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FIRE TESTS DOOR ASSEMBLIES 1976

NATIONAL FIRE PROTECTION ASSOCIATION

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Standard Methods of
Fire Tests of Door Assemblies

NFPA No. 252 — 1976

This 1976 edition of NFPA No. 252 was adopted by the Fall Meeting of the National Fire Protection Association on November 17, 1976. It supersedes the 1972 edition.

Origin and Development of No. 252

The Standard for Fire Tests of Door Assemblies was adopted as a tentative standard by the ASTM in 1940 and was finally adopted in 1941. In 1942 this standard was adopted by the NFPA and approved by the American Standards Association. It was reaffirmed by the Committee on Fire Tests of Building Construction and Materials and adopted in 1950. In 1953 a new NFPA Committee on Fire Tests was formed by action of the Board of Directors and recommendations for revision of the standard made from that Committee were adopted in 1958, 1969, and 1972.

The test procedure covered by this standard was developed by Underwriters Laboratories Inc.

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This list represents the membership at the time the Committee was balloted on the text of this edition. Since that time, changes in the membership may have occurred.

Interpretation Procedure of the Committee on Fire Tests

Those desiring an interpretation shall supply the Chairman with five identical copies of a statement in which shall appear specific reference to a single problem, paragraph, or section. Such a statement shall be on the business stationery of the inquirer and shall be duly signed.

When applications involve actual field situations they shall so state and all parties involved shall be named.

The Interpretations Committee will reserve the prerogative to refuse consideration of any application that refers specifically to proprietary items of equipment or devices. Generally inquiries should be confined to interpretation of the literal text or the intent thereof.

Requests for interpretations should be addressed to the National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

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Standard Methods of

Fire Tests of Door Assemblies

NFPA No. 252–1976

Chapter 1 General

1-1 Purpose. This standard outlines methods of fire test for door assemblies.

1-2 Scope.

1-2.1 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.

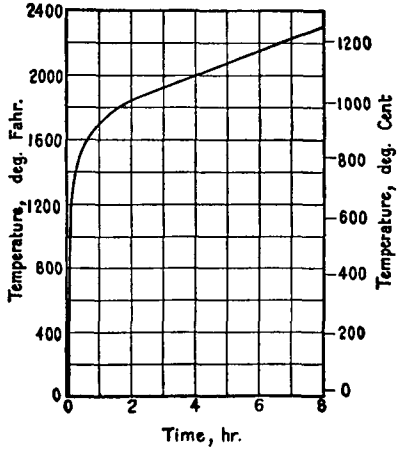
1-2.2 Tests made in conformity with these test methods will register performance during the test exposure; but such tests shall not be construed as determining suitability for use after exposure to fire.

1-2.3 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.

Chapter 2 Control of Fire Tests

2-1 Time-Temperature Curve.

2-1.1 The fire exposure of door assemblies shall be controlled to conform to the applicable portion of the standard time-temperature curve shown in Figure 2-1.1. The points on the curve that determine its character are:



1000° F (538° C)....at 5 minutes
1300° F (704° C)....at 10 minutes
1550° F (843° C)....at 30 minutes
1638° F (892° C)....at 45 minutes
1700° F (927° C)....at 1 hour
1792° F (978° C)....at 1½ hours
1925° F (1052° C)....at 3 hours

Figure 2-1.1

2-1.2 For a closer definition of the time-temperature curve, see the Appendix.

2-2 Furnace Temperatures.

2-2.1 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 and distributed to show the temperature near all parts of the test assembly. The thermocouples shall be protected by sealed porcelain tubes having ¾-inch (19 mm) outside diameter and ⅛-inch (3 mm) wall thickness, or, as an alternate, in the case of base metal thermocouples, protected by ½-inch (13 mm) wrought steel or wrought iron pipe of standard weight. The junction of the thermocouples shall be 6 inches (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.

2-2.2 The temperatures shall be read at intervals not exceeding 5 minutes during the first 2 hours, and thereafter the intervals may be increased to not more than 10 minutes.

2-2.3 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 percent of the corresponding area under the standard time-temperature curve for fire tests of 1 hour or less duration, within 7.5 percent for those over 1 hour and not more than 2 hours, and within 5 percent for tests exceeding 2 hours in duration.

2-3 Unexposed Surface Temperatures.

2-3.1 If unexposed surface temperatures are recorded, they shall be determined in the following manner:

2-3.1.1 Unexposed surface temperatures shall be taken at not less than three points with at least one thermocouple in each 16 square foot (1.5 m^2) area of the door. Thermocouples shall not be located over reinforcements extending through the door, over vision panels, or nearer than 12 inches (305 mm) from the edge of the door.

2-3.1.2 Unexposed surface temperatures shall be measured with thermocouples placed under flexible, oven-dry, felted asbestos pads 6 $\pm$ ⅛ inches square (152 $\pm$ 3 mm square), 0.40 $\pm$ 0.05 inch (10 $\pm$ 1 mm) in thickness, and weighing not less than 1.0 nor more than 1.4 lb/ft.^{2} (5 kg nor more than 6.8 kg/m^2). The pads shall be held firmly against the surface of the door and shall fit closely about the thermocouples. The thermocouple leads shall be positioned under the pad for a distance of not less than 3½ inches (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 AWG (0.82 mm^2) and shall be electrically insulated with heat-resistant and moisture-resistant coatings.

