



Designation: E 2074 – 00^{ε1}

An American National Standard

Standard Test Method for Fire Tests of Door Assemblies, Including Positive Pressure Testing of Side-Hinged and Pivoted Swinging Door Assemblies¹

This standard is issued under the fixed designation E 2074; 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.

^{ε1} NOTE—The fire-test-response caveat was updated in October 2004.

INTRODUCTION

This fire-test-response standard replaces E 152, Standard Methods of Fire Tests of Door Assemblies, which was formerly under the jurisdiction of Committee E-5 on Fire Standards. The E 152 standard was withdrawn on January 1, 1995 in accordance with Section 10.5.3.1 of the *Regulations Governing ASTM Technical Committee*, which requires that standards shall be updated by the end of the eighth year since last approval date.

1. Scope

1.1 This fire-test-response standard is applicable to door assemblies for use in walls to retard the passage of fire (see X1.1-X1.3.).

1.2 This fire-test-response standard determines the ability of door assemblies to function as a fire-resistive barrier during a standard fire endurance test. Such a test method shall not be construed as determining the suitability of door assemblies for continued use after their exposure to fire.

1.3 This fire-test-response standard is intended to evaluate the ability of a door assembly to remain in an opening during a predetermined test exposure, which when required by 12.10 is then followed by the application of a hose stream (see X1.4 and X1.5).

1.4 The hose stream test used in this test method is not designed to be representative of an actual hose stream used by a fire department during fire suppression efforts.

1.5 The fire exposure is not representative of all fire conditions, which vary with changes in the amount, nature, and distribution of the fire loading, ventilation, compartment size and configuration, and heat characteristics of the compartment. It does, however, provide a relative measure of fire endurance of door assemblies under specified fire exposure conditions.

1.6 Any variation from the tested construction or test conditions will possibly change the performance characteristics of door assembly.

1.7 This fire-test-response standard *does not* provide the following:

1.7.1 The fire endurance of door assemblies constructed of materials other than those tested.

1.7.2 A temperature limit on the unexposed surface of the door assembly, although the temperatures are measured and recorded.

1.7.3 A limit on the number of openings allowed in glazed areas or of the number and size of lateral openings between the door and frame.

1.7.4 A measurement of smoke or products of combustion that pass through the door assembly.

1.7.5 A measurement of smoke, toxic gases, or other products of combustion generated by the door assembly.

NOTE 1—The information in 1.7.4 and 1.7.5 may be important in determining the fire hazard or fire risk of door assemblies under actual fire conditions. This information may be determined by other suitable fire test methods. For example, flame spread and smoke development may be determined by Test Method E 84.

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 *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 This test method is under the jurisdiction of ASTM Committee E-5 on Fire Standards and is the direct responsibility of Subcommittee E05.11 on Fire Endurance.

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1.10 This test method 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 this test method.

1.11 The values stated in either inch-pound units or SI units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in nonconformance with the standard.

2. Referenced Documents

2.1 *ASTM Standards:*²

E 84 Test Method for Surface Burning Characteristics of Building Materials

E 119 Tests Methods for Fire Tests of Building Construction and Materials

E 152 Methods of Fire Tests of Door Assemblies³

E 176 Terminology of Fire Standards

E 631 Terminology of Building Constructions

2.2 *Other Documents:*

UL 385 Standard for Play Pipes for Water Supply Testing in Fire-Protection Service, 1993⁴

3. Terminology

3.1 For the purpose of this test method, the definitions given in Terminologies E 176 and E 631, together with the following, shall apply:

3.1.1 *integrity, n*—the ability of a test assembly, when exposed to fire from one side, to prevent the passage of flame and hot gases through it or the occurrence of flames on its unexposed side.

3.1.2 *through-opening, n*—an uninterrupted hole in the test assembly that is seen from the unexposed side when viewing the suspected hole from a position perpendicular to the plane of the test assembly.

4. Summary of Test Method

4.1 This fire-test-response standard describes the following test sequence and procedure.

4.1.1 A door assembly is exposed to a standard fire exposure, controlled to achieve specified temperatures and pressures throughout a specified time period.

