

NFPA 91  
Standard for  
Exhaust Systems  
for Air Conveying  
of Materials  
1995 Edition



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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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**NFPA 91**  
**Standard for**  
**Exhaust Systems for Air**  
**Conveying of Materials**  
**1995 Edition**

This edition of NFPA 91, *Standard for Exhaust Systems for Air Conveying of Materials*, was prepared by the Technical Committee on Blower Systems and acted on by the National Fire Protection Association, Inc., at its Fall Meeting held November 14-16, 1994, in Toronto, Ontario, Canada. It was issued by the Standards Council on January 13, 1995, with an effective date of February 7, 1995, and supersedes all previous editions.

The 1995 edition of this document has been approved by the American National Standards Institute.

**Origin and Development of NFPA 91**

The National Fire Protection Association as early as 1899 recognized the hazards of blower and exhaust systems. Since 1900 the NFPA Committees on Blower Systems have given continuing attention to the subject. Following World War II, revisions and additions to the standard were recommended by the NFPA Committee on Blower Systems to cover various new developments in the protection of dust collecting systems and stock and refuse conveying systems, and were adopted by the NFPA at its Annual Meetings in 1946, 1947, 1948, and 1949. Editorially revised editions were published in 1959 and 1961. In 1972 Section 200 (Chapter 2) was expanded, and a new Section 500 (Chapter 5), covering systems involving plastic materials, was added. In the 1973 edition, Section 400 (Chapter 4) was completely revised. The 1983 edition was completely updated to conform with the NFPA Manual of Style and incorporated minor revisions in each chapter.

The 1990 edition included minor revisions to Chapter 2 including a new Figure 2-8 and Table 2-8(b). Changes were made to recognize NFPA 45, *Standard on Fire Protection for Laboratories Using Chemicals*, and to remove conflicts with that standard. These changes included moving Section 5-2 and Figures 5-2 through 5-5 to Appendix A.

The Technical Committee on Blower Systems completely revised the standard for the 1992 edition, including a new title and new scope. The previous title was *Standard for the Installation of Blower and Exhaust Systems for Dust, Stock, and Vapor Removal or Conveying*. Chapters 3 and 4 were deleted from the 1990 edition with some requirements from those chapters included in the revised and reorganized Chapter 2 and new Chapters 5, 6, and 7.

Minor changes were made in all chapters in the 1995 edition. The Committee clarified their intent that ducts can be round, oval, or rectangular. A new figure was added to show access openings for different shapes of ducts, and a new table was added in the appendix to show duct velocities for types of materials conveyed.

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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.

**Committee Scope:** This Committee shall have primary responsibility for documents on the construction, installation, operation, and maintenance of blower and exhaust systems and fans for the removal of dust, vapor, and refuse, including ducts and related equipment and the disposal of materials. The function of such equipment is to protect life and property from fire, from smoke and gases resulting from fire, and from conditions having manifestations similar to fire. Ventilation of restaurant and cooking equipment is covered by the Committee on Chimneys and Heating Equipment. Pneumatic conveying of combustible dusts is covered by the Committee on Dust Explosion Hazards.

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**Standard for**  
**Exhaust Systems for Air**  
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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 8 and Appendix B.

## Chapter 1 Introduction

### 1-1\* Scope.

**1-1.1** This standard provides minimum requirements for the design, construction, installation, operation, testing, and maintenance of exhaust systems for air conveying of materials except as modified or amplified by other applicable NFPA standards.

**1-1.2** This standard outlines requirements to obtain reasonable safety. Where unusual hazards are encountered, the authority having jurisdiction shall be permitted to require additional safeguards or modify the requirements of this standard, provided equivalent safety is ensured.

### 1-2 Purpose.

**1-2.1** The purpose of this standard is to eliminate or reduce known fire and explosion hazards inherent in the use of exhaust systems and to prevent them from becoming a means for spreading fire.

**1-2.2** The design and installation of exhaust systems shall be the responsibility of persons having a knowledge of these systems. Maintenance and operations shall be performed by persons having exhaust system experience.

**1-3 Equivalency.** Nothing in this standard is intended to prevent the use of new methods or devices, provided that sufficient technical data is submitted to the authority having jurisdiction to demonstrate that the proposed method or device is equivalent in quality, strength, fire endurance, effectiveness, durability, and safety to that prescribed by this standard.

**1-4 Retroactivity.** The provisions of this document are considered necessary to provide a reasonable level of protection from loss of life and property from fire and explosion. They reflect situations and the state of the art at the time the standard was issued. Unless otherwise noted, it is not intended that the provisions of this document be applied to facilities, equipment, structures, or installations that were existing or approved for construction or installation prior to the effective date of the document, except in those cases where it is determined by the authority having jurisdiction that the existing situation involves a distinct hazard to life or adjacent property.

### 1-5 Definitions.

**Air Moving Device (AMD).\*** A power-driven fan moving a volume of air to overcome the resistance to flow caused by exhaust system components.

**Approved.** Acceptable to the authority having jurisdiction.

NOTE: The National Fire Protection Association does not approve, inspect, or certify any installations, procedures, equipment, or materials; nor does it approve or evaluate testing laboratories. In determining the acceptability of installations, procedures, equipment, or materials, the authority having jurisdiction may base acceptance on compliance with NFPA or other appropriate standards. In the absence of such standards, said authority may require evidence of proper installation, procedure, or use. The authority having jurisdiction may also refer to the listings or labeling practices of an organization concerned with product evaluations that is in a position to determine compliance with appropriate standards for the current production of listed items.

**Authority Having Jurisdiction.** The organization, office, or individual responsible for approving equipment, an installation, or a procedure.

NOTE: The phrase "authority having jurisdiction" is used in NFPA documents in a broad manner, since jurisdictions and approval agencies vary, as do their responsibilities. Where public safety is primary, the authority having jurisdiction may be a federal, state, local, or other regional department or individual such as a fire chief; fire marshal; chief of a fire prevention bureau, labor department, or health department; building official; electrical inspector; or others having statutory authority. For insurance purposes, an insurance inspection department, rating bureau, or other insurance company representative may be the authority having jurisdiction. In many circumstances, the property owner or his or her designated agent assumes the role of the authority having jurisdiction; at government installations, the commanding officer or departmental official may be the authority having jurisdiction.

**Duct.** A pipe, tube, or other enclosure used to air convey materials.

**Dust.** Any finely divided solid material 420  $\mu\text{m}$  or smaller in diameter (material passing a U.S. No. 40 Standard Sieve).

**Exhaust System.** An air conveying system for moving materials from a source to a point of discharge. A system can consist of an AMD with ducting connected to either the inlet or discharge, or to both. More complicated systems can include ductwork, an AMD, control dampers, a filtration system, noise attenuation, and pollution control equipment.

**Labeled.** Equipment or materials to which has been attached a label, symbol, or other identifying mark of an organization that is acceptable to the authority having jurisdiction and concerned with product evaluation that maintains periodic inspection of production of labeled equipment or materials and by whose labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner.

