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Standard Methods of Fire Tests of Door Assemblies¹

This standard is issued under the fixed designation E 152; 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.

These methods have been approved for use by agencies of the Department of Defense. Consult the DoD Index of Specifications and Standards for the specific year of issue which has been adopted by the Department of Defense.

^{ε1} NOTE—Paragraphs 10.2 and X1.13.1 were changed editorially and all references were renumbered in July 1984.

^{ε2} NOTE—Paragraph 1.4 was corrected and paragraph 1.5 was added editorially in June 1993.

1. Scope

1.1 These methods of fire test are applicable to door assemblies of various materials and types of construction, for use in wall openings to retard the passage of fire (see commentary in Appendix).

1.2 Tests made in conformity with these test methods will register performance during the test exposure; but such tests shall not be construed as determining suitability for use after exposure to fire.

1.3 It is the intent that tests made in conformity with these test methods will develop data to enable regulatory bodies to determine the suitability of door assemblies for use in locations where fire resistance of a specified duration is required.

1.4 *This standard should be used to measure and describe the response of materials, products, or assemblies to heat and flame under controlled laboratory conditions and should 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 the test may be used as elements of a fire-hazard assessment or a fire-risk assessment which takes into account all of the factors which are pertinent to an assessment of the fire hazard or fire risk of a particular end use.*

1.5 *This standard does not purport to address all of the safety problems, 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.*

2. Significance

2.1 These methods are intended to evaluate the ability of a door assembly to remain in an opening during a predetermined test exposure.

2.2 The tests expose a specimen to a standard fire exposure controlled to achieve specified temperatures throughout a specified time period, followed by the application of a specified standard fire host stream. The exposure, however, may not be representative of all fire conditions,

which may 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 door assemblies under these specified fire exposure conditions.

2.3 Any variation from the construction or conditions that are tested may substantially change the performance characteristics of the assembly.

2.4 The methods do not provide the following:

2.4.1 Full information as to performance of all door assemblies in walls constructed of materials other than that tested.

2.4.2 Evaluation of the degree by which the door assembly contributes to the fire hazard by generation of smoke, toxic gases, or other products of combustion.

2.4.3 A specific requirement that the unexposed surface temperatures be reported although the temperature measurement procedure is described.

2.4.4 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.

2.4.5 Measurement of the degree of control or limitation of the passage of smoke or products of combustion through the door assembly.

CONTROL OF FIRE TESTS

3. Time-Temperature Curve

3.1 The fire exposure of door assemblies shall be controlled to conform to the applicable portion of the standard time-temperature curve shown in Fig. 1. The points on the curve that determine its character are:

1000°F (538°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

3.1.1 For a closer definition of the time-temperature curve, see Table A1.1.

4. Furnace Temperatures

4.1 The temperatures of the test exposure shall be deemed to be the average temperature obtained from the readings of not less than nine thermocouples symmetrically disposed

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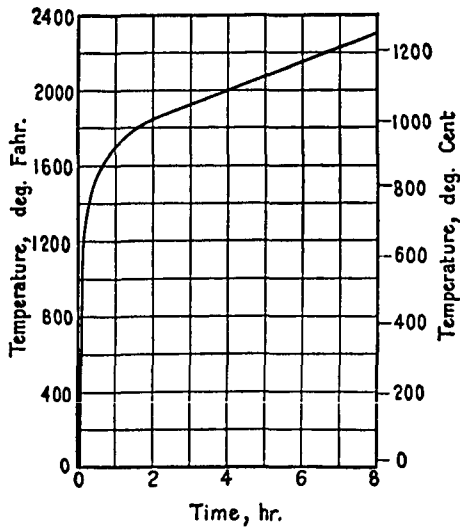


FIG. 1 Time-Temperature Curve

and distributed to show the temperature near all parts of the test assembly. The thermocouples shall be protected by sealed porcelain tubes having 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 1/2-in. (13-mm) wrought steel or wrought iron pipe of standard weight. The junction of the thermocouples shall be 6 in. (152 mm) from the exposed face of the test assembly or from the masonry in which the assembly is installed, during the entire test exposure.

4.2 The temperatures shall be read at intervals not exceeding 5 min during the first 2 h, and thereafter the intervals may be increased to not more than 10 min.

4.3 The accuracy of the furnace control shall be such that the area under the time-temperature curve, obtained by averaging the results from the thermocouple readings, is within 10 % of the corresponding area under the standard time-temperature curve for fire tests of 1 h or less duration, within 7.5 % for those over 1 h and not more than 2 h, and within 5 % for tests exceeding 2 h in duration.

