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NFPA 91
Exhaust Systems for Air Conveying of Materials
1992 Edition

National Fire Protection Association, 1 Batterymarch Park, PO Box 9101, Quincy, MA 02269-9101

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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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NFPA 91

Standard for

Exhaust Systems for Air Conveying of Materials

1992 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 18-20, 1991 in Montréal, Québec, Canada. It was issued by the Standards Council on January 17, 1992, with an effective date of February 10, 1992, and supersedes all previous editions.

The 1992 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.

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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.

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Contents

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Exhaust Systems for Air Conveying of Materials

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

1-1.1 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 assured.

1-2 Purpose. 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.

1-2.1 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.

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 or 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 which is in a position to determine compliance with appropriate standards for the current production of listed items.

Authority Having Jurisdiction. The "authority having jurisdiction" is 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, 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 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 μm or smaller in diameter (material passing a U.S. No. 40 Standard sieve).

Exhaust System. An air conveying system for moving materials from the source to the point of termination.

Labeled. Equipment or materials to which has been attached a label, symbol or other identifying mark of an organization 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°C,* shall be considered noncombustible materials.

Shall. This term indicates a mandatory requirement.

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

Chapter 2 Design and Construction

2-1 The design of any exhaust system shall consider the physical and chemical properties and hazard characteristics of the materials being conveyed.

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

2-2.1 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.

2-2.2 Exhaust systems designed to air convey flammable or combustible materials that may contain foreign ferrous materials shall have magnetic separators installed at those points where the ferrous materials enter the system. When electromagnetic separators are used they shall be listed.

2-3* 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.

2-4 Ducts designed to air convey materials shall be round.

Exception: Rectangular ducts shall be permitted when clearances prohibit the use of round ducts provided safety of the exhaust system is not compromised. When ducts are rectangular, they shall be square or nearly square.

2-5 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) Ducts that have been listed with interrupters.

2-6 Fire detection and alarm systems shall not be interlocked to shut down air moving devices.

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

Exception No. 2: AMDs shall be permitted to automatically shut down 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.

2-7 Duct Material and Construction.

2-7.1 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.

2-7.2 The duct construction shall conform to applicable SMACNA Standards:

(a) *Accepted Industry Practice for Industrial Duct Construction* (1975).

(b) *Rectangular Industrial Duct Construction Standard* (1980).

(c) *Round Industrial Duct Construction Standard* (1977).

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

Exception: Reinforced thermoset type materials shall conform to ASTM C582.

2-7.3 Laps in duct construction shall be in the direction of airflow.

2-7.4 Joints in duct construction shall be liquidtight when the conveying system contains condensible vapors or liquids in suspension.

2-7.5 The interior of ducts shall be smooth and joints neatly finished.

2-8 Access doors shall be provided in horizontal duct, adjacent to elbows, junctions, and vertical duct. Doors shall be located on the top or sides of the duct, and door spacing shall not exceed 12 ft (3.6 m).

2-8.1 Required openings or other penetrations shall be sealed, gasketed, or tightly fitted so that conveyed material will not escape.

2-9 A means shall be provided for balancing the system.

2-9.1 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.

2-9.2 Balancing devices shall be secured to prevent inadvertent adjustment or loss of transport velocity. Butterfly dampers shall not be permitted.

2-10 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.

2-10.1 Ducts shall lead directly to the point of termination.

2-11 Terminations with discharge to atmosphere shall be safely arranged. Discharge shall terminate away from fresh air intakes to prevent material from entering the air intake. 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).

2-12* 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.

2-13* Dusts or vapors containing residues shall be filtered.

2-14 Duct liners shall be limited-combustible or noncombustible.

2-15 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.

2-16 Flexible ducts shall not be used in exhaust systems.

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

2-17 Hangers and Supports. Duct supports shall be designed to carry the weight of the system plus the weight of the duct half filled with material. When sprinkler protection is provided in the duct, the hangers' design shall include the weight of the duct half filled with water. Loads shall not be placed on connecting equipment.

2-17.1 Hangers and supports exposed to corrosive atmospheres shall be type 316 SS or equal.

2-17.2 Hangers and supports shall be securely fastened to the building or structure to avoid vibration and stress on the duct.

2-17.3 Hangers and supports shall be designed to allow for expansion and contraction.

2-18 Duct Clearances.

2-18.1 All duct systems handling noncombustible materials and operating at approximately 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.

2-18.2 Duct systems handling combustible material and operating at approximately 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 may 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 may 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 2-18.3.1.

2-18.3 Duct systems operating at elevated temperatures [above 100°F (37.7°C)] shall have clearance from combustible building construction or any combustible material not less than shown in Table 2-18.3.

2-18.3.1 The clearance to combustible construction for ducts handling materials not in excess of 900°F (482°C) may be reduced provided the combustible construction is protected as described in Table 2-18.3.1.