**Limited-Combustible.** As applied to a building construction material, a material, not complying with the definition of noncombustible material, which, in the form in which it is used, has a potential heat value not exceeding 3500 Btu per lb (8141 kJ/kg) (see NFPA 259, *Standard Test Method for Potential Heat of Building Materials*), and complies

with one of the following paragraphs (a) or (b). Materials subject to increase in combustibility or flame spread rating beyond the limits herein established through the effects of age, moisture, or other atmospheric condition shall be considered combustible.

(a) Materials having a structural base of noncombustible material, with a surfacing not exceeding a thickness of 1/8 in. (3.2 mm) that has a flame spread rating not greater than 50.

(b) Materials, in the form and thickness used, other than as described in (a), having neither a flame spread rating greater than 25 nor evidence of continued progressive combustion and of such composition that surfaces that would be exposed by cutting through the material on any plane would have neither a flame spread rating greater than 25 nor evidence of continued progressive combustion.

**Listed.** Equipment or materials included in a list published by an organization acceptable to the authority having jurisdiction and concerned with product evaluation that maintains periodic inspection of production of listed equipment or materials and whose listing states either that the equipment or material meets appropriate standards or has been tested and found suitable for use in a specified manner.

**NOTE:** The means for identifying listed equipment may vary for each organization concerned with product evaluation, some of which do not recognize equipment as listed unless it is also labeled. The authority having jurisdiction should utilize the system employed by the listing organization to identify a listed product.

**Noncombustible Material.** A material that, in the form in which it is used and under the conditions anticipated, will not ignite, burn, support combustion, or release flammable vapors when subjected to fire or heat. Materials reported as passing ASTM E136, *Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 Degrees C*, shall be considered noncombustible materials.

**Shall.** Indicates a mandatory requirement.

**Should.** Indicates a recommendation or that which is advised but not required.

## Chapter 2 Design and Construction

### 2-1 General Requirements.

**2-1.1** The design of any exhaust system shall consider the physical and chemical properties and hazard characteristics of the materials being conveyed.

**2-1.2\*** An air moving device shall be sized to confine, capture, and remove materials. The velocity shall be adequate to capture materials and convey them through the exhaust system.

**2-1.3\*** Incompatible materials shall not be conveyed in the same system.

**2-1.3.1** Operations, generating flames, sparks, or hot materials, such as from grinding wheels and welding, shall not be consolidated in the same exhaust system that air conveys flammable or combustible materials.

**2-1.3.2** Exhaust systems designed to air convey flammable or combustible materials that might contain foreign ferrous materials shall have magnetic separators installed at those points where the ferrous materials enter the system. Where electromagnetic separators are used they shall be listed.

**2-1.4\*** Plans and specifications for new systems and systems to be modified shall be submitted to the authority having jurisdiction for approval prior to installation or modification. The submittal shall provide adequate information to describe the hazard and demonstrate safe performance of the system.

**2-1.5** Ducts designed to air convey material shall be round, oval, or rectangular.

**2-1.6** Fire dampers shall not be installed in exhaust systems.

*Exception:* Fire dampers shall be permitted for any of the following situations:

(a) Where ducts pass through fire barriers, fire walls, or floors.

(b) Where there is a collection system on the end of the system that is protected with an automatic extinguishing system.

(c) Where the duct system is protected with an automatic extinguishing system.

(d) Where ducts have been listed with interrupters.

**2-1.7** Fire detection and alarm systems shall not be interlocked to shut down air moving devices.

*Exception No. 1:* AMDs shall shut down automatically when a fire damper closes within the exhaust system.

*Exception No. 2:* AMDs shall be permitted to shut down automatically when either of the following is provided:

1. A collection system that is protected with an automatic extinguishing system.

2. A duct system that is protected with an automatic extinguishing system.

### 2-2 Duct Material and Construction.

**2-2.1** Duct material shall be noncombustible or limited-combustible.

*Exception:* Alternative material shall be used when the material being conveyed is incompatible with noncombustible or limited-combustible construction materials.

**2-2.2** The duct construction shall conform to applicable SMACNA standards:

(a) *Accepted Industry Practice for Industrial Duct Construction*,

(b) *Rectangular Industrial Duct Construction Standard*,

(c) *Round Industrial Duct Construction Standard*,

(d) *Thermoplastic Duct (PVC) Construction Manual (1974)*.

*Exception:* Reinforced thermoset type materials shall conform to ASTM C582, *Standard Specification for Contact-Molded Reinforced Thermosetting Plastic (RTP) Laminates for Corrosion Resistant Equipment*.

**2-2.3** Horizontal duct work shall be capable of supporting the weight of the duct half filled with material. Where sprinkler protection is provided in the duct, horizontal duct work shall be capable of supporting the weight of the system plus the weight of the duct half filled with water or material being conveyed, whichever has the higher density.

*Exception:* Where adequate drainage is provided, the weight of the water shall not require consideration.

**2-2.4** Laps in duct construction shall be in the direction of airflow.

**2-2.5** Joints in duct construction shall be liquidtight when the conveying system contains condensible vapors or liquids in suspension. Provisions shall be made for drainage of condensate at low points in the duct.

**2-2.6** The interior of ducts shall be smooth and joints shall be finished neatly.

### 2-3 Access.

**2-3.1** Access doors shall be provided in horizontal ducts, adjacent to elbows, junctions, and vertical ducts. Doors shall be located on the tops or sides of the ducts, and door spacing shall not exceed 12 ft (3.6 m).

*Exception:* Ducts handling materials that do not create a condition requiring access into the duct.

**2-3.2** Access doors shall be of the same material and of equal or greater thickness than the duct. Required openings or other penetrations shall be sealed, gasketed, or tightly fitted so that conveyed material will not escape.

**2-3.3** The size of access openings shall be equal to the diameter or 75 percent of the shortest dimension of rectangular duct up to a maximum of 24 in. (609.6 mm). Access openings shall be round, square, or as nearly square as possible. The access openings shall be sized as follows:

(a) *Round ducts.* The diameter of the duct measured around the circumference.

(b) *Oval ducts.* The shortest dimension of the oval measured around the perimeter.

(c) *Rectangular ducts.* Seventy-five percent of the shortest dimension of the rectangle.

### 2-4 Design Requirements.

**2-4.1** A means shall be provided for balancing the system.

**2-4.2** Dampers or shutters shall be permitted only for weather or back-draft protection. Where dampers or louvers are used, they shall be located on the clean-air side of the filtration system.

**2-4.3** Balancing devices shall be secured to prevent inadvertent adjustment or loss of transport velocity. Butterfly dampers shall not be permitted for balancing duct systems conveying solid materials.

**2-4.4** Ducts shall be self-contained. Building walls, floors, or roofs shall not be used as component parts.

*Exception:* Use of building walls, floors, or roofs shall be permitted when construction is noncombustible and the building component is designed as an integral part of the duct system.