4.1.2 The integrity of the door assembly is evaluated using a cotton wool pad test when the average unexposed surface temperature of a door assembly is less than 650°F (361°C) above ambient and openings are created by the fire exposure.

4.1.3 After the fire endurance test the door assembly is subjected to a hose stream test when required by 12.10.

5. Significance and Use

5.1 In this fire-test-response standard, the test specimens are subjected to one or more specific sets of laboratory test conditions. When different test conditions are substituted or the end-use conditions are changed, it is not always possible by, or from, this test method to predict changes to the characteristics measured. Therefore, the results are valid only for the exposure conditions described in this test method.

5.2 This fire-test-response standard measures and records the temperatures on the unexposed side of a door assembly. This data is intended to assist and enable regulatory bodies to determine the suitability of door assemblies for use in locations where fire resistance of a specified duration is required.

5.3 The data is not intended to be used to describe or appraise the fire hazard or fire risk of materials, products, or assemblies under actual fire conditions.

5.4 This fire-test-response standard requires that observations be made and recorded relevant to the passage of flame.

5.5 This fire-test-response standard uses a cotton wool pad test to assess the integrity of the door assembly relevant to the passage of hot gases.

5.6 This fire-test-response standard uses a hose stream test to assess the durability of the door assembly relevant to the passage of a stream of water.

6. Apparatus

6.1 *Furnace and Test Frame:*

6.1.1 The furnace construction shall be suitable to meet the requirements of the fire test protocol. An example of the furnace and test frame is illustrated in Fig. 1 (see X1.6).

6.1.2 The height and width of the furnace opening shall be greater than the test assembly's corresponding dimension.

6.1.3 The furnace shall be heated with burners that are fired using either natural gas or liquefied petroleum gases. The burners shall have a controllable heat output (see X1.8) and be able to expose the test assembly to the uniform heating of the standard time-temperature curve.

6.2 *Copper Disk Thermocouples:*

6.2.1 The copper disk thermocouples shall be covered by pads as specified in 6.2.4, reference Fig. 2, and shall have a

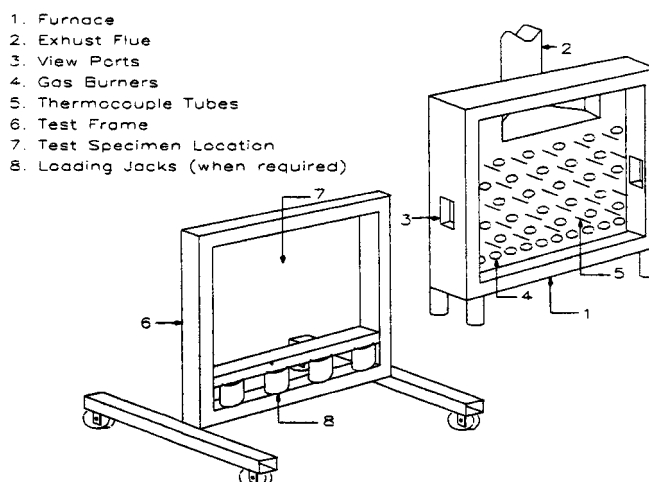


FIG. 1 Furnace and Test Frame

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 Withdrawn.

⁴ Available from Underwriters Laboratories, 333 Pfingsten Road, Northbrook, IL 60062.

