



Designation: E 2010 – 01

An American National Standard

Standard Test Method for Positive Pressure Fire Tests of Window Assemblies¹

This standard is issued under the fixed designation E 2010; 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.

INTRODUCTION

This fire test response standard replaces test method E 163, which was formerly under the jurisdiction of Committee E05 on Fire Standards. Test method E 163 was withdrawn on January 1, 1995 in accordance with section 10.5.3.1 of the Regulations Governing ASTM Technical Committees, which requires that standards shall be updated by the end of the eighth year since last approval date.

1. Scope

1.1 This test method covers fire-test-response applicable to window assemblies, including glass block and other light transmitting assemblies, for use in walls or partitions to retard the passage of fire (see Appendix X1).

1.2 This fire-test-response test method will determine the ability of window assemblies, including glass block and other light transmitting assemblies, to function as a fire barrier during a standard fire endurance test. Such tests shall not be construed as determining suitability of window assemblies for continued use after fire exposure (see Appendix X1.2).

1.3 This fire-test-response test method is intended to evaluate the ability of window assemblies, including glass block or other light transmitting assemblies, to remain in a wall or partition during a predetermined fire test exposure, which is then followed by the application of a hose stream (see Appendix X1.3).

1.4 The fire exposure is not necessarily representative of all fire conditions, which normally vary with changes in the amount, nature and distribution of fire loading, ventilation, compartment size and configuration, and heat sink characteristics of the compartment. It does, however, provide a relative measure of fire performance of window assemblies under these specified fire exposure conditions.

1.5 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.

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

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

1.7.1 The fire endurance of window assemblies in walls or partitions constructed of materials other than those tested.

1.7.2 A temperature measurement on the unexposed surface of the window assembly.

1.7.3 A measurement of smoke or products of combustion that pass through the window assembly.

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

NOTE 1—The information in 1.7.3 and 1.7.4 may be important in determining the fire hazard or fire risk of window 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 fire-test-response test method permits through-openings, that are created by cracking, separation, or loss of glazing material, provided they do not exceed specified limits.

1.9 The values stated in either inch-pound or SI units are to be regarded separately as the standard. Within the text, the SI units are shown in brackets. The values stated in each system are not exact equivalents; therefore, each system shall be used independently of the other.

NOTE 2—Combining values from the two systems may result in non-conformance to this test method.

1.10 *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.*

1.11 *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*

¹ This test method is under the jurisdiction of ASTM Committee E05 on Fire Standards and is the direct responsibility of Subcommittee E05.11 on Fire Endurance.

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assessment of the materials, products, or assemblies under actual fire conditions.

1.12 The text of 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.

2. Referenced Documents

2.1 ASTM Standards:

E 119 Tests Methods for Fire Tests of Building Construction and Materials²

E 163 Test Methods of Fire Tests of Window Assemblies³

E 176 Terminology of Fire Standards²

E 631 Terminology of Building Constructions²

2.2 UL Standard:

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

3. Terminology

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

3.1.1 *fire window assembly, n*—a window or glass block configuration, intended for use in walls or partitions, for which a fire endurance rating has been determined in accordance with this fire-test-response standard.

3.1.2 *glass block assembly, n*—a light transmitting configuration constructed of glass block held together with mortar or other suitable materials.

3.1.3 *glazing material, n*—transparent or translucent material used in fire window assemblies.

3.1.4 *light flame, n*—a flame approximately 6 in. (152 mm) long.

3.1.5 *through-opening, n*—a 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.

3.1.6 *window assembly, n*—an integrally fabricated unit containing a glazed light(s) placed in an opening in a wall or partition and that is intended primarily for the transmission of light, or light and air, and not primarily as an entrance or exit.

4. Summary of Test Method

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

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

4.1.2 After the fire endurance test, the window assembly is subjected to a hose stream test.

5. Significance and Use

5.1 In this fire-test-response test method, 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 determines the fire endurance, in elapsed min, during the test exposure and develops data to enable regulatory bodies to determine the suitability of window 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 test method requires that observations be made and recorded relevant to the passage of flame. This data is too imprecise for quality control purposes.

5.5 This fire-test-response test method uses a hose stream test to assess the durability of the window assembly relevant to the passage of a stream of water. This data is too imprecise for quality control purposes.

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 Appendix X1.4).

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:

6.1.3.1 Have a controllable heat output.

6.1.3.2 Be able to expose the test sample to the uniform heating of the standard time-temperature curve.

6.2 Pressure-Sensing Probes:

6.2.1 The pressure-sensing probes shall be either:

6.2.1.1 A T-shaped sensor as shown in Fig. 2, or

6.2.1.2 A tube sensor as shown in Fig. 3.

6.3 Differential Pressure Measurement Instruments:

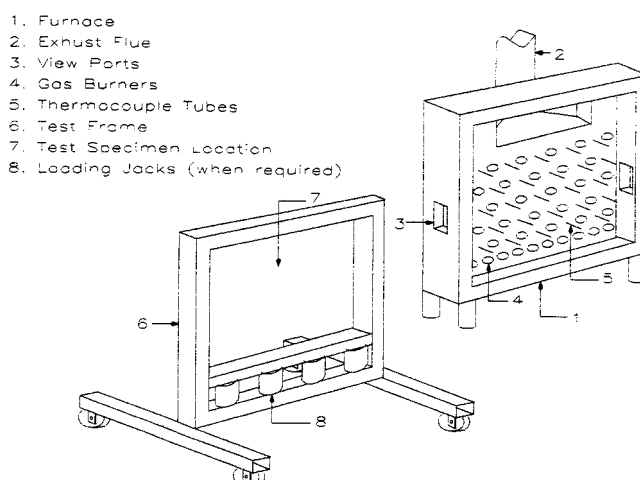


FIG. 1 Furnace and Test Frame

² Annual Book of Standards, Vol 04.07.