**2-4.5** Ducts shall lead directly to the point of termination.

**2-4.5.1** Terminations with discharge to atmosphere shall be safely arranged. Discharge shall terminate away from outside air intakes to prevent material from entering the air intakes. For duct systems containing flammable or combustible materials, discharge shall terminate above the roof with direction away from combustible construction that is within 25 ft (7.6 m).

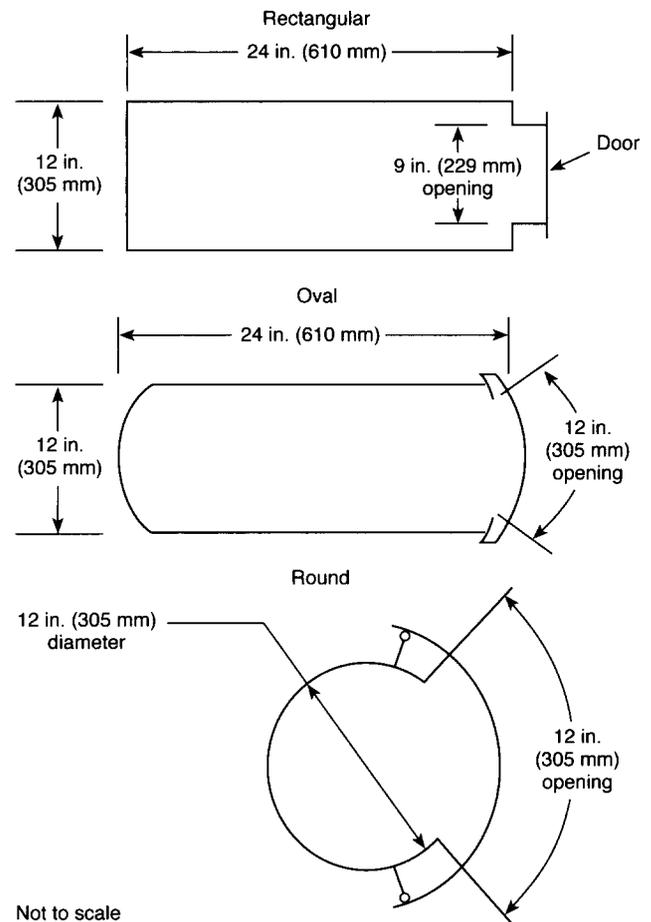


Figure 2-3.3 Sizing access openings for different shapes of ducts.

**2-4.6\*** Materials shall be confined to and removed from the area where they are generated by hoods or enclosures and an air-moving device.

*Exception:* When vapors are generated and it is not possible for the process to be enclosed or hoods installed, general ventilation through a system of suction ducts shall be permitted.

**2-4.7\*** Dusts or vapors containing residues shall be filtered.

**2-4.8** Duct liners shall be limited-combustible or non-combustible.

**2-4.9** Additional branch ducts shall not be added to an existing system without redesigning the system. Branch ducts shall not be disconnected nor unused portions of the system be blanked off without providing means to maintain required airflow.

**2-4.10** Flexible ducts shall not be used in exhaust systems.

*Exception:* Flexible ducts shall be permitted to be used at inlets where moveability or portability is required. Where used, they shall have strength equivalent to that of the connecting ducts.

### 2-5 Hangers and Supports.

**2-5.1** Duct supports shall be designed to carry the weight of the duct half filled with material. Where sprinkler protection is provided in the duct, the hanger's design shall include the weight of the duct half filled with water or

material being conveyed, whichever has the highest density. Loads shall not be placed on connecting equipment.

*Exception:* Where adequate drainage is provided, the weight of the water shall not require consideration.

**2-5.2** Hangers and supports exposed to corrosive atmospheres shall be type 316 SS or equivalent.

**2-5.3** Hangers and supports shall be securely fastened to the building or structure to avoid vibration and stress on the duct.

**2-5.4** Hangers and supports shall be designed to allow for expansion and contraction.

**2-6 Duct Clearances.**

**2-6.1** All duct systems handling noncombustible materials and operating at room temperature shall have a clearance of at least 6 in. (152 mm) from stored combustible materials and not less than 1/2-in. (12.7-mm) clearance from combustible construction even though flameproofed, fire-retardant treated, or plastered.

**2-6.2** Duct systems handling combustible material and operating at room temperature shall have a clearance of not less than 18 in. (457 mm) from combustible construction or any combustible material.

*Exception No. 1:* If a duct system is equipped with an approved automatic extinguishing system designed for the specific hazard, clearance shall be permitted to be 6 in. (152 mm) from combustible material and 1/2 in. (12.7 mm) from combustible construction.

*Exception No. 2:* Clearances from ducts to combustible material shall be permitted to be reduced if the combustible material is protected by an engineered protection system acceptable to the authority having jurisdiction, or by the use of materials or products listed for protection purposes, or in accordance with Table 2-6.3.1.

**2-6.3** Duct systems operating at temperatures above 100°F (37.7°C) shall have clearance from combustible building construction or any combustible material not less than shown in Table 2-6.3.

**2-6.3.1** The clearance to combustible construction for ducts handling materials not in excess of 900°F (482°C) shall be permitted to be reduced, provided the combustible construction is protected as described in Table 2-6.3.1.

**2-6.3.2** Ducts handling materials at temperatures in excess of 900°F (482°C) shall be lined with refractory material or the equivalent.

**Table 2-6.3 Clearances**

Duct Gas Temperature	Largest Duct Dimension	Clearance
100°-600°F (38°-315°C) incl.	8 in. (203 mm) Over 8 in. (203 mm)	8 in. (203 mm) 12 in. (305 mm)
Over 600°-900°F (315°-482°C) incl.	8 in. (203 mm) Over 8 in. (203 mm)	18 in. (457 mm) 24 in. (610 mm)
Over 900°F (482°C)	All ducts lined with refractories	24 in. (610 mm)

NOTE: Minimum clearance of 18 in. (457 mm) if material in the duct is a combustible material

