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NFPA 105
Installation of Smoke-Control Door Assemblies
1989 Edition

NFPA

National Fire Protection Association Batterymarch Park, Quincy, MA 02269

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Policy Adopted by NFPA Board of Directors on December 3, 1982

The Board of Directors reaffirms that the National Fire Protection Association recognizes that the toxicity of the products of combustion is an important factor in the loss of life from fire. NFPA has dealt with that subject in its technical committee documents for many years.

There is a concern that the growing use of synthetic materials may produce more or additional toxic products of combustion in a fire environment. The Board has, therefore, asked all NFPA technical committees to review the documents for which they are responsible to be sure that the documents respond to this current concern. To assist the committees in meeting this request, the Board has appointed an advisory committee to provide specific guidance to the technical committees on questions relating to assessing the hazards of the products of combustion.

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NOTICE

NFPA 105
Installation of Smoke and Draft Control Door Assemblies
1989 Edition

The 1989 edition of NFPA 105, Installation of Smoke and Draft Control Door Assemblies was printed noting an ANSI approval date of February 6, 1989 on the cover. The ANSI Board of Standards Review has voted to deny approval of this edition of NFPA 105. NFPA has appealed this ruling.

Tentative Interim Amendment

NFPA 105

Installation of Smoke-Control Door Assemblies

1989 Edition

Reference: 3-1.2, 3-1.3, 3-1.4, 3-2.1, 3-2.2
T.I.A. 89-1

Pursuant to Section 15 of the NFPA Regulations Governing Committee Projects, the National Fire Protection Association has issued the following Tentative Interim Amendment to NFPA 105, *Installation of Smoke-Control Door Assemblies,* 1989 edition. The TIA was issued by the Standards Council on July 14, 1989.

A Tentative Interim Amendment is tentative because it has not been processed through the entire standards making procedures. It is interim because it is effective only between editions of the standard. A TIA automatically becomes a Proposal of the proponent for the next edition of the standard; as such, it then is subject to all of the procedures of the standards making process.

1. *Add a Note to 3-1.2, 3-1.3, 3-1.4, 3-2.1 and 3-2.2 to read as follows:*

   NOTE: Effective July 1, 1990

Issue Date: July, 1989

NFPA 105

Recommended Practice for the

Installation of Smoke-Control Door Assemblies

1989 Edition

This edition of NFPA 105, *Recommended Practice for the Installation of Smoke-Control Door Assemblies*, was prepared by the Technical Committee on Fire Doors and Windows, released by the Correlating Committee on Building Construction, and acted on by the National Fire Protection Association, Inc. at its Fall Meeting held November 14-17, 1988 in Nashville, Tennessee. It was issued by the Standards Council on January 13, 1989, with an effective date of February 6, 1989, and supersedes all previous editions.

The 1989 edition of this document has been approved by the American National Standards Institute.

Changes other than editorial are indicated by a vertical rule in the margin of the pages on which they appear. These lines are included as an aid to the user in identifying changes from the previous edition.

Origin and Development of NFPA 105

This recommended practice is the result of a multi-year project by the Technical Committee on Fire Doors and Windows and is based on the acknowledgment that smoke is the principal killer in destructive fires. Historically, fire doors have been permitted to have such clearances and deflections as would permit the passage of relatively great quantities of smoke. Those fire doors, when properly installed, have proven to be adequate barriers against the passage of fire but improvement is needed to protect against the passage of smoke. This recommended practice was prepared to introduce parameters for door performance that will limit smoke spread through a door opening.

This 1989 edition is the second and replaces the 1985 edition. It makes use, by reference, of a smoke-control door test that was not available when the first edition was prepared.

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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.

NOTE: Membership on a Committee shall not in and of itself constitute an endorsement of the Association or any document developed by the Committee on which the member serves.

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NFPA 105

Recommended Practice for the

Installation of Smoke-Control Door Assemblies

1989 Edition

NOTICE: An asterisk (*) following the number or letter designating a paragraph indicates explanatory material on that paragraph in Appendix A.

Information on referenced publications can be found in Chapter 4 and Appendix B.

Chapter 1 Introduction

1-1 Scope.

1-1.1 This recommended practice covers the use of door assemblies in openings where the passage of smoke is to be governed. These door assemblies are hereafter referred to as smoke-control door assemblies. Any specific known factors affecting any installations may require more stringent application of the recommendations in this recommended practice.