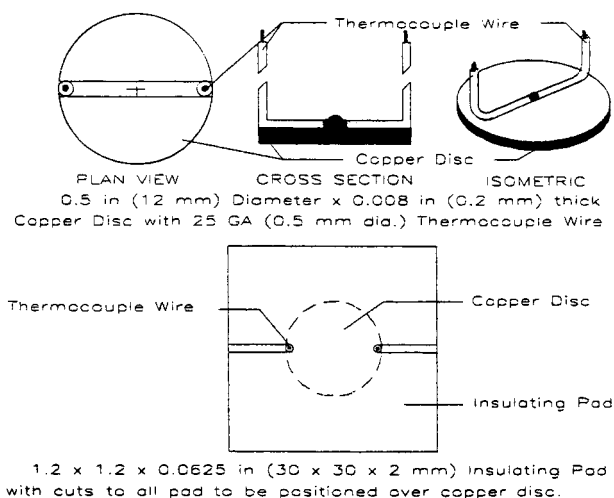


FIG. 2 Example of a Typical Thermocouple Disk and Insulating Pad

wire diameter of not more than 0.03 in. (0.7 mm), and be brazed to the center of the face of a copper disk having the following nominal measurements: $\frac{1}{2}$ in. (12 mm) in diameter and 0.01 in. (0.2 mm) thick.

6.2.2 Thermocouple Insulating Pads:

6.2.2.1 Refractory fiber pads shall have the following properties:

6.2.2.1.1 *Length and Width*, 1.20 ± 0.02 in. (30 ± 0.5 mm),

6.2.2.1.2 *Thickness*, 0.08 ± 0.02 in. (2 ± 0.5 mm), and

6.2.2.1.3 *Density*, 56.2 ± 6.2 lb/ft³ (900 ± 100 kg/m³).

6.2.2.2 If necessary, it is permitted to shape the pads by wetting, forming, and then drying them to provide complete contact on sharply contoured surfaces.

6.3 *Pressure-Sensing Probes*—Except for the diameters of the steel tubes, tolerances are $\pm 5\%$ of the dimensions shown in Fig. 3 or Fig. 4.

6.3.1 The pressure-sensing probes shall be either: a T-shaped sensor as shown in Fig. 3, or a tube sensor as shown in Fig. 4.

6.4 Differential Pressure Measurement Instruments:

6.4.1 The differential pressure measurement instrument shall be: a manometer or transducer, and capable of reading in graduated increments of no greater than 0.01 in. H₂O (2.5 Pa) with a precision of not less than ± 0.005 in. H₂O (± 1.25 Pa).

6.5 Hose Stream Delivery System:

6.5.1 The hose stream delivery system shall consist of the following:

6.5.1.1 A standard 2½-in. (64-mm) diameter hose attached to a national standard play pipe as described in UL 385.

6.5.1.2 The play pipe shall have an overall length of 30 ± 0.25 in. (762 ± 6 mm) and shall be equipped with a standard 1½-in. (28.5-mm) discharge tip of the standard-taper-smooth-bore pattern without shoulder at the orifice.

6.5.1.3 The play pipe shall be fitted with a standard 2½-in. (64-mm) inside dimension by 6-in. (153-mm) long nipple mounted between the hose and the base of the play pipe.

6.5.1.4 A pressure tap for measuring the water pressure at the base of the nozzle shall be normal to the surface of the nipple, shall be centered in its length, and shall not protrude into the water stream.

6.5.1.5 A suitable pressure gage capable of reading a minimum of 0 to 50 psi (0 to 344.8 kPa) and graduated into no greater than 2-psi (13.8-kPa) increments shall be used to measure the water pressure.

