NFPA No.

252

FIRE TESTS DOOR ASSEMBLIES 1969

Fifty Cents

NATIONAL FIRE PROTECTION ASSOCIATION
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Official NFPA Definitions

Adopted Jan. 23, 1964. Where variances to these definitions are found, efforts to eliminate such conflicts are in process.

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SHOULD is intended to indicate recommendations or that which is advised but not required.

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Statement on NFPA Procedures

This material has been developed in the interest of safety to life and property under the published procedures of the National Fire Protection Association. These procedures are designed to assure the appointment of technically competent Committees having balanced representation from those vitally interested and active in the areas with which the Committees are concerned. These procedures provide that all Committee recommendations shall be published prior to action on them by the Association itself and that following this publication these recommendations shall be presented for adoption to the Annual Meeting of the Association where anyone in attendance, member or not, may present his views. While these procedures assure the highest degree of care, neither the National Fire Protection Association, its members, nor those participating in its activities accepts any liability resulting from compliance or noncompliance with the provisions given herein, for any restrictions imposed on materials or processes, or for the completeness of the text.

Standard Methods of
Fire Tests of Door Assemblies

NFPA No. 252 — 1969

This 1969 edition supersedes the last edition dated 1958.

This 1969 edition was adopted at the Annual Meeting of the National Fire Protection Association on May 12–16, 1969.

The only change from the 1958 edition of the standard included in this 1969 edition is the note following Section 11.

History

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.

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

Committee on Fire Tests

Jack A. Bono, *Chairman*,
Underwriters' Laboratories, Inc., 333 Pfingsten Rd., Northbrook, Ill. 60062

Richard W. Bletzacker, The Ohio State University.

Buell B. Dutton, Building Officials Conference of America.

Richard G. Gewain, American Iron & Steel Institute.

Armand H. Gustaferro, Portland Cement Assn.

F. E. Hodgdon, American Gas Assn. Laboratories.

Robert J. Kaleita, American Insurance Assn.

Dennis Lawson, British Joint Fire Research Organization.

Gerald L. Maatman, Lumbermens Mutual Casualty Co.

W. F. Maroni, Factory Mutual Engineering Assn.

Norman S. Pearce, Underwriters' Laboratories of Canada.

Dr. A. F. Robertson, National Bureau of Standards.

R. M. L. Russell, Factory Insurance Assn.

John Ed Ryan, National Forest Products Assn.

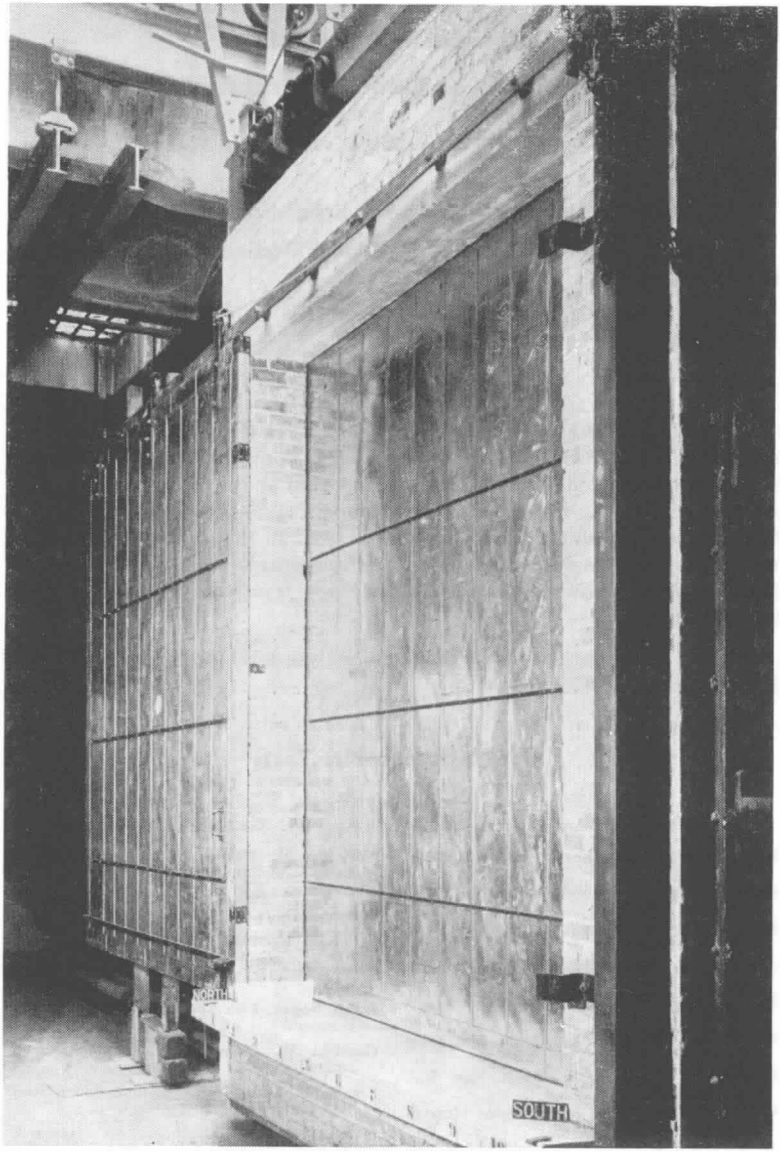
Louis Segal, Fire Marshals Assn. of North America.