2-18.3.2 Ducts handling materials at temperatures in excess of 900°F (482°C) shall be lined with refractory material or the equivalent.

Table 2-18.3 Clearances

Duct Gas Temperature	Largest Duct Dimension	Clearance
100°-600°F (38-315°C) incl.	8 in. (203 mm)	8 in. (203 mm)
	Over 8 in. (203 mm)	12 in. (305 mm)
Over 600°-900°F (315°-482°C) incl.	8 in. (203 mm)	18 in. (457 mm)
	Over 8 in. (203 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 2-18.3.1 Reduction of Duct Clearance with Specified Forms of Protection[1, 2, 3, 4, 5, 6, 7]

Clearance reduction applied to and covering all combustible surfaces within the distance specified as required clearance with no protection in 2-18.2, and Table 2-18.3.	Maximum allowable reduction in clearance (percent)[7]	
Form of Protection	**As Wall Protector**	**As Ceiling Protector**
(a) 3½ in. (90 mm) thick masonry wall without ventilated air space.	33%	—
(b) ½ in. (13 mm) thick noncombustible insulation board over 1 in. (25 mm) glass fiber or mineral wool batts without ventilated air space.	50%	33%
(c) 0.024 in./0.61 mm (24 gage) sheet metal over 1 in. (25 mm) glass fiber or mineral wool batts reinforced with wire, or equivalent, on rear face with at least a 1 in. air gap.	66%	66%
(d) 3½ in. (90 mm) thick masonry wall with at least a 1 in. air gap.	66%	—
(e) 0.024 in./0.61 mm (24 gage) sheet metal with at least a 1 in. air gap.	66%	50%
(f) ½ in. (13 mm) thick noncombustible insulation board with at least a 1 in. air gap.	66%	50%
(g) 0.024 in./0.61 mm (24 gage) sheet metal with ventilated air space over 0.024 in./0.61 mm (24 gage) sheet metal with at least a 1 in. air gap.	66%	50%
(h) 1 in. (25 mm) glass fiber or mineral wool batts sandwiched between two sheets 0.024 in./0.61 mm (24 gage) sheet metal with at least a 1 in. air gap.	66%	50%

[1] Spacer and ties for protection materials shall be of noncombustible material. No spacers or ties shall be used directly behind the duct.

[2] With all clearance reduction systems using a ventilated air space, adequate air circulation shall be provided as described in 2-18.4. 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.

[3] Mineral wool batts (blanket or board) shall have a minimum density of 8 lb per ft^3 (128.7 kg/m^3) and have a minimum melting point of 1500°F (816°C).

[4] Insulation board used as part of clearance reduction system shall have a thermal conductivity of 1.0 (Btu-in.)/sq ft-hr-°F) or less. Insulation board shall be formed of noncombustible material.

[5] 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.

[6] All clearances and thicknesses are minimum; larger clearances and thicknesses are acceptable.

[7] To calculate the minimum allowable clearance, the following formula may be used:

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

C_{pi} is the minimum allowable clearance with protection.

C_{un} is the required clearance with no protection, and R is the maximum allowed reduction in clearance.

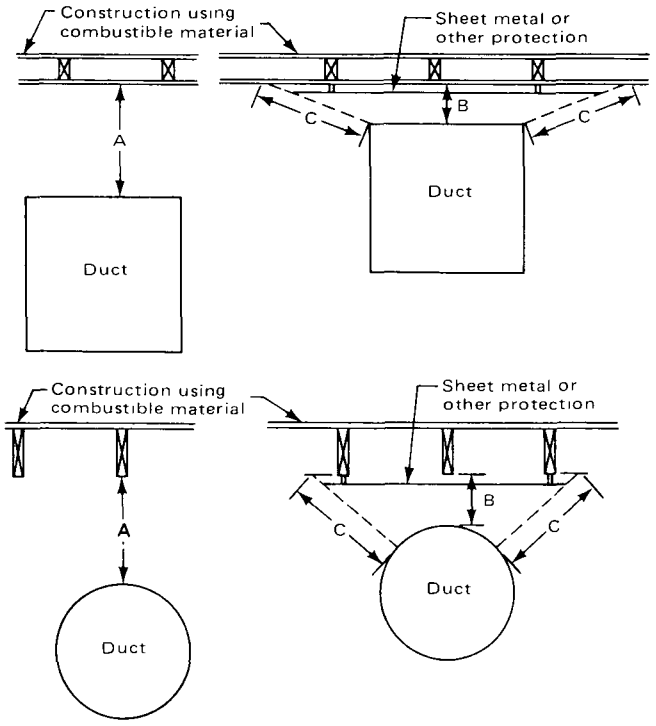
2-18.4 For clearance reduction systems using an air space between the combustible wall and the wall protector, adequate air circulation shall be provided by one of the following methods.