1-1.2 This recommended practice is primarily concerned with the effect of smoke on visibility. It does not contain an assessment of toxicity. While the use of smoke-control doors will be helpful in reducing the flow of airborne gases, it is not to be assumed that using this recommended practice obviates the concern over toxic combustion products.

1-2* Purpose. This recommended practice is intended to assist in the treatment of the problems associated with controlling the flow of smoke and gases through door openings in buildings.

1-3 General.

1-3.1 NFPA *101*®, *Life Safety Code*®, and building codes include specific requirements for smoke-control door assemblies and should be consulted in every instance. NFPA 80, *Standard for Fire Doors and Windows*, should be followed when fire door assemblies are used as smoke-control doors.

1-3.2 Consideration should be given to the leakage characteristics of adjacent wall, ceiling, and floor assemblies. It is generally considered to be of marginal benefit to install smoke control doors in locations where adjacent walls, ceilings, or floors do not effectively resist the passage of smoke. (*For additional information see the ASHRAE publication by Klote and Fothergill, Design of Smoke Control Systems for Buildings.*)

1-3.3* When protecting against smoke migration into spaces of large volume, a reasonably tight-fitting door may be considered adequate because of the relatively long time it would take for such a space to become untenable due to smoke. Conversely, the average 8-ft (2.4-m) high by 4-ft to 6-ft (1.2- to 1.8-m) wide corridor, however, can become untenable in less than two minutes as shown in a test conducted in California titled "Operation School Burning," where the fire room door was open.

1-3.4 The temperature of smoke at the door is of critical importance. When temperatures get high, the responses of doors and any gasketing materials or sealing systems used can have detrimental effects on the smoke-inhibiting properties of the assembly. According to studies, most gasketing materials will give good protection up to about 175 °F (80 °C). Some are resistant to temperatures up to about 400 °F (204 °C) before breakdown begins. Some intumescent materials activate upon reaching temperatures of about 250 °F (121 °C).

1-3.5 NFPA 252, *Standard Methods of Fire Tests of Door Assemblies*, permits a 1¾-in. (44-mm) thick door to deflect up to 2⅝ in. (67 mm). This is unacceptable for smoke infiltration protection. Special recommendations are needed, therefore, for smoke-control doors used in locations where fire exposure and hot smoke are expected.

NFPA 252, *Standard Methods of Fire Tests of Door Assemblies*, does not provide for measurements of leakage through fire door assemblies under the standard fire exposure conditions. Furthermore, door deflection may occur at elevated temperatures, depending on the door construction. It should be noted that fire doors are commonly tested under neutral or even negative pressure, whereas in typical fires, positive pressures exist over the upper one-half or two-thirds of the door. In view of the deflections permitted in NFPA 252, under fire exposure conditions fire doors may allow considerable leakage unless special designs involving seals are used.

1-3.6* Smoke Temperature.

1-3.6.1 Depending on the function of the door, its location in relation to the fire, and the movement of hot gases and air, door assemblies may be exposed to ambient or elevated smoke temperatures. For the purposes of this recommended practice, three temperature exposures are considered:

1-3.6.2 Ambient Smoke Temperature. The temperature at the exposed face of the door is assumed to be at or near 75 °F (24 °C).

1-3.6.3 Warm Smoke Temperature. The temperature at the exposed face of the door is assumed to be at or near 400 °F (204 °C).

1-3.6.4 Hot Smoke Temperature. The temperature at the exposed face of the door is assumed to be in excess of 400 °F (204 °C).

1-3.7* Exposure Pressure. Pressure differences of at least 0.04 in. wg (10 Pa) are developed in the upper parts of rooms that are involved in fire. Considerably higher pressure differences may exist in rooms, corridors, and stair enclosures due to the action of air handling systems, stack effect, and wind. For the purposes of this recommended practice, pressures up to 0.30 in. wg (75 Pa) are considered.

1-3.8* Smoke management systems both affect and are affected by smoke-control doors. Pressurized stair enclosures, for example, are more easily engineered when leakage through the stair doors is reduced. In other areas, pressurization may inhibit smoke flow so that reasonably tight-fitting doors unrated for smoke protection may be entirely appropriate.