Gordon W. Shorter, National Research Council.

Lewis W. Vaughan, Canadian Sheet Steel Building Institute.

Calvin H. Yuill, Southwest Research Institute.

SCOPE: Standards for fire testing procedures. Cooperates with other Committees dealing with special fire test procedures, including Flameproofing and Preservative Treatments and Wearing Apparel. Also cooperates with the American Society for Testing and Materials.



Assembly of two tin-clad fire doors, one on each side of 12-inch fire wall (Class A situation), one door open and one closed, during operation test preceding fire exposure test.

Standard Methods of

Fire Tests of Door Assemblies

NFPA No. 252 — 1969

Scope

1. (*a*) 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.

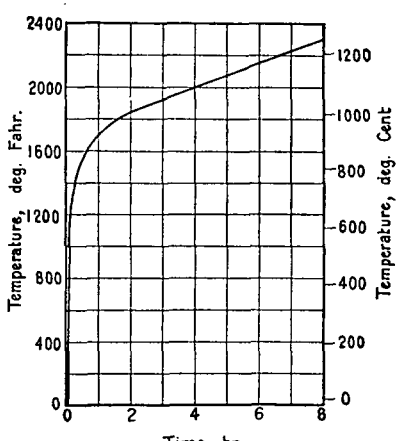
(*b*) Tests made in conformity with these test methods will register performance during the test exposure; but such tests shall not be construed as determining suitability for use after exposure to fire.

(*c*) 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.