2-18.4.1 Adequate air circulation may be provided by leaving all edges of the wall protector open with at least a 1-in. (25.4-mm) air gap.

2-18.4.2 If the wall protector is mounted on a single flat wall away from corners, adequate air circulation may 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.

2-18.4.3 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.

2-18.5 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 2-18.5.



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 2-18.5 Extent of protection required to reduce clearances from ducts.

Chapter 3 Nonflammable Corrosive Fumes and Vapors

3-1 General.

3-1.1 Duct systems of plastic material shall be permitted to be used to handle only nonflammable corrosive fumes and vapors when conventional metal duct systems will not be adequate. The choice of the material type is the responsibility of the design engineer. The following are minimum standards of materials, construction, and workmanship deemed necessary to ensure minimum fire hazard in the operation of these systems. All chemical-resistant plastics have heat limitations that must be considered when designing a system.

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 equal to the material of the duct system.

3-1.3 Plastic duct materials shall be listed with a 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 (AMD)

4-1 Air moving devices shall be designed, constructed, and installed in accordance with AMCA (Air Movement and Control Association, Inc.) *Standards Handbook* (Publication 99-86), applying to ferrous and nonferrous metals.

Exception: When the materials conveyed are not compatible with metals, alternate materials may be used.

4-2 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.

4-2.1 AMDs used in systems air conveying dust or vapors containing residue shall be located on the clean air side of the filtration system.

4-3 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 flammables or combustibles shall be electrically bonded and grounded in an approved manner. When contact is broken, metallic straps shall be installed for effective bonding. (*See NFPA 77, Recommended Practice on Static Electricity.*)

Chapter 6 Fire Protection

6-1* Exhaust systems utilizing plastic ducts shall be provided with an automatic extinguishing system within the duct. (*See NFPA Standards 11, 11A, 12, 12A, 12B, 13, 15, 17, and 17A.*)

Exception: Systems constructed of limited-combustible material listed for use without sprinkler protection.

6-2 Limited-combustible or noncombustible systems shall be protected as follows:

6-2.1 The provisions of automatic or special extinguishing equipment for systems handling flammable vapors or combustible materials shall be subject to the authority having jurisdiction.

6-3 When a sprinkler system is installed, adequate 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 assure 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 roof area and 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 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.

7-6.1 All deficiencies found during testing and inspection shall be corrected. Serious deficiencies 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 11, *Standard for Low Expansion Foam and Combined Agent Systems*, 1988 edition

NFPA 11A, *Standard for Medium- and High-Expansion Foam Systems*, 1988 edition

NFPA 12, *Standard on Carbon Dioxide Extinguishing Systems*, 1989 edition

NFPA 12A, *Standard on Halon 1301 Fire Extinguishing Systems*, 1989 edition

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

NFPA 13, *Standard for the Installation of Sprinkler Systems*, 1991 edition

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

NFPA 17, *Standard for Dry Chemical Extinguishing Systems*, 1990 edition

NFPA 17A, *Standard for Wet Chemical Extinguishing Systems*, 1990 edition

NFPA 70, *National Electrical Code*,® 1990 edition

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

NFPA 259, *Standard Test Method for Potential Heat of Building Materials*, 1987 edition.

8-1.2 Other Publications.

8-1.2.1 AMCA Publication. Air Movement and Control Association, Inc., 30 W. University Drive, Arlington Heights, IL 60004.

AMCA Standards Handbook (Publication 99-86).

8-1.2.2 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 E136-82, *Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C.*

8-1.2.3 SMACNA Publications. Sheet Metal and Air-Conditioning Contractors National Association, 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

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

The following notes, bearing the same number as the text of this standard to which they apply, contain useful explanatory material and references to standards.

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, *Manufacture and Storage of Aerosol Products*

NFPA 32, *Drycleaning Plants*

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

NFPA 34, *Dipping and Coating Processes*

NFPA 35, *Manufacture of Organic Coatings*

NFPA 36, *Solvent Extraction Plants*

NFPA 40E, *Storage of Pyroxylin Plastic*

NFPA 45, *Laboratories Using Chemicals*

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

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

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

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

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

NFPA 65, *Processing and Finishing of Aluminum*

NFPA 68, *Guide for Venting of Deflagrations*

NFPA 81, *Fur Storage, Fumigation and Cleaning*

NFPA 85A, *Prevention of Furnace Explosions in Fuel Oil- and Natural Gas-Fired Single Burner Boiler-Furnaces*

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

NFPA 86, *Ovens and Furnaces*

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

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

NFPA 88B, *Repair Garages*

NFPA 92A, *Smoke Control Systems*

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

NFPA 96, *Removal of Smoke and Grease-Laden Vapors from Commercial Cooking Equipment*

NFPA 120, *Coal Preparation Plants*

NFPA 204M, *Smoke and Heat Venting*

NFPA 303, *Marinas and Boatyards*

NFPA 409, *Aircraft Hangars*

NFPA 480, *Storage, Handling and Processing of Magnesium*

NFPA 481, *Production, Processing, Handling, and Storage of Titanium*

NFPA 651, *Manufacture of Aluminum and Magnesium Powder*

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

NFPA 655, *Prevention of Sulfur Fires and Explosions*

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

NFPA 801, *Fire Protection Practice for Facilities Handling Radioactive Materials*

A-1.5 Air Moving Device. An air moving device (AMD) is a fan, centrifugal fan, or mixed flow fan. These devices have previously been called blowers or exhausters.