**Table 2-6.3.1 Reduction of Duct Clearance with Specified Forms of Protection<sup>1, 2, 3, 4, 5, 6, 7</sup>**

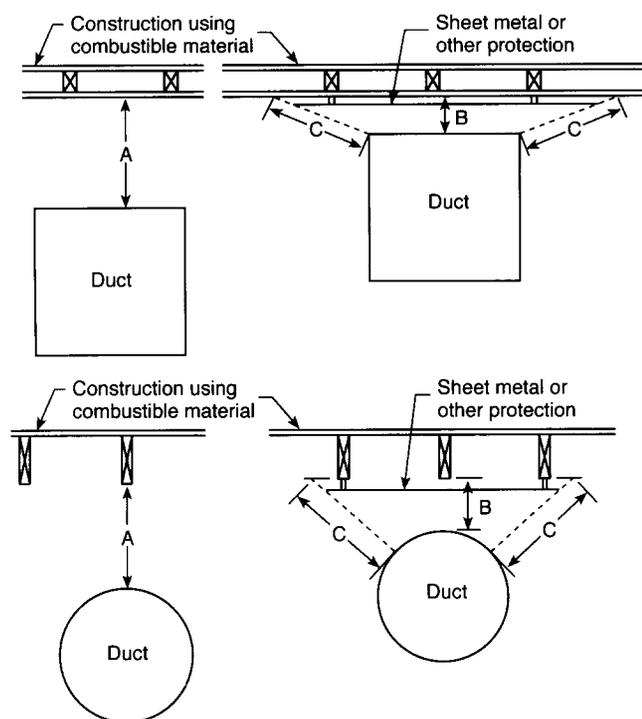
Clearance reduction applied to and covering all combustible surfaces within the distance specified as required clearance with no protection in 2-6.2, and Table 2-6.3.	Maximum allowable reduction in clearance (percent) <sup>7</sup>	
	As Wall Protector	As Ceiling Protector
Form of Protection		
(a) 3 1/2-in. (90-mm) thick masonry wall without ventilated air space	33%	—
(b) 1/2-in. (13-mm) thick noncombustible insulation board over 1-in. (25.4-mm) glass fiber or mineral wool batts without ventilated air space	50%	33%
(c) 0.024 in./0.61 mm (24 gauge) sheet metal over 1-in. (25.4-mm) glass fiber or mineral wool batts reinforced with wire, or equivalent, on rear face with at least a 1-in. (25.4-mm) air gap	66%	66%
(d) 3 1/2-in. (90-mm) thick masonry wall with at least a 1-in. (25.4-mm) air gap	66%	—
(e) 0.024 in./0.61 mm (24 gauge) sheet metal with at least a 1-in. (25.4-mm) air gap	66%	50%
(f) 1/2-in. (13-mm) thick noncombustible insulation board with at least a 1-in. (25.4-mm) air gap	66%	50%
(g) 0.024 in./0.61 mm (24 gauge) sheet metal with ventilated air space over 0.024 in./0.61 mm (24 gauge) sheet metal with at least a 1-in. (25.4-mm) air gap	66%	50%
(h) 1-in. (25.4-mm) glass fiber or mineral wool batts sandwiched between two sheets 0.024 in./0.61 mm (24 gauge) sheet metal with at least a 1-in. (25.4-mm) air gap	66%	50%

<sup>1</sup> Spacer and ties for protection materials shall be of noncombustible material. No spacers or ties shall be used directly behind the duct.  
<sup>2</sup> With all clearance reduction systems using a ventilated air space, adequate air circulation shall be provided as described in 2-6.4. There shall be at least 1 in. (25 mm) between the clearance reduction system and combustible walls and ceilings for clearance reduction systems using a ventilated air space.  
<sup>3</sup> Mineral wool batts (blanket or board) shall have a minimum density of 8 lb per ft<sup>3</sup> (128.7 kg/m<sup>3</sup>) and have a minimum melting point of 1500°F (816°C).  
<sup>4</sup> Insulation board used as part of clearance reduction system shall have a thermal conductivity of 1.0 (Btu-in.)/ft<sup>2</sup>-hr-°F) or less. Insulation board shall be formed of noncombustible material.  
<sup>5</sup> There shall be at least 1 in. (25 mm) between the duct and the protector. In no case shall the clearance between the duct and the wall surface be reduced below that allowed in the table.  
<sup>6</sup> All clearances and thicknesses are minimum: larger clearances and thicknesses are acceptable.  
<sup>7</sup> To calculate the minimum allowable clearance, the following formula can be used:

$$C_{pr} = C_{un} \times (1 - R/100)$$

where:

C<sub>pr</sub> is the minimum allowable clearance with protection,  
 C<sub>un</sub> is the required clearance with no protection, and  
 R is the maximum allowed reduction in clearance.



A equals the required clearance with no protection.  
 B equals the reduced clearance permitted.  
 The protection applied to the construction using combustible material shall extend far enough in each direction to make C equal to A.

Figure 2-6.5 Extent of protection required to reduce clearances from ducts.

**2-6.4** For clearance reduction systems using an air space between the combustible wall and the wall protector, adequate air circulation shall be provided by one of the following methods.

**2-6.4.1** Adequate air circulation can be provided by leaving all edges of the wall protector open with at least a 1-in. (25.4-mm) air gap.

**2-6.4.2** If the wall protector is mounted on a single flat wall away from corners, adequate air circulation can be provided by leaving only the bottom and top edges or only the side and top edges open with at least a 1-in. (25.4-mm) air gap.

**2-6.4.3** Wall protectors that cover two walls in a corner shall be open at the bottom and top edges with at least a 1-in. (25.4-mm) air gap.

**2-6.5** All clearances shall be measured from the outer surface of the combustible material to the nearest point on the surface of the duct, disregarding any intervening protection applied to the combustible material. Clearances shall be measured as shown in Figure 2-6.5.

### Chapter 3 Corrosive Fumes and Vapors

#### 3-1 General.

**3-1.1** Where metal materials are not suitable, plastic material shall be permitted to convey nonflammable corrosive fumes and vapors, or flammable corrosive vapors at a

concentration below 25 percent of their lower flammable limit (LFL). The choice of the material type shall be the responsibility of the design engineer. All chemical-resistant plastics have heat limitations that shall be considered when designing a system. The following minimum standards of materials, construction, and workmanship shall be deemed necessary to ensure minimum fire hazard in the operation of these systems.

**3-1.2** The plastic shall have a flame spread rating of 25 or less as measured in accordance with NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials*. All hoods and air moving device surfaces that are part of the system shall have flame spread ratings at least equivalent to the flame spread rating of the material of the duct system.

**3-1.3** Plastic duct materials shall be listed with an external smoke development rating of 50 or less when located in a multistory building or a concealed space.

*Exception No. 1:* Duct systems that are located in an area protected by an automatic sprinkler system.

*Exception No. 2:* Duct systems that are located in a fire-rated enclosure.

### Chapter 4 Air Moving Devices (AMDs)

**4-1** Air moving devices (AMDs) shall be constructed of noncombustible materials and shall be designed and installed to convey materials through the exhaust system safely.

*Exception:* Where the materials conveyed are not compatible with metals, alternate materials of construction shall be permitted.

**4-2** Where the materials conveyed are flammable or combustible, the rotating element of the AMD shall be nonferrous or the AMD shall be constructed so that a shift of the rotating element or shaft does not permit two ferrous parts to rub or strike.

**4-3** Clearance between the rotating element and the fan casing shall be provided to avoid friction that might lead to fire. Allowances shall be made for expansion and loading to prevent contact between moving parts and the duct or fan housing.

**4-4** Fan rotating elements shall be mounted on a shaft designed to maintain proper alignment even when the blades or impeller are loaded.

**4-5** Motors, bearings, drive components, and electrical equipment shall not be placed inside ducts unless they are protected or enclosed to prevent ignition of flammable vapors, mists, residues, dusts, or other combustible materials that are conveyed in the exhaust system.

**4-6** AMDs shall be located to permit ready access for inspection, lubrication, maintenance, cleaning, and repair. They shall be placed on proper foundations or firmly secured to proper supports.

**4-7** AMDs used in systems that air convey dust or vapors containing residue shall be located on the clean-air side of the filtration system.