CONTROL OF FIRE TESTS

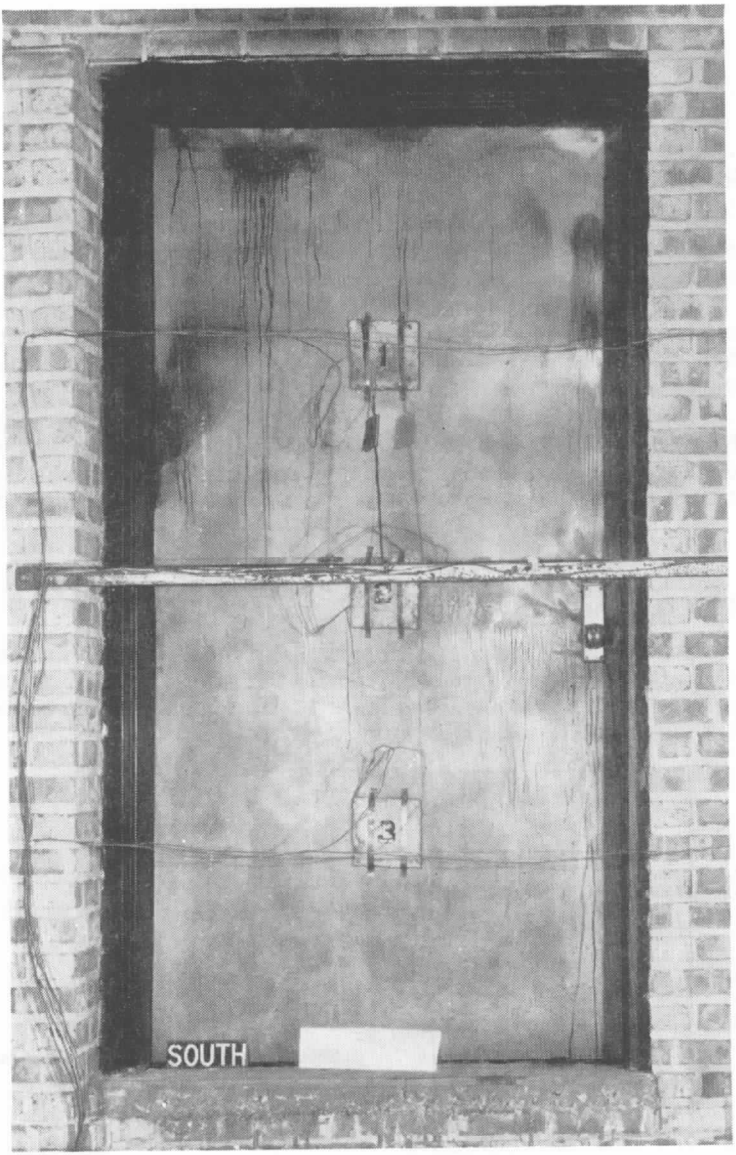
Time-Temperature Curve

2. The fire exposure of door assemblies shall be controlled to conform to the applicable portion of the standard time-temperature curve shown in Figure 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
1700 F (927 C)	at	1 hour
1850 F (1010 C)	at	2 hours
2000 F (1093 C)	at	4 hours
2300 F (1260 C)	at	8 hours or over

Figure 1. Time-Temperature Curve.



Unexposed face of flush-type metal-clad fire door, after standard fire exposure and application of hose stream. Note location of thermocouples on face of door.

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

Furnace Temperatures

3. (*a*) 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 outside diameter and ⅛-inch wall thickness, or, as an alternate, in the case of base metal thermocouples, protected by ½-inch wrought steel or wrought iron pipe of standard weight. The junction of the thermocouples shall be 6 inches from the exposed face of the test assembly or from the masonry in which the assembly is installed, during the entire test exposure.

(*b*) 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.

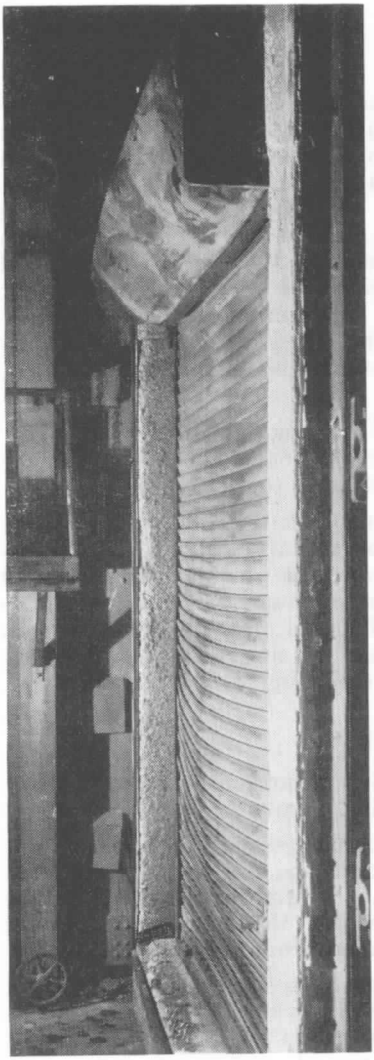
(*c*) The accuracy of the furnace control shall be such that the area under the time-temperature curve, obtained by averaging the results from the thermocouple readings, is within 10 per cent of the corresponding area under the standard time-temperature curve for fire tests of 1 hour or less duration,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

Unexposed Surface Temperatures

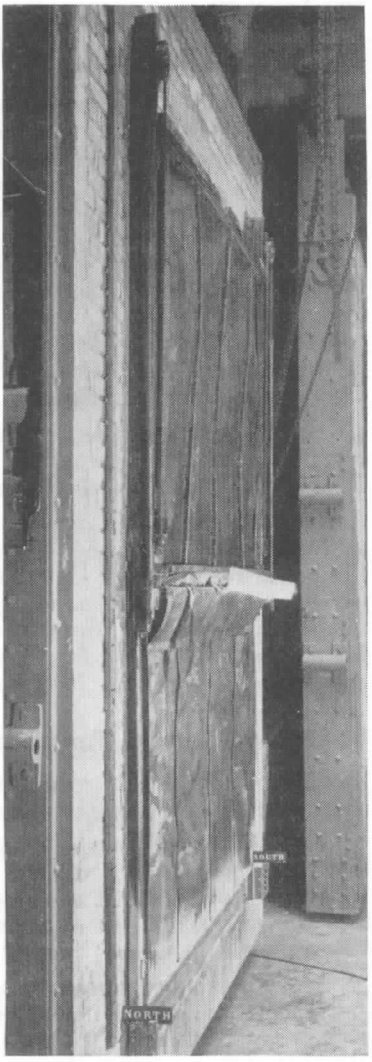
4. If unexposed surface temperatures are recorded, they shall be determined in the following manner:

