be needlessly expensive if laboratory-scale or bench-scale tests are shown to be capable of producing data that correlate with large-scale testing.

Specimens similar to those tested in the large-scale apparatus were tested in a laboratory-scale procedure at the University of California at Richmond Field Test Station by Fisher Research and Development, Inc. (Fisher and Fleishmann, 1992). Specimens for the laboratory-scale tests measured 1.22 m × 2.44 m (4 ft × 8 ft) and were exposed to a 0.91 m × 0.91 m (3 ft × 3 ft) gas-fired radiant panel. To achieve an exposure of 12.5 kW/m^2 (1.10 Btu/ft^2-sec), the specimen was separated from the radiant