**4-8** Flexible connections shall be permitted to minimize the transmission of vibration.

## Chapter 5 Electrical

**5-1** All electrical wiring and equipment shall conform to the provisions of NFPA 70, *National Electrical Code*®.

**5-2** All components of the exhaust system conveying flammable or combustible materials shall be electrically bonded and grounded in an approved manner. When continuous contact is interrupted, metallic straps shall be installed for effective bonding.

NOTE: See NFPA 77, *Recommended Practice on Static Electricity*.

## Chapter 6 Fire Protection

**6-1** Exhaust systems utilizing combustible components shall be provided with an automatic extinguishing system within the duct and at the duct intake, hood, canopy, and the immediate areas thereof to quickly extinguish source fires.

NOTE: See NFPA 11, *Standard for Low-Expansion Foam*; NFPA 11A, *Standard for Medium- and High-Expansion Foam Systems*; NFPA 12, *Standard on Carbon Dioxide Extinguishing Systems*; NFPA 12A, *Standard on Halon 1301 Fire Extinguishing Systems*; NFPA 12B, *Standard on Halon 1211 Fire Extinguishing Systems*; NFPA 13, *Standard for the Installation of Sprinkler Systems*; NFPA 15, *Standard for Water Spray Fixed Systems for Fire Protection*; NFPA 17, *Standard for Dry Chemical Extinguishing Systems*; NFPA 17A, *Standard for Wet Chemical Extinguishing Systems*; and NFPA 2001, *Standard on Clean Agent Fire Extinguishing Systems*.

*Exception No. 1: Ducts with cross-sectional areas less than 75 in.<sup>2</sup> (0.0484 m<sup>2</sup>).*

*Exception No. 2: Systems constructed of material listed for use without sprinkler protection.*

**6-2\*** Exhaust systems constructed of limited-combustible or noncombustible materials shall be protected as follows:

Where required by the authority having jurisdiction, automatic or special extinguishing systems shall be provided for systems that convey flammable vapors or combustible materials.

**6-3** When a sprinkler system is installed, means shall be provided to prevent water accumulation in the duct or flow of water back to a process subject to damage by water.

## Chapter 7 Testing and Maintenance

**7-1** Exhaust systems shall be tested, inspected, and maintained to ensure safe operating conditions.

**7-1.1** The responsibility for proper maintenance shall be assigned to trained personnel who are capable of recognizing potential hazards.

**7-1.2** Such maintenance shall include the determination that special protection for duct systems is fully operable and that plant automatic sprinkler protection is in service.

**7-2\*** When installation of new systems is complete, the system shall be fully tested to demonstrate performance before acceptance by the owner. Modified systems shall be retested.

**7-3\*** Existing systems shall be tested periodically by the owner to demonstrate continued performance.

**7-4\*** All system components shall be inspected monthly.

*Exception No. 1: Where manufacturer's requirements are more stringent.*

*Exception No. 2: Where conditions of service dictate more frequent inspection.*

**7-4.1** Adequate maintenance of air-conveying systems requires periodic inspection of the duct, fittings, hardware, filtration system, and AMDs.

**7-4.2** This inspection shall include the hoods, enclosures, air inlets, ducts, and access doors through the termination of the system. It shall include the termination, adjacent surfaces, and any adjacent air intakes.

**7-4.3** The user's operational and maintenance program shall include all of the manufacturer's listed procedures that are applicable to the equipment.

**7-4.4** An operational and maintenance checklist shall be maintained and is essential to safe operation of the equipment.

**7-4.5** Accumulations of conveyed materials and residues shall be removed from hoods and enclosures, ducts and fittings, and AMDs. The ducts shall be checked for obstructions such as improperly adjusted dampers or shutters. Filtration systems shall be inspected and filters cleaned or replaced as required.

**7-4.6** AMDs shall be inspected for belt tension and wear and lubrication.

**7-4.7** Hoods and enclosures shall be inspected for proper confinement and removal of materials.

**7-5** Ductwork shall be examined periodically to determine adequacy of cleaning frequency.

**7-6** All system components shall be maintained in good operating condition. A written maintenance program shall be established. The program shall include any and all recommendations provided by the manufacturer.

All deficiencies found during testing and inspection shall be corrected. Serious deficiencies shall require immediate attention.

**7-7** An operational maintenance log shall be maintained to document maintenance actions.

## Chapter 8 Referenced Publications

**8-1** The following documents or portions thereof are referenced within this standard and shall be considered part of the requirements of this document. The edition indicated for each reference is the current edition as of the date of the NFPA issuance of this document.

**8-1.1 NFPA Publications.** National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101.

NFPA 70, *National Electrical Code*, 1993 edition.

NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials*, 1990 edition.

## 8-1.2 Other Publications.

**8-1.2.1 ASTM Publications.** American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

ASTM C582-87, *Standard Specification for Contact-Molded Reinforced Thermosetting Plastic (RTP) Laminates for Corrosion Resistant Equipment.*

ASTM E136 Rev D-93, *Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 Degrees C.*

**8-1.2.2 SMACNA Publications.** Sheet Metal and Air-Conditioning Contractors' National Association, Inc., 4201 Lafayette Center Drive, Chantilly, VA 22021.

*Accepted Industry Practice for Industrial Duct Construction*, 1975 edition.

*Rectangular Industrial Duct Construction Standard*, 1980 edition.

*Round Industrial Duct Construction Standard*, 1977 edition.

*Thermoplastic Duct (PVC) Construction Manual*, Revision A, May 1974 edition.

## Appendix A Explanatory Material

*This Appendix is not a part of the requirements of this NFPA document but is included for informational purposes only.*

**A-1-1** The following NFPA standards contain information on the application of exhaust systems to specific industries or operations.

NFPA 30, *Flammable and Combustible Liquids Code*

NFPA 30B, *Code for the Manufacture and Storage of Aerosol Products*

NFPA 32, *Standard for Drycleaning Plants*

NFPA 33, *Standard for Spray Application Using Flammable and Combustible Materials*

NFPA 34, *Standard for Dipping and Coating Processes Using Flammable or Combustible Liquids*

NFPA 35, *Standard for the Manufacture of Organic Coatings*

NFPA 36, *Standard for Solvent Extraction Plants*

NFPA 40E, *Code for the Storage of Pyroxylin Plastic*

NFPA 45, *Standard on Fire Protection for Laboratories Using Chemicals*

NFPA 46, *Recommended Safe Practice for Storage of Forest Products*

NFPA 61A, *Standard for the Prevention of Fire and Dust Explosions in Facilities Manufacturing and Handling Starch*

NFPA 61B, *Standard for the Prevention of Fires and Explosions in Grain Elevators and Facilities Handling Bulk Raw Agricultural Commodities*

NFPA 61C, *Standard for the Prevention of Fire and Dust Explosions in Feed Mills*

NFPA 61D, *Standard for the Prevention of Fire and Dust Explosions in the Milling of Agricultural Commodities for Human Consumption*