1-3.9 Smoke-control doors should be used with the entire system taken into account. The amount of leakage tolerable will vary according to the degree of compartmentation, whether smoke management systems are used, and whether the building is protected by sprinklers.

1-3.10 The required duration of smoke protection can be equated with the path of egress. Evacuation typically starts in a room, progresses through a corridor, perhaps passes through a smoke barrier or horizontal exit, and proceeds through an entrance to the exit, which may be a stair enclosure, exit passageway, or the exit discharge. As with fire door assemblies, the longest time of protection is generally required at the entrance to an exit enclosure or horizontal exit with shorter durations appropriate for preceding doors.

This should also be the case with smoke-control doors. This is compatible with the protect-in-place concept as occupants are expected to be moved from one compartment to another for protection or, in some cases, protected in rooms other than the room of fire origin.

Occupancies not typical of this scenario include atria, malls, open office plans, and industrial occupancies. Areas of this sort may be adequately protected by reasonably tight-fitting doors without specific smoke-control door ratings because of the large volume of space involved.

1-3.11 Criteria for rating smoke-control doors reflect several areas of compliance. Included are amount of door deflection, limitation of leakage at various temperatures, protection related to specific volumes of space, and duration of protection. Practicality, however, dictates against so many variables as to make each assembly different from another. It is likely then that smoke-control door assemblies for ambient and warm smoke temperature protection will be rated on the basis of a simple air infiltration test with a requirement for some sort of on-site verification that materials used are of the same construction as those tested and the installation is appropriate.

While not covered in this recommended practice, a rating for hot smoke protection should be in connection with a fire test and under label service with an in-plant follow-up inspection service. At this time, a nationally recognized standard test for measuring hot smoke temperature leakage does not exist.

1-3.12* Complete sealing of doors is not always desirable. A disadvantage of complete sealing is the difficulty to open or close doors because of pressure differential. Some smoke management designs call for some areas to be pressurized. A small pressure acting across the full area of a door may exert sufficient force to make opening a door difficult. A seal must be first broken to equalize the pressure on both sides of the door before the door can be easily opened.

1-3.13 Twenty-minute smoke-control door assemblies do not require the hose stream portion of the test called for in NFPA 252, *Standard Methods of Fire Tests of Door Assemblies*. Some 20-minute fire door assemblies have been tested with the hose stream portion of the test. For the purposes of this document, either type of assembly is appropriate for use under Section 2-1.

Chapter 2 Guidelines

2-1 Fire Door Assemblies Used as Smoke-Control Doors.

2-1.1 The installation of fire door assemblies is covered by NFPA 80, *Standard for Fire Doors and Windows*.

2-1.2 The addition of gasketing materials is also covered by NFPA 80, *Standard for Fire Doors and Windows*.

2-1.3 If protection against leakage at elevated temperature is desired, a suitable sealing system or gasketing should be provided that will allow the door to meet the performance criteria in Section 3-2.

2-1.4* Gasketing, if used, should not inhibit the closing and positive latching of the door. Satisfactory closing and latching of the door should be verified after any gasketing has been installed.

2-1.5 For pairs of fire doors used for smoke control, double egress doors (leaves swinging in opposite directions) are recommended with the use of either overlapping astragals or other tested methods that do not hinder free use of either leaf. Double egress doors do not hinder the free use of either leaf and a satisfactory seal is provided.

2-1.6 Pairs of fire doors swinging in the same direction should be provided with split or compensating astragals adjusted so that closing and positive latching is not inhibited. Gasketing may also be used if the doors have been so tested. Use of a center mullion is another alternative, provided the required units of exit width in the opening are maintained.

2-1.7 If automatic-closing fire doors are used in lieu of self-closing fire doors, the release device should be smoke actuated. Delay on closing after actuation should not exceed 10 seconds. Where appropriate, interconnect with other fire alarm, suppression, and detection systems.

2-1.8 Because louvers are normally subject to leakage, they should not be used. (*See NFPA 80, Standard for Fire Doors and Windows, paragraph 1-3.2.*)

2-2 Non-Fire Door Assemblies Used as Smoke-Control Doors.

2-2.1 Doors used should be substantial and may include glazing.

2-2.2 Frames used should be smoke resistant (*see also 1-3.2*) and of sufficient strength to support an operating door.

2-2.3 Non-fire doors should only be used for controlling ambient and warm smoke. Non-fire doors used for controlling warm smoke should not be equipped with materials that would adversely affect the performance of the smoke-control door at temperatures less than 400 °F (204 °C).