2-3.1.3 Unexposed surface temperatures shall be read at the same intervals as used for the furnace temperatures in Section 2-2.2.

Chapter 3 Test Assemblies

3-1 Construction and Size.

3-1.1 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.

3-1.2 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.

3-2 Mounting.

3-2.1 Swinging doors shall be mounted so as to open into the furnace chamber.

3-2.2 Sliding and rolling doors, except horizontal slide-type elevator doors, shall be mounted on the exposed side of the opening in the wall closing the furnace chamber.

3-2.3 Horizontal slide-type elevator doors shall be mounted on the unexposed side of the opening in the wall closing the furnace chamber.

3-2.4 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.

3-2.5 Dumbwaiter and service-counter doors and frame assemblies shall be mounted on the exposed side of the opening in the wall.

3-2.6 Door frames shall be evaluated when mounted so as to have the doors open either away from or into the furnace chamber, at the discretion of the testing authority, to obtain representative information on the performance of the construction under test.

3-2.7 Surface-mounted hardware (fire-exit devices) for use on fire doors shall be evaluated by being installed on one door assembly swinging into the furnace chamber and another door assembly swinging away from the furnace chamber.

3-2.8 The mountings 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.

3-2.9 Clearances for swinging doors shall be as follows: With a minus 1/16-inch (1.6 mm) tolerance — 1/8 inch (3 mm) along the top, 1/8 inch (3 mm) along the hinge and latch jambs, 1/8 inch (3 mm) along the meeting edge of doors in pairs, and 3/8 inch (10 mm) at the bottom edge of a single swinging door, and 1/4 inch (6 mm) at the bottom of a pair of doors.

3-2.10 Clearances for horizontal sliding doors not mounted within guides shall be as follows: With a minus 1/8-inch (3 mm) tolerance — 1/2 inch (12.7 mm) between door and wall surfaces, 3/8 inch (10 mm) between door and floor structure, and 1/4 inch (6 mm) between the meeting edges of center-parting doors. A maximum lap of 4 inches (102 mm) of the door over the wall opening at sides and top shall be provided.

3-2.11 Clearances for vertical sliding doors moving within guides shall be as follows: With a minus 1/8-inch (3 mm) tolerance — 1/2 inch (12.7 mm) between the door and wall surfaces along top and/or bottom door edges with guides mounted directly to the wall surface and 3/16 inch (5 mm) between meeting edges of bi-parting doors or 3/16 inch (5 mm) between door and floor structure or sill.

3-2.12 Clearances for horizontal slide-type elevator doors shall be as follows: With a minus 1/8-inch (3 mm) tolerance — 3/8 inch (10 mm) between the door and wall surface, 3/8 inch (10 mm) between multisection door panels, and 3/8 inch (10 mm) from the bottom of a panel to the sill. Multisection door panels shall overlap 3/4 inch (19 mm). Door panels shall lap the wall opening 3/4 inch (19 mm) at sides and top.

Chapter 4 Conduct of Tests

4-1 Time of Testing.

4-1.1 Masonry shall have sufficient strength to retain the assembly in position throughout the fire and hose stream test.

4-2 Fire Endurance Test.

4-2.1 Maintain the pressure in the furnace chamber as nearly equal to the atmospheric pressure as possible.

4-2.2 Continue the test until the exposure period of the desired classification or rating is reached unless the conditions of acceptance set forth in Chapter 5 are exceeded in a shorter period.

4-3 Hose Stream Test.

4-3.1 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.

4-3.2 Deliver the hose stream through a 2½-inch (64 mm) hose discharging through a National Standard Playpipe of corresponding size equipped with 1⅛-inch (29 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 for the duration of application in seconds per square foot of exposed area shall be as prescribed in Table 4-3.2.

4-3.3 The tip of the nozzle shall be located 20 feet (6 meters) 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 degrees from the line normal to the center of the test door. When so located the distance from the center shall be less than 20 feet (6 meters) by an amount equal to 1 foot (0.3 meters) for each 10 degrees of deviation from the normal.

Table 4-3.2 Water Pressure at Base of Nozzle and Duration of Application.

Desired Rating	Water Pressure at Base of Nozzle, pounds per square inch	Duration of Application, Seconds per Square Foot of Exposed Area
3 hour	45 (310 kPa)	3.0 (32 seconds/m²)
1½ hour and over, if less than 3 hour	30 (207 kPa)	1.5 (16 seconds/m²)
1 hour and over, if less than 1½ hour	30 (207 kPa)	0.9 (10 seconds/m²)
Less than 1 hour	30 (207 kPa)	0.6 (6 seconds/m²)

NOTE: 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.

4-4 Report.