NFPA 65, *Standard for the Processing and Finishing of Aluminum*

NFPA 68, *Guide for Venting of Deflagrations*

NFPA 81, *Standard for Fur Storage, Fumigation and Cleaning*

NFPA 85C, *Standard for the Prevention of Furnace Explosions/Implosions in Multiple Burner Boiler-Furnaces*

NFPA 86, *Standard for Ovens and Furnaces*

NFPA 86C, *Standard for Industrial Furnaces Using a Special Processing Atmosphere*

NFPA 86D, *Standard for Industrial Furnaces Using Vacuum as an Atmosphere*

NFPA 88B, *Standard for Repair Garages*

NFPA 92A, *Recommended Practice for Smoke-Control Systems*

NFPA 92B, *Guide for Smoke Management Systems in Malls, Atria, and Large Areas*

NFPA 96, *Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations*

NFPA 120, *Standard for Coal Preparation Plants*

NFPA 204M, *Guide for Smoke and Heat Venting*

NFPA 211, *Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances*

NFPA 303, *Fire Protection Standard for Marinas and Boatyards*

NFPA 318, *Standard for the Protection of Cleanrooms*

NFPA 409, *Standard on Aircraft Hangars*

NFPA 480, *Standard for the Storage, Handling, and Processing of Magnesium Solids and Powders*

NFPA 481, *Standard for the Production, Processing, Handling, and Storage of Titanium*

NFPA 650, *Standard for Pneumatic Conveying Systems for Handling Combustible Materials*

NFPA 651, *Standard for the Manufacture of Aluminum Powder*

NFPA 654, *Standard for the Prevention of Fire and Dust Explosions in the Chemical, Dye, Pharmaceutical, and Plastics Industries*

NFPA 655, *Standard for Prevention of Sulfur Fires and Explosions*

NFPA 664, *Standard for the Prevention of Fires and Explosions in Wood Processing and Woodworking Facilities*

NFPA 801, *Standard for Facilities Handling Radioactive Materials*

NFPA 8501, *Standard for Single Burner Boiler Operation*

**A-1-5 Air Moving Device (AMD).** An air moving device (AMD) is a fan, centrifugal fan, or mixed flow fan. These devices have previously been called blowers or exhausters.

**A-2-1.2** Capture, control, and conveying of materials is achieved by inward air flow generated by the exhaust pickup or intake, the intake velocity, and the duct velocity.

Capture velocities must be high enough to maintain control of the material:

(a) Until it reaches the intake opening;

(b) To overcome thermal air currents from hot processes or heat generating operations;

(c) To overcome air currents caused by grinding wheels and belt conveyors;

(d) To overcome air currents caused by dumping and filling operations.

Exhaust systems designed for gases, vapors, fumes, and fine dust particles (20 microns or less) require intake velocities high enough to offset air currents caused by room cross drafts.

Duct velocities are determined by the type of material conveyed (see Table A-2-1.2).

The designer also must consider sticky or wet residues or particles, electrostatic effects, etc.

For further information, refer to *Industrial Ventilation — a Manual of Recommended Practice*, published by the American Conference of Governmental Industrial Hygienists.

**A-2-1.3** Materials when mixed should not create a fire, explosion, or health hazard.

Table A-2-1.2 Range of Minimum Duct Design Velocities

Nature of Contaminant	Examples	Design Velocity
Vapors, gases, smoke	All vapors, gases and smoke	Any desired velocity (economic optimum velocity usually 1000-2000 fpm) (305-610 m/min)
Fumes	Welding	2000-2500 (610-763 m/min)
Very fine light dust	Cotton lint, wood flour, litho powder	2500-3000 (763-915 m/min)
Dry dusts and powders	Fine rubber dust, Bakelite molding powder dust, jute lint, cotton dust, shavings (light), soap dust, leather shavings	3000-4000 (915-1220 m/min)
Average industrial dust	Grinding dust, buffing lint (dry), wool jute dust (shaker waste), coffee beans, shoe dust, granite dust, silica flour, general material handling, brick cutting, clay dust, foundry (general), limestone dust, packaging and weighing asbestos dust in textile industries	3500-4000 (1068-1220 m/min)
Heavy dusts	Sawdust (heavy and wet), metal turnings, foundry tumbling barrels and shake-out, sand blast dust, wood blocks, hog waste, brass turnings, cast iron boring dust, lead dust	4000-4500 (1220-1373 m/min)
Heavy or moist	Lead dusts with small chips, moist cement dust, asbestos chunks from transite pipe cutting machines, buffing lint (sticky), quick-lime dust	4500 and up (1373-and up m/min)

Source: *Industrial Ventilation — a Manual of Recommended Practice*, American Conference of Governmental Industrial Hygienists.

**A-2-1.4** The design of the exhaust system should be coordinated with the architectural and structural designs. The plans and specifications should include a list of all equipment giving manufacturer and type number and show the data listed below. Plans should be drawn to an indicated scale and show all essential details as to location, construction, ventilation ductwork, volume of outside air at standard temperature and pressure introduced for safety ventilation, and control wiring diagrams.

- Name of owner and occupant.
- Location, including street address.
- Point of compass.
- Ceiling construction.
- Full height cross section.
- Location of fire walls.
- Location of partitions.
- Materials of duct construction.

**A-2-4.6** Control at the point of generation should be provided in any vapor-conveying system. Control is provided by hoods or enclosures connected to suction ducts. These can confine vapors and, in most cases, will do this with lower air volume.

When the vapors cannot be readily picked up at the source, general ventilation through a system of suction ducts can be used. The suction inlets have little directional effect beyond a few inches from the inlet; they should be located to sweep the air and minimize pockets with no air movement. The location of the air make-up system ductwork and discharge points will provide more uniform air movement.

When vapors are heavier than air or vapors and residues are mixed, inlets located near the floor should be considered. When the vapors are lighter than air, the inlets should be located near the ceiling of the room or enclosure.

**A-2-4.7** Methods of filtering include other means besides cloth or paper-type filters. Examples of filtration devices include, but are not limited to, disposable or cleanable filters, scrubbers, cyclones, dust collectors, or reduction of transport velocity.

**A-6-2** In systems used for the removal of flammable vapors or gases that might result in the condensation of combustible residues within the duct, the installation of an approved fixed pipe system for the application of water, dry chemical, or inert gas is recommended, as conditions warrant.

Such systems can be automatically or manually controlled, as required by the authority having jurisdiction. (See NFPA 11, *Standard for Low-Expansion Foam*; NFPA 11A, *Standard for Medium- and High-Expansion Foam Systems*; NFPA 12, *Standard on Carbon Dioxide Fire Extinguishing Systems*; NFPA 12A, *Standard on Halon 1301 Fire Extinguishing Systems*; NFPA 12B, *Standard on Halon 1211 Fire Extinguishing Systems*; NFPA 13, *Standard for the Installation of Sprinkler Systems*; NFPA 15, *Standard for Water Spray Fixed Systems for Fire Protection*; NFPA 17, *Standard for Dry Chemical Extinguishing Systems*; NFPA 17A, *Standard for Wet Chemical Systems*; NFPA 69, *Standard on Explosion Prevention Systems*; and NFPA 2001, *Standard on Clean Agent Fire Extinguishing Systems*.)