2-2.4* Doors should be self-closing or automatic-closing upon smoke detection.

Exception: It is recognized that some codes call for the use of 20-minute fire doors or their equivalent and waive the requirement for a door closer. These doors are still desired even though a label cannot be provided because of the omission of a required fire door assembly component. These doors are usually in room-to-corridor locations where protection against leakage at elevated temperature may be desired.

2-2.5 Doors should be hinged in accordance with NFPA 80, *Standard for Fire Doors and Windows.*

Exception: Double acting doors may be used if they meet the performance criteria of Section 3-2.

2-2.6 Latches should be provided unless the anticipated pressures are such that the performance criteria (*see Section 3-2*) of the door assembly can be achieved without latching.

2-2.7 Gasketing, if used, should be of a type covered in NFPA 80, *Standard for Fire Doors and Windows*, and should not inhibit the closing and positive latching of the door. Satisfactory closing and latching of the door should be verified after any gasketing has been installed.

2-2.8 Pairs of doors should be installed in accordance with the recommendations in 2-1.6 or 2-1.7.

2-2.9 Because louvers are normally subject to leakage, they should not be used. (*See NFPA 80, Standard for Fire Doors and Windows, paragraph 1-3.2.*)

2-2.10 Operating transoms should not be used. Fixed solid transom panels are satisfactory.

2-2.11 Glazing should be sealed in place to minimize leakage. If glazing is used for doors described in the exception to 2-2.4, it should be wired glass labeled for fire protection and no larger than that tested in the door.

Chapter 3 Recommended Test

3-1 Air Leakage.

3-1.1* It is acknowledged that a nationally recognized test for the measurement of smoke leakage does not exist. However, Underwriters Laboratories Subject 1784 is under investigation as a test method for measuring ambient and warm air leakage rates of door assemblies. By taking into account recognized design features, e.g., close-fitting assemblies, limited deflections, and the use of gasketing and sealing materials, in conjunction with this performance test, satisfactory performance should be achieved.

3-1.2 To determine leakage rates of a smoke-control door assembly that may be exposed to ambient or warm smoke temperatures, each side of the door assembly should be tested in accordance with Underwriters Laboratories Subject 1784.

3-1.3 Depending upon the type and functional use of the door assembly, an additional test should be conducted with an artificial seal applied at the bottom edge. Artificial sealing of the gap (or undercut), e.g., with an impermeable sheet or tape, provides information on the extent of air leakage at the bottom gap and provides a better measure of anticipated leakage for doors given that they will be exposed to positive pressure in the upper part and to negative pressure in the lower part of a door. (*See Table 3-2.1.*)

3-1.4 The sequence of testing should follow this order:

Temperature	Pressure Differential
Ambient (75 °F/24 °C)	0.05 in. wg/12.5 Pa
Ambient (75 °F/24 °C)	0.10 in. wg/25 Pa
Ambient (75 °F/24 °C)	0.20 in. wg/50 Pa
Ambient (75 °F/24 °C)	0.30 in. wg/75 Pa
Warm (400°F/204 °C)	0.05 in. wg/12.5 Pa
Warm (400°F/204 °C)	0.10 in. wg/25 Pa
Warm (400°F/204 °C)	0.20 in. wg/50 Pa
Warm (400°F/204 °C)	0.30 in. wg/75 Pa

For the warm temperature measurement, the chamber air temperature should be increased so that it reaches 350 °F (177 °C) within 15 minutes. When stabilized at the prescribed air temperature [400 ± 20 °F (204 ± 11 °C)], the leakage rate should be measured at the four pressure differentials in sequence during a period not to exceeding 30 minutes.

3-2 Performance Criteria.

3-2.1 To provide reasonable levels of performance for the door application indicated, air leakage rates should not exceed the values provided in Table 3-2.1 per sq ft of door opening.