6.6 Furnace Thermocouples:

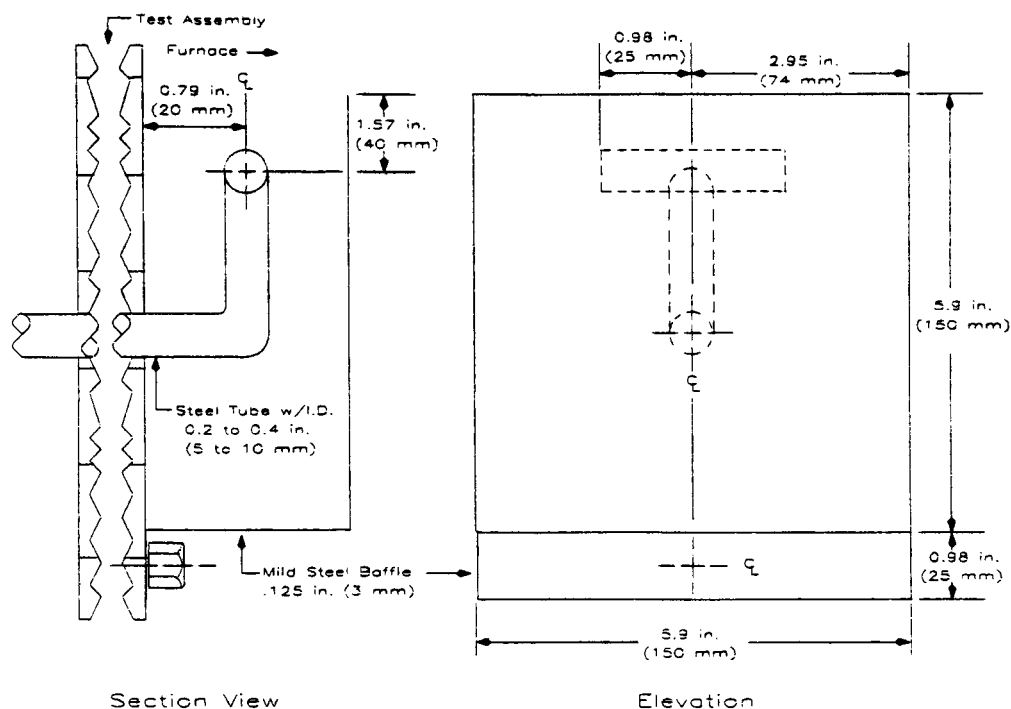
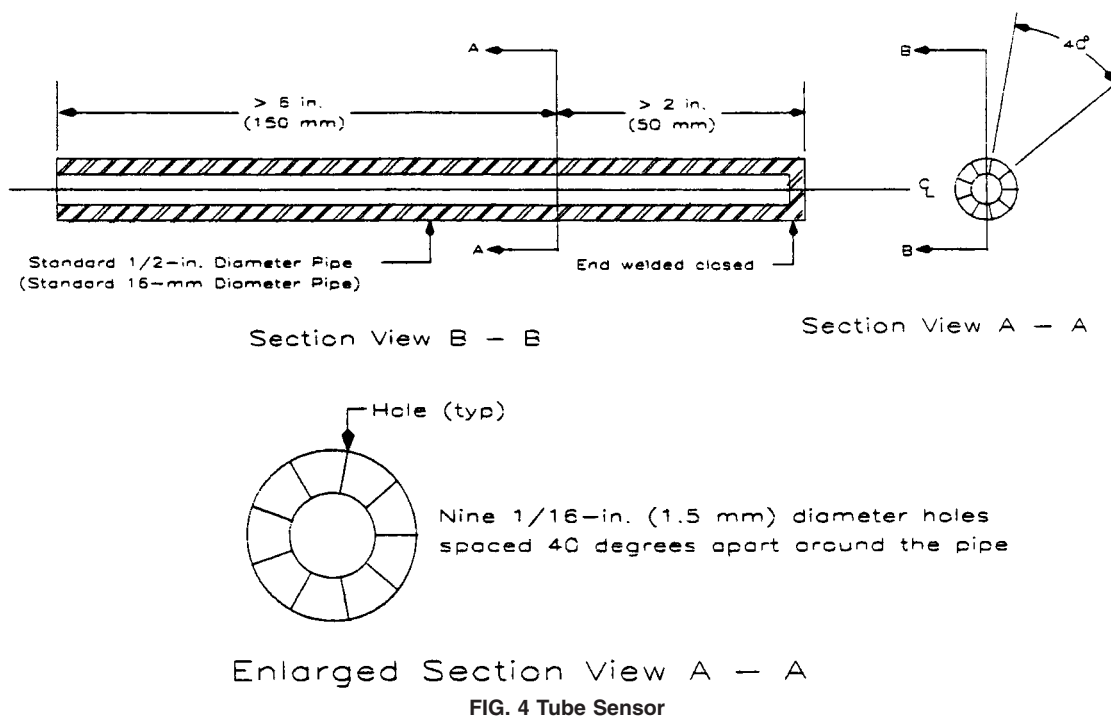