**A-7-2 Initial Test.** The following outlines the required procedure and the minimum data necessary for a thorough initial ventilation test:

(a) Review the system specifications and drawings to determine the relative location and sizes of ducts, fittings, and associated system components.

(b) Inspect the system to determine that its installation is in accordance with the specifications and drawings. Check such items as fan rotation, belt slippage, damper settings, and thermal overload sizes of starters.

(c) Make a single-line drawing of the installed system and select and identify test locations.

(d) Measure the air volume, fan static pressure, motor rpm and amperes, and the temperature of the air in the system. Also, determine pressure drops across all components (such as air cleaning equipment).

(e) Record the test data and design specifications.

(f) Compare the test data with design specifications and determine if alterations or adjustments of the system are necessary to meet specifications.

(g) If alterations or adjustments are made, retest the system and record the final test data, noting any physical changes that were made on the sketch.

(h) Provide permanent label indicating fan data: static pressures, rpm, and motor current.

(i) Lock all dampers and mark positions with permanent marker.

(j) Owner must retain Test Data Sheets for the life of the system.

**Field Test.** The tests described pertain to air-handling characteristics only. At times it might be necessary or desirable to conduct tests of the environment to determine whether the system is providing the desired environmental control. In these cases, the services of a trained industrial hygienist might be required.

For some tests, moisture content of the air in the system or the ambient barometric pressure should also be obtained.

All periodic measurements can also be made continuously by means of an operating console or other remote readout system.

The value of obtaining ventilation test data is noted in the following applications:

(a) To record the initial performance of the system and determine if it is functioning in accordance with specifications.

(b) To determine the degree of compliance with applicable codes or trade association standards.

(c) To provide data upon which to base any necessary changes in the system.

(d) To obtain data to assist in the design of future systems.

(e) To determine whether the system has sufficient capacity for additional ductwork or other alterations.

(f) To obtain data through periodic checks to determine when maintenance or repairs are necessary.

**A-7-3** The following is the required procedure for measurements needed to perform the periodic tests:

(a) Refer to the initial Test Data Sheet for test locations.

(b) Inspect the system for physical damage (broken, corroded, collapsed duct, etc.) and proper operation of components (fan rotation, damper positions, air cleaner condition, etc.).

(c) Measure static pressure at the same locations used in the initial test.

(d) Compare measured static pressure at the same locations used in the initial test.

(e) Make and record any corrections required.

(f) Recheck the system to verify performance if corrections have been made.

**A-7-4** Inspection should include hoods; enclosures; ducts; duct connections; filtration system; blast gates locked in marked positions; access openings closed and secured; AMD inlets and outlets; AMD for belt tension, vibration, and lubrication; and termination and adjacent surfaces.

## Appendix B Referenced Publications

**B-1** The following documents or portions thereof are referenced within this standard for informational purposes only and thus are not considered part of the requirements

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 NFPA Publications.** National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101.

NFPA 11, *Standard for Low-Expansion Foam*, 1994 edition.

NFPA 11A, *Standard for Medium- and High-Expansion Foam Systems*, 1994 edition.

NFPA 12, *Standard on Carbon Dioxide Extinguishing Systems*, 1993 edition.

NFPA 12A, *Standard on Halon 1301 Fire Extinguishing Systems*, 1992 edition.

NFPA 12B, *Standard on Halon 1211 Fire Extinguishing Systems*, 1990 edition.

NFPA 13, *Standard for the Installation of Sprinkler Systems*, 1994 edition.

NFPA 15, *Standard for Water Spray Fixed Systems for Fire Protection*, 1990 edition.

NFPA 17, *Standard for Dry Chemical Extinguishing Systems*, 1994 edition.

NFPA 17A, *Standard for Wet Chemical Extinguishing Systems*, 1994 edition.

NFPA 30, *Flammable and Combustible Liquids Code*, 1993 edition.

NFPA 30B, *Code for the Manufacture and Storage of Aerosol Products*, 1994 edition.

NFPA 32, *Standard for Drycleaning Plants*, 1990 edition.

NFPA 33, *Standard for Spray Application Using Flammable and Combustible Materials*, 1989 edition.

NFPA 34, *Standard for Dipping and Coating Processes Using Flammable or Combustible Liquids*, 1989 edition.

NFPA 35, *Standard for the Manufacture of Organic Coatings*, 1995 edition.

NFPA 36, *Standard for Solvent Extraction Plants*, 1993 edition.

NFPA 40E, *Code for the Storage of Pyroxylin Plastic*, 1993 edition.

NFPA 45, *Standard on Fire Protection for Laboratories Using Chemicals*, 1991 edition.

NFPA 46, *Recommended Safe Practice for Storage of Forest Products*, 1990 edition.

NFPA 61A, *Standard for the Prevention of Fire and Dust Explosions in Facilities Manufacturing and Handling Starch*, 1989 edition.

NFPA 61B, *Standard for the Prevention of Fires and Explosions in Grain Elevators and Facilities Handling Bulk Raw Agricultural Commodities*, 1989 edition.

NFPA 61C, *Standard for the Prevention of Fire and Dust Explosions in Feed Mills*, 1989 edition.

NFPA 61D, *Standard for the Prevention of Fire and Dust Explosions in the Milling of Agricultural Commodities for Human Consumption*, 1989 edition.

NFPA 65, *Standard for the Processing and Finishing of Aluminum*, 1993 edition.

NFPA 68, *Guide for Venting of Deflagrations*, 1994 edition.

NFPA 69, *Standard on Explosion Prevention Systems*, 1992 edition.

NFPA 77, *Recommended Practice on Static Electricity*, 1993 edition.

NFPA 81, *Standard for Fur Storage, Fumigation and Cleaning*, 1986 edition.

NFPA 85C, *Standard for the Prevention of Furnace Explosions/Implosions in Multiple Burner Boiler-Furnaces*, 1991 edition.

NFPA 86, *Standard for Ovens and Furnaces*, 1990 edition.

NFPA 86C, *Standard for Industrial Furnaces Using a Special Processing Atmosphere*, 1991 edition.

NFPA 86D, *Standard for Industrial Furnaces Using Vacuum as an Atmosphere*, 1990 edition.

NFPA 88B, *Standard for Repair Garages*, 1991 edition.

NFPA 92A, *Recommended Practice for Smoke-Control Systems*, 1993 edition.

NFPA 92B, *Guide for Smoke Management Systems in Malls, Atria, and Large Areas*, 1991 edition.

NFPA 96, *Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations*, 1994 edition.

NFPA 120, *Standard for Coal Preparation Plants*, 1994 edition.

NFPA 204M, *Guide for Smoke and Heat Venting*, 1991 edition.

NFPA 211, *Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances*, 1992 edition.

NFPA 259, *Standard Test Method for Potential Heat of Building Materials*, 1993 edition.

NFPA 303, *Fire Protection Standard for Marinas and Boatyards*, 1990 edition.