Table 3-2.1
Allowable Air Leakage

Door Installation	Pressure Difference (in. wg)	Temperature	Maximum Leakage (scfm per sq ft door opening)
Room to corridor[1]	0.1	Warm	1.5
Room to corridor (pressurized)	0.05	Warm	1.5
Area of refuge	0.2	Warm	2
Elevator lobby	0.1	Ambient	3
Elevator-pressurized hoistway	0.1	Ambient	6
Elevator (not pressurized) w/o lobby separation	0.1	Ambient	3
Cross corridor[1]	0.05	Warm	1
Stair enclosure	0.1	Ambient	3
Stair enclosure (pressurized)	0.3	Ambient	11

[1]Tested with artificial bottom seal. However, in an actual installation, the bottom seal that was provided in the test may be omitted due to the neutral pressure plane being located in a fire condition approximately one-third of the way up from the bottom of the door.

For SI Units: 1 in. wg = 250 Pa
1 scfm/sqf = 0.3 $m^3/min/m^2$

3-2.2 When an engineering evaluation is performed and the volume of space to be protected is known, the values in Table 3-2.1 for smoke control may be modified to restrict smoke leakage in terms of a specified smoke tenability level.

3-3 Gasketing. Gasketing or seals used as part of smoke-control door assemblies should be classified and listed by an independent testing laboratory. Evaluations should indicate that the material investigated does not adversely affect the performance of fire doors. It should be helpful if such materials could also be evaluated according to temperature resistance. Lacking such evaluations, the manufacturer should be requested to indicate maximum temperatures under which its gasket material is effective. Resiliency, durability, and cycling should be considerations.

Chapter 4 Referenced Publications

4-1 The following documents or portions thereof are referenced within this recommended practice and should be considered part of the recommendations of this document. The edition indicated for each reference is current as of the date of the NFPA issuance of this document.

4-1.1 NFPA Publications. National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

NFPA 80-1986, *Standard for Fire Doors and Windows*

NFPA *101*-1988, *Life Safety Code*

NFPA 252-1984, *Standard Methods of Fire Tests of Door Assemblies.*

4-1.2 Other Publications.

4-1.2.1 UL Subject 1784, Outline of Proposed Investigation of Air Leakage Tests of Door Assemblies, April 1988, Underwriters Laboratories, 333 Pfingsten Rd, Northbrook, IL 60062.

4-1.2.2 Klote, John, et al., *Design of Smoke Control Systems for Buildings*, American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., 1791 Tullie Circle, N.E., Atlanta, GA 30329.

4-1.2.3 Los Angeles Fire Department, "Operation School Burning," NFPA, 1959.

Appendix A

This Appendix is not a part of the recommendations of this NFPA document, but is included for information purposes only.

A-1-2 The Committee hopes this recommended practice will be of assistance to authorities having jurisdiction and designers of building smoke management systems when smoke-control door assemblies are used as part of the system.

A-1-3.3 For the purposes of this recommended practice, smoke can be considered to be airborne particulates and gases resulting from combustion. Therefore, to understand smoke movement it is only necessary to understand air movement. Hot smoke, however, will be buoyant and will be located above the neutral plane in the fire compartment. As it moves away from the fire source, it will cool, lose its buoyancy, and become less stratified. Beyond the immediate influence of the fire, smoke will behave just as warm or cool air would behave. It will be driven by pressure differentials within the building or will follow air currents created by the HVAC system in the building. Pressure differentials may be the result of: fire pressure build-up which would only drive the smoke out of the compartment or area of origin; stack effect due to temperature differentials between the interior and exterior of the building; wind; or mechanically created pressures using HVAC systems, exhaust fans, supply (pressurization) fans, vents, etc. Therefore, to control smoke movement, a designer needs to control air movement. Leakage rates for smoke control door assemblies can be established for different pressure differentials. Quantity of air movement through a door assembly can be determined and performance criteria established for the specific application.

Based on measurements reported in "Operation School Burning" and by McGuire et al., it has been estimated that a tenable or tolerable smoke concentration limit corresponds to an optical density per meter within the range of 0.04 to 0.08. Since the maximum density of smoke generated in the fire area is considered to lie in the range of 4 to 8 optical density per meter, a tenable smoke atmosphere is sometimes assumed to correspond to 1 percent of the atmosphere in the immediate fire area.

A-1-3.6 Smoke control doors used in locations likely to be in close proximity to a fire may be exposed to elevated temperatures. This includes doors separating rooms and corridors, and doors serving as smoke barriers or horizontal exits. Such doors, whether rated as fire doors or not, should restrict the passage of smoke that may be heated to a temperature of 400 °F (204 °C). In a fully sprinklered building, protection against elevated temperature smoke may not be necessary, and the criteria for protection against ambient temperature smoke may be appropriate.