FIG. 3 T-Shaped Sensor



6.6.1 The furnace thermocouples shall:

6.6.1.1 Be protected by sealed porcelain tubes having a nominal $\frac{3}{4}$ -in. (19-mm) outside diameter and $\frac{1}{8}$ -in. (3-mm) wall thickness, or, as an alternative, in the case of base metal thermocouples, protected by a standard $\frac{1}{2}$ -in. (13-mm) diameter wrought steel or wrought iron pipe of standard weight, and

6.6.1.2 Have a time constant in the range from 6.0 to 7.2 min while encased in the tubes described in 6.6.1.1.

NOTE 2—A typical thermocouple assembly meeting these time constant requirements may be fabricated by fusion-welding the twisted ends of No. 18 gage Chromel-Alumel wires, mounting the leads in porcelain insulators, and inserting the assembly so the thermocouple bead is 0.5 in. (25 mm) from the sealed end of the standard weight nominal $\frac{1}{2}$ -in. iron, steel, or Inconel⁵ pipe. The time constant for this and for several other thermocouple assemblies was measured in 1976. The time constant may also be calculated from knowledge of its physical and thermal properties.⁶

6.6.2 Other types of protection tubes or pyrometers are permitted to be used provided that under test conditions they give the same indications as those of 6.6.1 within the limit of accuracy that applies for furnace-temperature measurements.

6.7 Cotton Wool Pads:

6.7.1 The cotton wool pads shall:

6.7.1.1 Measure 4 ± 0.125 in. (100 ± 3 mm) long by 4 ± 0.125 in. (100 ± 3 mm) wide by 0.85 ± 0.0625 in. (20 ± 2 mm) thick,

6.7.1.2 Consist only of new undyed soft cotton fibers, without any admixture of artificial fibers,

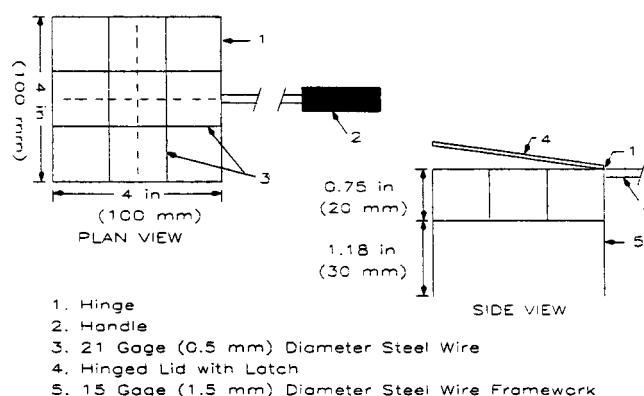
6.7.1.3 Have a mass between 3 and 4 g, and

6.7.1.4 Be attached using wire clips to a wire frame. The frame used to hold the cotton wool pad is to be formed of steel wire (typically No. 15 AWG (1.5 mm)) and is to be provided with a handle long enough to reach all points of the test assembly. See Fig. 5.

6.7.1.5 The cotton wool pads are to be conditioned prior to use by drying in an oven at $212 \pm 9^\circ\text{F}$ ($100 \pm 5^\circ\text{C}$) for at least 30 min. After drying, the cotton wool pads shall be stored in a desiccator until they are used.

7. Time-Temperature Curve

7.1 The fire exposure of door assemblies shall be controlled to conform to the applicable portion of the standard time-temperature curve shown in Fig. 6 (see X1.7). The points on the curve that determine its character are as follows:



NOTE 1: Solid lines illustrate the framework.

NOTE 2: Dashed lines illustrate the hinged lid.

FIG. 5 Example of a Typical Cotton Wool Pad Holder

⁵ Inconel is a registered trade name of INCO Alloys, Inc., 3800 Riverside Dr., Huntington, WV 25720.

⁶ Supporting data is available from ASTM Headquarters. Request RR:E05-1001.