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

A-2-3 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.

(a) Name of owner and occupant

(b) Location, including street address

(c) Point of compass

(d) Ceiling construction

(e) Full height cross section

(f) Location of fire walls

(g) Location of partitions

(h) Materials of duct construction.

A-2-12 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 may 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-2-13 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-6-1 In systems used for the removal of flammable vapors or gases that may 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 may be automatically or manually controlled, as required by the authority having jurisdiction. (See NFPA 11, *Low Expansion Foam and Combined Agent Systems*; NFPA 11A, *Medium- and High-Expansion Foam Systems*; NFPA 12, *Carbon Dioxide Fire Extinguishing Systems*; NFPA 12A, *Halon 1301 Fire Extinguishing Systems*; NFPA 12B, *Halon 1211 Fire Extinguishing Systems*; NFPA 13, *Installation of Sprinkler Systems*; NFPA 15, *Water Spray Fixed Systems for Fire Protection*; NFPA 17, *Dry Chemical Extinguishing Systems*; NFPA 17A, *Wet Chemical Systems*; and NFPA 69, *Explosion Prevention Systems*.)

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

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

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.

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

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).

Record the test data and design specifications.

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

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.

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

Lock all dampers and mark positions with permanent marker.

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 may 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 may be required.

For some tests moisture content of the air in the system and/or 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:

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

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

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

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

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

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:

Refer to the initial Test Data Sheet for test locations.

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

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

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

Make and record any corrections required.

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

A-7-4 Inspection should include hoods and enclosures, duct connections at hoods and enclosures, 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 and Combined Agent Systems*, 1988 edition

NFPA 11A, *Standard for Medium- and High-Expansion Foam Systems*, 1988 edition

NFPA 12, *Standard on Carbon Dioxide Extinguishing Systems*, 1989 edition

NFPA 12A, *Standard on Halon 1301 Fire Extinguishing Systems*, 1989 edition

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

NFPA 13, *Standard for the Installation of Sprinkler Systems*, 1991 edition

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

NFPA 17, *Standard for Dry Chemical Extinguishing Systems*, 1990 edition

NFPA 17A, *Standard for Wet Chemical Extinguishing Systems*, 1990 edition

NFPA 30, *Flammable and Combustible Liquids Code*, 1990 edition

NFPA 30B, *Code for the Manufacture and Storage of Aerosol Products*, 1990 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*, 1987 edition

NFPA 36, *Standard for Solvent Extraction Plants*, 1988 edition

NFPA 40E, *Code for the Storage of Pyroxylin Plastic*, 1986 edition

NFPA 43A, *Code for the Storage of Liquid and Solid Oxidizers*, 1990 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*, 1987 edition

NFPA 68, *Guide for Venting of Deflagrations*, 1988 edition

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

NFPA 77, *Recommended Practice on Static Electricity*, 1988 edition

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

NFPA 85A, *Standard for Prevention of Furnace Explosions in Fuel Oil- and Natural Gas-Fired Single Burner Boiler-Furnaces*, 1987 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 96, *Standard for the Installation of Equipment for the Removal of Smoke and Grease-Laden Vapors from Commercial Cooking Equipment*, 1991 edition

NFPA 120, *Standard for Coal Preparation Plants*, 1988 edition

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

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

NFPA 480, *Standard for the Storage, Handling and Processing of Magnesium*, 1987 edition

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

NFPA 651, *Standard for the Manufacture of Aluminum and Magnesium Powder*, 1987 edition

NFPA 654, *Standard for Prevention of Dust Explosions in the Chemical, Dye, Pharmaceutical, and Plastics Industries*, 1988 edition

NFPA 655, *Standard for Prevention of Sulfur Fires and Explosions*, 1988 edition

NFPA 664, *Standard for the Prevention of Fires and Explosions in Wood Processing and Woodworking Facilities*, 1987 edition

NFPA 801, *Recommended Fire Protection Practice for Facilities Handling Radioactive Materials*, 1991 edition.

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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)

FOR OFFICE USE ONLY
Log # _____
Date Rec'd _____

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.

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. ☒ **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 analogous form is used.

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