Mention should be made of the effects of automatic sprinkler protection on smoke. The activation of an automatic sprinkler occurs early in a flaming fire condition, usually within five minutes or so after visible flaming is observed. Temperatures immediately drop to almost ambient, and smoke is driven to the floor and diffused throughout the available space. Smoke production rate is reduced as the fire size decreases and the temperature of the flame plume is reduced. The temperature of the smoke is also reduced to near ambient. Thus, in a sprinklered building it may be appropriate to treat smoke as if it were at or near ambient temperature. Fewer mitigating measures may be taken to control smoke movement since the production rate of smoke will be reduced. However, under a smoldering fire condition, sprinkler activation can be delayed and this, too, should be considered.

Fire door assemblies protecting stair enclosures and vestibules adjacent to stair enclosures, for example, are more likely to be exposed to ambient temperature smoke provided there are no combustible materials in the enclosure. These doors may form part of a control system involving pressurized stairwells or vestibules. The air leakage characteristics of such door assemblies are an essential part of smoke control design.

A-1-3.7 It has been determined from many full-scale fire tests of compartments that the maximum instantaneous pressure difference created by an uncontrolled fire may approach 0.15 in. wg (37.5 Pa). More typically, a pressure difference of 0.06 to 0.10 in. wg (15 to 25 Pa) is achieved over the period of most intense burning in such light fire loading occupancies as residential, health care, and business (offices).

In sprinklered buildings where the fire will be controlled, it is anticipated that the maximum pressure differential generated should not exceed 0.05 in. wg (12.5 Pa).

Typical stair pressurization systems may often result in pressure differentials as high as 0.25 to 0.50 in. wg (62.5 to 125 Pa) across the door assembly.

Stack effect may also play a major role in determining pressure that must be overcome in order to pressurize shafts such as elevators and stairs to prevent smoke infiltration. Pressure differences between the exterior and unvented shafts can range from virtually nothing to as much as 0.5 to 1.0 in. wg (125 to 250 Pa) or more, depending on the location of the building neutral pressure plane, the height of the building, and the outside temperature.

The quantity of air movement through a door gap can be determined by the general formula:

$$Q = KAP^{1/N}$$

where Q is the volume flow rate of air, K is the orifice coefficient for the gap around the door perimeter, A is the area of the gap, P is the pressure differential across the door, and N is a number between 1 and 2 which can be determined empirically. (*See ASHRAE Handbook and Product Directory — Fundamentals.*)

A-1-3.8 Many factors must be taken into consideration before smoke management systems can be developed. Fire load, smoke load, rate of heat release, rate of smoke release, geometry, height of building, ambient environmental conditions, HVAC systems, exhaust systems, compartmentation, occupancy type, occupant status, means of egress, volume of spaces, and fire alarm detection system are just some of the factors that must be considered before a designer can develop a total system approach to the smoke problem. A smoke-control door assembly is only one component of a total smoke control and management system. A smoke management system can either be active or passive, or a combination of both. Active systems are dynamic and generally use mechanical systems in conjunction with automatic activating devices (i.e., a smoke exhaust system). Passive systems use built-in-place barriers (i.e., a smoke-retardant barrier) that do not rely on mechanical systems to function. Both types of systems may be either automatically or manually activated, or a combination of both.

A-1-3.12 Door opening force is addressed in various standards on ingress for mobility-impaired people. Ease of egress is equally important. A designer of a smoke management system should be aware of the importance of door opening force and should consider pressure reducing measures, such as using vestibules and equalizing pressures through the use of multiple ducts.

A-2-1.4 If gasketing or other sealing system is used and protection against hot smoke is intended, noncombustible gasketing or a suitable sealing system that will not break down under hot smoke conditions for a 20-minute period should be considered.

A-2-2.4 In such situations, it is suggested that the authority having jurisdiction require regular fire drills or staff training sessions where manual closing of the door is a high priority portion of the drill or training session.

A-3-1.1 Temperature has a direct effect on pressure. When protecting against warm or hot smoke infiltration, this test method in itself may not be completely appropriate but it provides a uniform and repeatable test method. It also provides a standard evaluation of an assembly for a pressurized application.