³ Discontinued; see 1994 Annual Book of Standards, Vol 04.07.

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

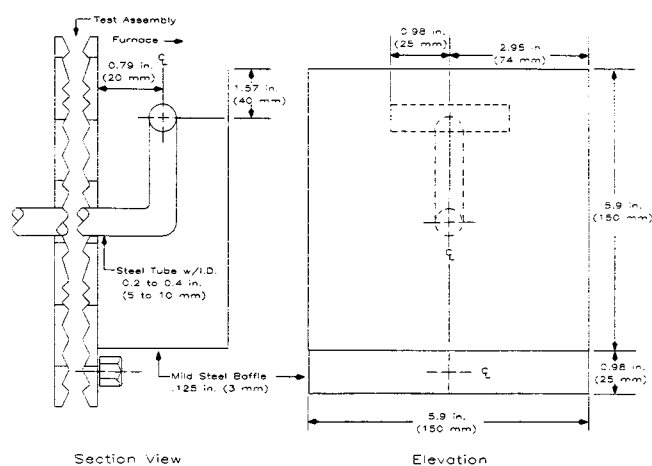
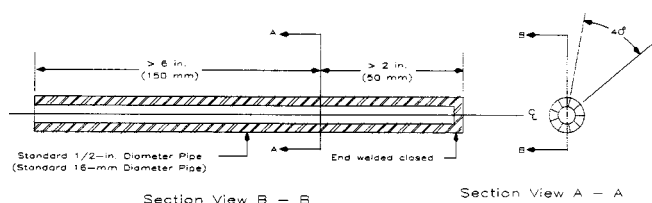
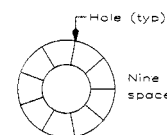


FIG. 2 T-Shaped Sensor



Section View B – B

Section View A – A



Enlarged Section View A – A

FIG. 3 Tube Sensor

6.3.1 The differential pressure measurement instrument shall be:

6.3.1.1 A manometer or equivalent transducer, and

6.3.1.2 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).

6.4 Hose Stream Delivery System:

6.4.1 The hose stream delivery system shall consist of:

6.4.1.1 A standard 2-1/2 in. (64 mm) diameter hose attached to a national standard play pipe as described in UL 385.

6.4.1.2 The play pipe shall have an overall length of 30 ± 0.25 in. (762 ± 6 mm) and shall be equipped with a standard 1-1/8 in. (28.5 mm) discharge tip of the standard-taper-smooth-bore pattern without shoulder at the orifice.

6.4.1.3 The play pipe shall be fitted with a standard 2-1/2 in. (64 mm) inside dimension by 6 in. (153 mm) long nipple mounted between the hose and the base of the play pipe.

6.4.1.4 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.

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

6.5 Furnace Thermocouples:

The points on the curve that determine its character are:

1000°F (638°C)	at 5 min
1300°F (704°C)	at 10 min
1550°F (843°C)	at 30 min
1700°F (926°C)	at 1 h
1850°F (1010°C)	at 2 h
2000°F (1093°C)	at 4 h
2300°F (1260°C)	at 8 h or over

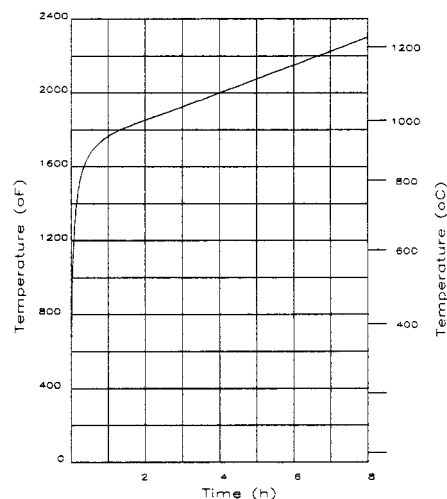


FIG. 4 Standard Time-Temperature Curve

6.5.1 The furnace thermocouples shall:

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

6.5.1.2 Have a time constant between the range of 6.0 to 7.2 min while encased in the tubes described in 6.5.1.1.

NOTE 3—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 bed is 0.5 in. (25 mm) from the sealed end of the standard weight nominal 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

6.5.2 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 6.5.1 within the limit of accuracy that applies for furnace-temperature measurements.

7. Time-Temperature Curve

7.1 The fire exposure of window assemblies shall be controlled to conform to the applicable portion of the standard time-temperature curve shown in Fig. 4 (see X2.5).

7.1.1 For a more detailed definition of the time-temperature curve, refer to Table 1.

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

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