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

(*b*) Unexposed surface temperatures shall be measured with thermocouples placed under flexible, oven-dry, felted asbestos pads 6 inches square, 0.4 inch in thickness, and weighing not less than 1.0 nor more than 1.4 pounds per square foot. 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 3½ inches with the hot junction under the center of the pad. The thermocouple leads under the pads shall be not heavier than



Exposed face of automatic rolling steel fire door, after fire exposure and hose stream tests.



Exposed face of counterbalanced freight elevator fire door, after standard fire exposure and application of hose stream.

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

(*c*) Unexposed surface temperatures shall be read at the same intervals as used for the furnace temperatures in Section 3(*b*).

TEST ASSEMBLIES

Construction and Size

5. (*a*) The construction and size of the test door assembly, consisting of single doors or doors in pairs, shall be representative of that for which classification or rating is desired. The materials and construction of the door and frame, and the details of the installation, hardware, trim, finish and clearance or lap shall be recorded to assure positive identification or duplication in all respects.

(*b*) A sill shall be provided as part of the opening to be protected, except where such sill interferes with the operation of the door. The sill shall be of noncombustible material and project into the furnace approximately twice the thickness of the test door.

Mounting

6. (*a*) Swinging doors shall be mounted so as to open into the furnace chamber. Sliding and rolling doors shall be mounted on the exposed side of the opening in the wall closing the furnace chamber. The mounting of all doors shall be such that they fit snugly within the frame, against the wall surface or in guides, but such mounting shall not prevent free and easy operation of the test door.

(*b*) Clearances for swinging doors shall be as follows, with $\frac{1}{16}$-inch variation: $\frac{3}{32}$ inch at the top, $\frac{3}{16}$ inch at the bottom, and $\frac{3}{32}$ inch between the door and hinge and lock jams.

CONDUCT OF TESTS

Time of Testing

7. Masonry settings shall be allowed to dry at least 3 days before tests are made.

Fire Endurance Test

8. (*a*) The pressure in the furnace chamber shall be maintained as nearly equal to the atmospheric pressure as possible.

(*b*) The test shall be continued until the exposure period of the desired classification or rating is reached unless the con-

ditions of acceptance set forth in Section 11 are exceeded in a shorter period.

Hose Stream Test

9. (*a*) Immediately following the fire endurance test, the test assembly shall be subjected 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, changes in direction being made slowly.

(*b*) The hose stream shall be delivered through a 2½-inch hose discharging through a National Standard Playpipe of corresponding size equipped with a 1⅛-inch 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 minutes per 100 square feet of exposed area shall be as prescribed in Table I.

(*c*) The tip of the nozzle shall be located 20 feet 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 by an amount equal to 1 foot for each 10 degrees of deviation from the normal.

TABLE I. — 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, minutes per 100 square feet exposed area*
3 hour	45	5
1½ hour and over, if less than 3 hour	30	2½
1 hour and over, if less than 1½ hour	30	1½
Less than 1 hour	30	1

Report

10. 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 tem-

perature measurements of the 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.

CONDITIONS OF ACCEPTANCE

Conditions of Acceptance

11. 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:

(*a*) The movement of swing 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, and as a result of the hose stream.

(*b*) An assembly consisting of a pair of swinging doors shall not separate more than ¾ inch or equal to the throw of the latch bolt at the latch location.

(*c*) An assembly consisting of a single swinging door shall not separate more than ½ inch at the latch location.

(*d*) Doors mounted on the face of the wall shall not move from the wall sufficient to develop a separation equivalent to the thickness of the edge of the door at the point of separation.

(*e*) Doors mounted in guides shall not release from guides and guides shall not loosen from fastenings.

(*f*) 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.

NOTE: It should be noted that the acceptance criteria for assemblies classified in accordance with the provisions of this Standard do not include limitations as to the transmission of heat.

Appendix.