4-4.1 Results shall be reported in accordance with the performance in the tests prescribed in these test methods. The report shall show the performance under the desired exposure period chosen from the following: 20 minute, 30 minute, ¾ hour, 1 hour, 1½ hour, or 3 hour. The report shall include the temperature measurements of furnace and, if determined, of the unexposed side of the test assembly. It shall also contain a record of all observations having a bearing on the performance of the test assembly. The materials and construction of the door and frame, and the details of the installation, hardware, hangers, guides, trim, finish, and clearance or lap shall be recorded to assure positive identification or duplication in all respects.

Chapter 5 Conditions of Acceptance

5-1 General.

5-1.1 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:

5-1.1.1 The test assembly shall have withstood the fire endurance test and the 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.

5-1.1.2 No flaming shall occur on the unexposed surface of a door assembly during the first 30 minutes of the classification period.

5-1.1.3 After 30 minutes, some intermittent light flames [approximately six inches (152 mm) long], for periods not exceeding five-minute intervals, may occur along the edges of doors.

5-1.1.4 Light flaming may occur during the last 15 minutes of the classification period on the unexposed surface area of the door, provided it is contained within a distance of 1½ inches (38 mm) from a vertical door edge and within 3 inches (76 mm) from the top edge of the door and within 3 inches (76 mm) from the top edge of the frame of a vision panel.

5-1.1.5 When hardware is to be evaluated for use on fire doors, it shall hold the door closed in accordance with the conditions of acceptance for an exposure period of three hours and, in addition, the latch bolt shall remain projected and shall be intact after the test. The hardware need not be operable after test.

5-1.1.6 Swinging Doors.

5-1.1.6.1 The movement of swinging doors shall not result in any portion of the edges adjacent to the door frame moving from the original position in a direction perpendicular to the plane of the door more than the thickness of the door during the first half of the classification period, nor more than 2⅞ inches (73 mm) during the entire classification period or as a result of the hose stream test.

5-1.1.6.2 The movement of swinging doors mounted in pairs shall not result in any portion of the meeting edges moving more than the thickness of the door away from the adjacent door edge in a direction perpendicular to the plane of the doors during the entire classification period or as a result of the hose stream test.

5-1.1.6.3 An assembly consisting of a pair of swinging doors incorporating an astragal shall not separate in a direction parallel to the plane of the doors more than $\frac{3}{4}$ inch (19 mm) nor a distance equal to the throw of the latch bolt along the meeting edges.

5-1.1.6.4 An assembly consisting of a pair of swinging doors, without an overlapping astragal, for a fire and hose stream exposure of $1\frac{1}{2}$ hours or less, shall not separate along the meeting edges more than $\frac{3}{8}$ inch (10 mm), including the initial clearance between doors.

5-1.1.6.5 An assembly consisting of a single swinging door shall not separate more than $\frac{1}{2}$ inch (13 mm) at the latch location.

5-1.1.6.6 Door frames to be evaluated with doors shall remain securely fastened to the wall on all sides and shall not permit through openings between frame and doors or between frame and adjacent wall.

5-1.1.7 Sliding Doors.

5-1.1.7.1 Doors mounted on the face of the wall shall not move from the wall sufficiently to develop a separation of more than $2\frac{7}{8}$ inches (73 mm) during the entire classification period or as a result of the hose stream test.

5-1.1.7.2 Doors mounted in guides shall not release from the guides, and the guides shall not loosen from fastenings.

5-1.1.7.3 The bottom bar of rolling steel doors shall not separate from the floor structure more than $\frac{3}{4}$ inch (19 mm) during the entire classification period or as a result of the hose stream test.

5-1.1.7.4 The meeting edge of center-parting horizontal sliding doors and bi-parting vertical sliding doors shall not separate more than the door thickness in a direction perpendicular to the plane of the doors.

5-1.1.7.5 The meeting edges of center-parting horizontal sliding doors and bi-parting vertical sliding doors without an overlapping astragal, for a fire and hose stream exposure of $1\frac{1}{2}$ hours or less, shall not separate in a direction parallel to the plane of the doors more than $\frac{3}{8}$ inch (10 mm) along the meeting edges, including the initial clearance between doors.

5-1.1.7.6 The meeting edges of center-parting horizontal sliding doors incorporating an astragal shall not separate in a direction parallel to the plane of the doors more than $\frac{3}{4}$ inch (19 mm) nor a distance equal to the throw of the latch bolt along the meeting edges.

5-1.1.7.7 The bottom edge of service-counter doors or single-slide dumbwaiter doors shall not separate from the sill more than $\frac{3}{8}$ inch (10 mm).

5-1.1.7.8 A resilient astragal, if provided, shall not deteriorate sufficiently to result in through openings during the fire endurance test, but small portions may be dislodged during the hose stream test.

5-1.1.7.9 The lap edges of 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 $2\frac{7}{8}$ inches (73 mm) during the entire classification period or immediately following the hose stream test.

5-1.1.7.10 The meeting edges of center-parting horizontal slide-type elevator door assemblies, for a fire and hose stream exposure of $1\frac{1}{2}$ hours or less, shall not move apart more than $1\frac{1}{4}$ inches (32 mm) as measured in any horizontal plane during the entire classification period or immediately following the hose stream test.