NFPA 318, *Standard for the Protection of Cleanrooms*, 1995 edition.

NFPA 409, *Standard on Aircraft Hangars*, 1990 edition.

NFPA 480, *Standard for the Storage, Handling, and Processing of Magnesium Solids and Powders*, 1993 edition.

NFPA 481, *Standard for the Production, Processing, Handling, and Storage of Titanium*, 1987 edition.

NFPA 650, *Standard for Pneumatic Conveying Systems for Handling Combustible Materials*, 1990 edition.

NFPA 651, *Standard for the Manufacture of Aluminum Powder*, 1993 edition.

NFPA 654, *Standard for the Prevention of Fire and Dust Explosions in the Chemical, Dye, Pharmaceutical, and Plastics Industries*, 1994 edition.

NFPA 655, *Standard for Prevention of Sulfur Fires and Explosions*, 1993 edition.

NFPA 664, *Standard for the Prevention of Fires and Explosions in Wood Processing and Woodworking Facilities*, 1993 edition.

NFPA 801, *Standard for Facilities Handling Radioactive Materials*, 1995 edition.

NFPA 2001, *Standard on Clean Agent Fire Extinguishing Systems*, 1994 edition.

NFPA 8501, *Standard for Single Burner Boiler Operation*, 1992 edition.

## Appendix C Other Recommended Reference Material

*This Appendix is not a part of the requirements of this NFPA document but is included for informational purposes only.*

**C-1 ACGIH Publication.** American Conference of Governmental Industrial Hygienists, Bldg. D-5, 6500 Glenway Ave. B, Cincinnati, OH 45211.

*Industrial Ventilation — a Manual of Recommended Practice*, 21st edition, 1992.

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# **The NFPA Codes and Standards Development Process**

Since 1896, one of the primary purposes of the NFPA has been to develop and update the standards covering all areas of fire safety.

## **Calls for Proposals**

The code adoption process takes place twice each year and begins with a call for proposals from the public to amend existing codes and standards or to develop the content of new fire safety documents.

## **Report on Proposals**

Upon receipt of public proposals, the technical committee members meet to review, consider, and act on the proposals. The public proposals – together with the committee action on each proposal and committee-generated proposals – are published in the NFPA's Report on Proposals (ROP). The ROP is then subject to public review and comment.

## **Report on Comments**

These public comments are considered and acted upon by the appropriate technical committees. All public comments – together with the committee action on each comment – are published as the Committee's supplementary report in the NFPA's Report on Comments (ROC).

The committee's report and supplementary report are then presented for adoption and open debate at either of NFPA's semi-annual meetings held throughout the United States and Canada.

## **Association Action**

The Association meeting may, subject to review and issuance by the NFPA Standards Council, (a) adopt a report as published, (b) adopt a report as amended, contingent upon subsequent approval by the committee, (c) return a report to committee for further study, and (d) return a portion of a report to committee.

## **Standards Council Action**

The Standards Council will make a judgement on whether or not to issue an NFPA document based upon the entire record before the Council, including the vote taken at the Association meeting on the technical committee's report.

## **Voting Procedures**

Voting at an NFPA Annual or Fall Meeting is restricted to members of record for 180 days prior to the opening of the first general session of the meeting, except that individuals who join the Association at an Annual or Fall Meeting are entitled to vote at the next Fall or Annual Meeting.

"Members" are defined by Article 3.2 of the Bylaws as individuals, firms, corporations, trade or professional associations, institutes, fire departments, fire brigades, and other public or private agencies desiring to advance the purposes of the Association. Each member shall have one vote in the affairs of the Association. Under Article 4.5 of the Bylaws, the vote of such a member shall be cast by that member individually or by an employee designated in writing by the member of record who has registered for the meeting. Such a designated person shall not be eligible to represent more than one voting privilege on each issue, nor cast more than one vote on each issue.

Any member who wishes to designate an employee to cast that member's vote at an Association meeting in place of that member must provide that employee with written authorization to represent the member at the meeting. The authorization must be on company letterhead signed by the member of record, with the membership number indicated, and the authorization must be recorded with the President of NFPA or his designee before the start of the opening general session of the Meeting. That employee, irrespective of his or her own personal membership status, shall be privileged to cast only one vote on each issue before the Association.

# Sequence of Events Leading to Publication of an NFPA Committee Document

Call for proposals to amend existing document or for recommendations on new document.



Committee meets to act on proposals, to develop its own proposals, and to prepare its report.



Committee votes on proposals by letter ballot. If two-thirds approve, report goes forward.  
Lacking two-thirds approval, report returns to committee.



Report is published for public review and comment. (Report on Proposals - ROP)



Committee meets to act on each public comment received.



Committee votes on comments by letter ballot. If two-thirds approve, supplementary report goes forward. Lacking two-thirds approval, supplementary report returns to committee.



Supplementary report is published for public review. (Report on Comments - ROC).



NFPA membership meets (Annual or Fall Meeting) and acts on committee report (ROP and ROC).



Committee votes on any amendments to report approved at NFPA Annual or Fall Meeting.



Complaints to Standards Council on Association action must be filed  
within 20 days of the NFPA Annual or Fall Meeting.



Standards Council decides, based on all evidence, whether or not to issue standard  
or to take other action, including hearing any complaints.



Appeals to Board of Directors on Standards Council action must be filed  
within 20 days of Council action.

FORM FOR PROPOSALS ON NFPA TECHNICAL COMMITTEE DOCUMENTS

Mail to: Secretary, Standards Council

National Fire Protection Association, 1 Batterymarch Park, Quincy, Massachusetts 02269-9101

Fax No. 617-770-3500

Note: All proposals must be received by 5:00 p.m. EST/EDST on the published proposal-closing date.

If you need further information on the standards-making process, please contact the Standards Administration Department at 617-984-7249.

Date 9/18/93 Name John B. Smith Tel. No. 617-555-1212

Company

Street Address 9 Seattle St., Seattle, WA 02255

Please Indicate Organization Represented (if any) Fire Marshals Assn. of North America

1. a) NFPA Document Title National Fire Alarm Code NFPA No. & Year NFPA 72, 1993 ed.

b) Section/Paragraph 1-5.8.1 (Exception No.1)

- 2. Proposal recommends: (Check one) [ ] new text [ ] revised text [x] deleted text

FOR OFFICE USE ONLY

Log #

Date Rec'd

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

Delete exception.

4. Statement of Problem and Substantiation for Proposal: (Note: State the problem that will be resolved by your recommendation; give the specific reason for your proposal including copies of tests, research papers, fire experience, etc. If more than 200 words, it may be abstracted for publication.)

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

[ ] This Proposal is not original material; its source (if known) is as follows:

Note 1: Type or print legibly in black ink.

Note 2: 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.

I hereby grant NFPA the non-exclusive, royalty-free rights, including non-exclusive, royalty-free rights in copyright, in this proposal and I understand that I acquire no rights in any publication of NFPA in which this proposal in this or another similar or analogous form is used.

John B. Smith
Signature (Required)