5. Unexposed Surface Temperatures

5.1 Unexposed surface temperatures shall be recorded and shall be determined in the following manner:

5.1.1 Unexposed surface temperatures shall be taken at not less than three points with at least one thermocouple in each 16 ft (1.5 m²) area of the door. Thermocouples shall not be located over reinforcements extending through the door, over vision panels, or nearer than 12 in. (305 mm) from the edge of the door.

5.1.2 Unexposed surface temperatures shall be measured with thermocouples placed under flexible, oven-dry, felted asbestos pads 6 in. (152 mm) square, 0.4 in. (10 mm) in thickness, and weighing not less than 1.0 nor more than 1.4 lb/ft² (4.88 to 6.83 kg/m²). The pads shall be held firmly against the surface of the door and fit closely about the thermocouples. The thermocouple leads shall be immersed under the pad for a distance of not less than 3 1/2 in. (89 mm) with the hot junction under the center of the pad. The thermocouple leads under the pads shall be not heavier than

No. 18 B & S gage (0.04 in.) (1.02 mm) and shall be electrically insulated with heat-resistant and moisture-resistant coatings.

5.1.3 Unexposed surface temperatures shall be read at intervals not exceeding 5 min for the first 30 min of the test.

TEST ASSEMBLIES

6. Construction and Size

6.1 The construction and size of the test door assembly, consisting of single doors, doors in pairs, special-purpose doors (such as Dutch doors, double-egress doors, etc.), or multisection doors, shall be representative of that for which classification or rating is desired.

6.2 A floor structure shall be provided as part of the opening to be protected, except where such floor interferes with the operation of the door. The floor segment shall be of noncombustible material and shall project into the furnace approximately twice the thickness of the test door, or to the limit of the frame, whichever is greater.

7. Mounting for Test

7.1 Swinging doors shall be mounted so as to open into the furnace chamber. Sliding and rolling doors, except horizontal slide-type elevator shaft doors, shall be mounted on the exposed side of the opening in the wall closing the furnace chamber. Horizontal slide-type elevator shaft doors shall be mounted on the unexposed side of the opening in the wall closing the furnace chamber. Access-type doors and chute-type doors and frame assemblies shall be mounted so as to have one assembly open into the furnace chamber and another assembly open away from the furnace chamber. Dumb-waiter and service-counter doors and frame assemblies shall be mounted on the exposed side of the opening in the wall.

7.2 The mounting of all doors shall be such that they fit snugly within the frame, against the wall surfaces, or in guides, but such mounting shall not prevent free and easy operation of the test door.

7.2.1 Clearances for swinging doors shall be as follows: With a minus 1/16-in. (1.6-mm) tolerance: 1/8 in. (3.2 mm) along the top, 1/8 in. along the hinge and latch jambs, 1/8 in. along the meeting edge of doors, in pairs, and 3/8 in. (9.5 mm) at the bottom edge of a single swinging door, and 1/4 in. (6.3 mm) at the bottom of a pair of doors.

7.2.2 Clearances of horizontal sliding doors not mounted within guides shall be as follows: With a minus 1/8-in. (3.2-mm) tolerance: 1/2 in. (12.7 mm) between the door and wall surfaces, 3/8 in. (9.5 mm) between the door and floor structure and 1/4 in. (6.3 mm) between the meeting edges of center-parting doors. A maximum lap of 4 in. (102 mm) of the door over the wall opening at sides and top shall be provided.

7.2.3 Clearances of vertical sliding doors moving within guides shall be as follows: With a minus 1/8-in. (3.2-mm) tolerance: 1/2 in. (12.7 mm) between the door and wall surfaces along the top and/or the bottom door edges with guides mounted directly to the wall surfaces and 3/16 in. (4.8 mm) between the meeting edges of bi-parting doors or 3/16 in. between the door and floor structure or the sill.

7.2.4 Clearances for horizontal slide type elevator doors

TABLE 1 Water Pressure at Base of Nozzle and Duration of Application^A

Desired Rating	Water Pressure at Base of Nozzle, psi (kPa)	Duration of Application, s/ft ² (0.09 m ²) exposed area
3 h	45 (310)	3
1½ h and over, if less than 3 h	30 (207)	1.5
1 h and over, if less than 1½ h	30 (207)	0.9
Less than 1 h	30 (207)	0.6

^A The exposed area may be calculated using the outside dimensions of the test specimen, including a frame, hangers, tracks, or other parts of the assembly if provided, but normally not including the wall into which the specimen is mounted. Where multiple test specimens are mounted in the same wall, the rectangular or square wall area encompassing all of the specimens will have to be considered as the exposed area since the hose stream must traverse this area during its application.

shall be as follows: With a minus 1/8-in. (3.2-mm) tolerance: 3/8 in. (9.5 mm) between the door and wall surfaces, 3/8 in. between the multisection door panels, and 3/8 in. from the bottom of a panel to the sill. Multisection door panels shall overlap 3/4 in. (19.0 mm). Door panels shall lap the wall opening 3/4 in. at the sides and top.