Concepts and proposed test methods have been developed and should be considered for measuring smoke leakage during exposure in the standard fire resistance test. One such draft developed at the National Bureau of Standards' Center for Fire Research, "The Measurement of Smoke Leakage of Door Assemblies During Standard Fire Test Exposures," should be reviewed.

Appendix B Referenced Publications

B-1 The following documents or portions thereof are referenced within this recommended practice for informational purposes only and thus are not considered part of the recommendations of this document. The edition indicated for each reference is the current edition as of the date of the NFPA issuance of this document.

B-1.1 *ASHRAE Handbook and Product Directory — 1985 Fundamentals*, American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., 1791 Tullie Circle, N.E., Atlanta, GA 30329.

B-1.2 Cooper, L.Y., "The Measurement of Smoke Leakage of Door Assemblies During Standard Fire Test Exposures," NBSIR 80-2004, Center for Fire Research, National Bureau of Standards, and Fire Materials, Vol. 5, No. 4, p. 135, 1981.

B-1.3 Los Angeles Fire Department, "Operation School Burning," NFPA, 1959.

B-1.4 McGuire, J.H., Tamura, G.T., and Wilson, F.T., "Factors in Controlling Smoke in High Buildings," National Research Council of Canada, Division of Building Research, Technical Paper No. 341, June 1971.

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SUBMITTING PROPOSALS ON NFPA TECHNICAL COMMITTEE DOCUMENTS

Contact NFPA Standards Administration for final date for receipt of proposals on a specific document.

INSTRUCTIONS

Please use the forms which follow for submitting proposed amendments. Use a separate form for each proposal.

1. For each document on which you are proposing amendment indicate:
   (a) The number and title of the document
   (b) The specific section or paragraph.

2. Check the box indicating whether or not this proposal recommends new text, revised text, or to delete text.

3. In the space identified as "Proposal" include the wording you propose as new or revised text, or indicate if you wish to delete text.

4. In the space titled "Statement of Problem and Substantiation for Proposal" state the problem which will be resolved by your recommendation and give the specific reason for your proposal including copies of tests, research papers, fire experience, etc. If a statement is more than 200 words in length, the technical committee is authorized to abstract it for the Technical Committee Report.

5. Check the box indicating whether or not this proposal is original material, and if it is not, indicate source.

6. If supplementary material (photographs, diagrams, reports, etc.) is included, you may be required to submit sufficient copies for all members and alternates of the technical committee.

NOTE: The NFPA Regulations Governing Committee Projects in Paragraph 10-10 state: Each proposal shall be submitted to the Council Secretary and shall include:

(a) identification of the submitter and his affiliation (Committee, organization, company) where appropriate, and

(b) identification of the document, paragraph of the document to which the proposal is directed, and

(c) a statement of the problem and substantiation for the proposal, and

(d) proposed text of proposal, including the wording to be added, revised (and how revised), or deleted.

FORM FOR PROPOSALS ON NFPA TECHNICAL COMMITTEE DOCUMENTS

Mail to: Secretary, Standards Council
National Fire Protection Association, Batterymarch Park, Quincy, Massachusetts 02269

Date 5/18/85 Name John B. Smith Tel. No. 617-555-1212

Address 9 Seattle St., Seattle, WA 02255

Representing (Please indicate organization, company or self) Fire Marshals Assn. of North America

1. a) Document Title: Protective Signaling Systems NFPA No. & Year NFPA 72D

   b) Section/Paragraph: 2-7.1 (Exception)

2. Proposal recommends: (Check one)
   - ☐ new text
   - ☐ revised text
   - ☒ deleted text.

3. Proposal (include proposed new or revised wording, or identification of wording to be deleted):

   Delete exception.

SAMPLE

4. Statement of Problem and Substantiation for Proposal:

   A properly installed and maintained system should be free of ground faults. The occurrence of one or more ground faults should be required to cause a "trouble" signal because it indicates a condition that could contribute to future malfunction of the system. Ground fault protection has been widely available on these systems for years and its cost is negligible. Requiring it on all systems will promote better installations, maintenance and reliability.

5. ☒ This Proposal is original material.
   ☐ This Proposal is not original material; its source (if known) is as follows: ______

(Note: Original material is considered to be the submitter's own idea based on or as a result of his own experience, thought, or research and, to the best of his knowledge, is not copied from another source.)

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John B. Smith

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4. Statement of Problem and Substantiation for Proposal:

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