TABLE II.—STANDARD TIME-TEMPERATURE CURVE FOR CONTROL OF FIRE TESTS.

Time	Temperature,	Area Above 68 F. Base		Temperature	Area Above 20 C. Base	
hr. min.	deg. Fahr.	deg. Fahr.-min.	deg. Fahr.-hr.	deg. Cent.	deg. Cent.-min.	deg. Cent.-hr.
0:00	68	00	0	20	00	0
0:05	1 000	2 330	39	538	1 290	22
0:10	1 300	7 740	129	704	4 300	72
0:15	1 399	14 150	236	760	7 860	131
0:20	1 462	20 970	350	795	11 650	194
0:25	1 510	28 050	468	821	15 590	260
0:30	1 550	35 360	589	843	19 650	328
0:35	1 584	42 860	714	862	23 810	397
0:40	1 613	50 510	842	878	28 060	468
0:45	1 638	58 300	971	892	32 390	540
0:50	1 661	66 200	1 103	905	36 780	613
0:55	1 681	74 220	1 237	916	41 230	687
1:00	1 700	82 330	1 372	927	45 740	762
1:05	1 718	90 540	1 509	937	50 300	838
1:10	1 735	98 830	1 647	946	54 910	915
1:15	1 750	107 200	1 787	955	59 560	993
1:20	1 765	115 650	1 928	963	64 250	1 071
1:25	1 779	124 180	2 070	971	68 990	1 150
1:30	1 792	132 760	2 213	978	73 760	1 229
1:35	1 804	141 420	2 357	985	78 560	1 309
1:40	1 815	150 120	2 502	991	83 400	1 390
1:45	1 826	158 890	2 648	996	88 280	1 471
1:50	1 835	167 700	2 795	1 001	93 170	1 553
1:55	1 843	176 550	2 942	1 006	98 080	1 635
2:00	1 850	185 440	3 091	1 010	103 020	1 717
2:10	1 862	203 330	3 389	1 017	112 960	1 882
2:20	1 875	221 330	3 689	1 024	122 960	2 049
2:30	1 888	239 470	3 991	1 031	133 040	2 217
2:40	1 900	257 720	4 295	1 038	143 180	2 386
2:50	1 912	276 110	4 602	1 045	153 390	2 556
3:00	1 925	294 610	4 910	1 052	163 670	2 728
3:10	1 938	313 250	5 221	1 059	174 030	2 900
3:20	1 950	332 000	5 533	1 066	184 450	3 074
3:30	1 962	350 890	5 848	1 072	194 940	3 249
3:40	1 975	369 890	6 165	1 079	205 500	3 425
3:50	1 988	389 030	6 484	1 086	216 130	3 602
4:00	2 000	408 280	6 805	1 093	226 820	3 780
4:10	2 012	427 670	7 128	1 100	237 590	3 960
4:20	2 025	447 180	7 453	1 107	248 430	4 140
4:30	2 038	466 810	7 780	1 114	259 340	4 322
4:40	2 050	486 560	8 110	1 121	270 310	4 505
4:50	2 062	506 450	8 441	1 128	281 360	4 689
5:00	2 075	526 450	8 774	1 135	292 470	4 874
5:10	2 088	546 580	9 110	1 142	303 660	5 061
5:20	2 100	566 840	9 447	1 149	314 910	5 248
5:30	2 112	587 220	9 787	1 156	326 240	5 437
5:40	2 125	607 730	10 129	1 163	337 630	5 627
5:50	2 138	628 360	10 473	1 170	349 090	5 818
6:00	2 150	649 120	10 819	1 177	360 620	6 010
6:10	2 162	670 000	11 167	1 184	372 230	6 204
6:20	2 175	691 010	11 517	1 191	383 900	6 398
6:30	2 188	712 140	11 869	1 198	395 640	6 594
6:40	2 200	733 400	12 223	1 204	407 450	6 791
6:50	2 212	754 780	12 580	1 211	419 330	6 989
7:00	2 225	776 290	12 938	1 218	431 270	7 188
7:10	2 238	797 920	13 299	1 225	443 290	7 388
7:20	2 250	819 680	13 661	1 232	455 380	7 590
7:30	2 262	841 560	14 026	1 239	467 540	7 792
7:40	2 275	863 570	14 393	1 246	479 760	7 996
7:50	2 288	885 700	14 762	1 253	492 060	8 201
8:00	2 300	907 960	15 133	1 260	504 420	8 407