CONDUCT OF TESTS

8. Time of Testing

8.1 *Time of Testing*—Masonry shall have sufficient strength to retain the assembly securely in position throughout the fire and hose stream test.

9. Fire Endurance Test

9.1 Maintain the pressure in the furnace chamber as nearly equal to the atmospheric pressure as possible.

9.2 Continue the test until the exposure period of the desired classification or rating is reached unless the conditions of acceptance set forth in Section 12 are exceeded in a shorter period.

10. Hose Stream Test

10.1 Immediately following the fire endurance test, subject the test assembly to the impact, erosion, and cooling effects of a hose stream directed first at the middle and then at all parts of the exposed surface, making changes in direction slowly.

10.2 Deliver the hose stream through a 2½-in. (64-mm) hose discharging through a National Standard Playpipe of corresponding size equipped with a 1½-in. (28.5-mm) discharge tip of the standard-taper smooth-bore pattern without shoulder at the orifice. The water pressure at the base of the nozzle and duration of application in s/ft² (m²) of exposed area shall be as prescribed in Table 1.

10.3 The tip of the nozzle shall be located 20 ft (6 m) from

and on a line normal to the center of the test door. If impossible to be so located, the nozzle may be on a line deviating not to exceed 30° from the line normal to the center of the test door. When so located the distance from the center shall be less than 20 ft by an amount equal to 1 ft (0.3 m) for each 10° of deviation from the normal.

11. Report

11.1 Report results in accordance with the performance in the tests prescribed in these test methods. The report shall show:

11.1.1 The performance under the desired exposure period chosen from the following: 20 min, 30 min, ¾ h, 1 h, 1½ h, or 3 h.

11.1.2 The temperature measurements of the furnace.

11.1.3 The temperature measurement of the unexposed side.

11.1.4 All observations having a bearing on the performance of the test assembly.

11.1.5 Flaming, if any, on the unexposed surface of the door leaf during the first 20 min of the fire test.

11.1.6 The amount of movement of any portion of the edges of the door adjacent to the door frame from the original position (see Section 12).

11.1.7 The materials and the construction of the door and frame, and the details of the installation, hardware, hangers, guides, trim, finish, and clearance or lap shall be recorded or appropriately referenced to ensure positive identification or duplication in all respects.

11.1.8 Pressure measurements made in the furnace and their relationship to the top of the door.

CONDITIONS OF ACCEPTANCE

12. Conditions of Acceptance

12.1 A door assembly shall be considered as meeting the requirements for acceptable performance when it remains in the opening during the fire endurance test and hose-stream test within the following limitations:

12.1.1 The movement of swinging doors shall not permit any portion of the edges to move from the original position more than the thickness of the door, during the first half of the classification period, nor more than 1½ times the thickness during the entire classification period, nor more than 1½ times the thickness immediately following the hose stream test.

12.1.2 An assembly consisting of a pair of swinging doors shall not separate more than ¾ in. (19 mm) or equal to the throw of the latch bolt at the latch location.

12.1.3 An assembly consisting of a single swinging door shall not separate more than ½ in. (13 mm) at the latch location.

12.1.4 The lap edges of passenger (A17.1 horizontal slide-type) elevator doors, including the lap edges of multisection doors, shall not move from the wall or adjacent panel surfaces sufficiently to develop a separation of more than $2\frac{7}{8}$ in. (73.0 mm) during the entire classification period, or immediately following the hose stream test. The meeting edges of center-parting elevator door assemblies, for a fire and hose stream exposure of $1\frac{1}{2}$ h or less, shall not move apart more than $1\frac{1}{4}$ in. (31.7 mm) as measured in any horizontal plane during the entire classification period or immediately following the hose stream test.

12.1.5 Doors mounted in guides shall not release from

guides and guides shall not loosen from fastenings.

12.1.6 The test assembly shall have withstood the fire endurance test and hose-stream test, without developing openings anywhere through the assembly, except that small portions of glass dislodged by the hose stream shall not be considered a weakness.

13. Precision and Bias

13.1 Precision and bias data are not available at this time; however, a task group of Subcommittee E05.12 has been established to investigate the subject and prepare a statement.