

NFPA[®]

90A

**Standard for the Installation
of Air-Conditioning and
Ventilating Systems**

2018



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NFPA® 90A

Standard for the

Installation of Air-Conditioning and Ventilating Systems

2018 Edition

This edition of NFPA 90A, *Standard for the Installation of Air-Conditioning and Ventilating Systems*, was prepared by the Technical Committee on Air Conditioning. It was issued by the Standards Council on August 1, 2017, with an effective date of August 21, 2017, and supersedes all previous editions.

This edition of NFPA 90A was approved as an American National Standard on August 21, 2017.

Origin and Development of NFPA 90A

This standard dates from 1899, when committee attention was first given to blower and exhaust systems. Prior to 1936, the subject of air conditioning was covered in NFPA standards on blower systems. In 1937, it was decided to prepare a separate standard on air-conditioning, warm air heating, and ventilating systems. This standard was initially adopted in 1937 with subsequent amendments in 1938, 1939, 1940, 1942, 1950, 1952, 1955, 1956, 1960, 1961, 1963, 1964, 1965, 1968, 1971, 1973, 1976, 1980, 1984, and 1989. The 1993 and 1996 editions were reconfirmations of the 1989 edition. The 1999 edition contained changes that were mainly editorial in nature.

The 2002 edition incorporated format changes to comply with the *Manual of Style for NFPA Technical Committee Documents* and new provisions for the removal of accessible abandoned materials in concealed spaces and plenums.

The only changes to the 2006 edition were to update “flame spread rating” to “flame spread index.”

The major change in the 2009 edition was to replace the references to NFPA 255 with ANSI/UL 723 and ASTM E84, because NFPA 255 was withdrawn. All three test standards were quite similar.

The changes in the 2012 edition were edition updates of the referenced standards.

For the 2015 edition, the changes were primarily editorial alterations, reference updates, and clarifications of existing language. Also, a section and test method for air dispersion systems was added.

For the 2018 edition, the changes are primarily editorial alterations, reference updates, clarifications of existing language, and corrections for changes of terminology. Also, an option for testing flame spread of plastic pipe for use in plenums has been added.

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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 systems for air conditioning, warm air heating, and ventilating including filters, ducts, and related equipment to protect life and property from fire, smoke, and gases resulting from fire or from conditions having manifestations similar to fire.

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NFPA 90A**Standard for the****Installation of Air-Conditioning and Ventilating Systems**

2018 Edition

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

A reference in brackets [] following a section or paragraph indicates material that has been extracted from another NFPA document. As an aid to the user, the complete title and edition of the source documents for extracts in mandatory sections of the document are given in Chapter 2 and those for extracts in informational sections are given in Annex C. Extracted text may be edited for consistency and style and may include the revision of internal paragraph references and other references as appropriate. Requests for interpretations or revisions of extracted text shall be sent to the technical committee responsible for the source document.

Information on referenced publications can be found in Chapter 2 and Annex C.

Chapter 1 Administration

1.1* Scope. This standard shall cover construction, installation, operation, and maintenance of systems for air conditioning and ventilating, including filters, ducts, and related equipment, to protect life and property from fire, smoke, and gases resulting from fire or from conditions having manifestations similar to fire.

1.2 Purpose. This standard shall prescribe minimum requirements for safety to life and property from fire. These requirements shall be intended to accomplish the following:

- (1) Restrict the spread of smoke through air duct systems within a building or into a building from the outside
- (2) Restrict the spread of fire through air duct systems from the area of fire origin, whether located within the building or outside

- (3) Maintain the fire-resistive integrity of building components and elements such as floors, partitions, roofs, walls, and floor- or roof-ceiling assemblies affected by the installation of air duct systems
- (4) Minimize the ignition sources and combustibility of the elements of the air duct systems
- (5) Permit the air duct systems in a building to be used for the additional purpose of emergency smoke control

1.3 Application. This standard shall apply to all systems for the movement of environmental air in structures that serve the following:

- (1)* Spaces over 708 m³ (25,000 ft³) in volume
- (2)* Buildings of Types III, IV, and V construction over three stories in height, regardless of volume
- (3)* Buildings and spaces not covered by other applicable NFPA standards
- (4)* Occupants or processes not covered by other applicable NFPA standards

1.4 Retroactivity. The provisions of this standard shall not be intended to be applied retroactively. Where a system is being altered, extended, or renovated, the requirements of this standard shall apply only to the work being undertaken.

1.5 Equivalency. Nothing in this standard shall be intended to prevent the use of new methods or devices, provided that sufficient technical data are submitted to the authority having jurisdiction to demonstrate that the proposed method or device is equivalent in quality, strength, durability, and safety to that prescribed by this standard.

Chapter 2 Referenced Publications

2.1 General. The documents or portions thereof listed in this chapter are referenced within this standard and shall be considered part of the requirements of this document.

2.2 NFPA Publications. National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.

NFPA 30, *Flammable and Combustible Liquids Code*, 2018 edition.

NFPA 31, *Standard for the Installation of Oil-Burning Equipment*, 2016 edition.

NFPA 54, *National Fuel Gas Code*, 2018 edition.

NFPA 70®, *National Electrical Code®*, 2017 edition.

NFPA 72®, *National Fire Alarm and Signaling Code*, 2016 edition.

NFPA 75, *Standard for the Fire Protection of Information Technology Equipment*, 2017 edition.

NFPA 80, *Standard for Fire Doors and Other Opening Protectives*, 2016 edition.

NFPA 101®, *Life Safety Code®*, 2018 edition.

NFPA 105, *Standard for Smoke Door Assemblies and Other Opening Protectives*, 2016 edition.

NFPA 259, *Standard Test Method for Potential Heat of Building Materials*, 2013 edition.

NFPA 262, *Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces*, 2015 edition.

NFPA 275, *Standard Method of Fire Tests for the Evaluation of Thermal Barriers*, 2017 edition.

NFPA 286, *Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth*, 2015 edition.

NFPA 5000®, *Building Construction and Safety Code*®, 2018 edition.

2.3 Other Publications.

2.3.1 ASHRAE Publications. ASHRAE Inc., 1791 Tullie Circle, NE, Atlanta, GA 30329-2305.

ASHRAE 15 (packaged with ASHRAE 34), *Safety Standard for Refrigeration Systems and Designation and Classification of Refrigerants* (ANSI Approved), 2013.

ASHRAE Handbook — HVAC Systems and Equipment, 2012.

2.3.2 ASTM International Publications. ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959.

ASTM C411, *Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation*, 2011.

ASTM D93, *Standard Test Methods for Flashpoint by Pensky-Martens Closed Cup Tester*, 2012.

ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials*, 2016.

ASTM E119, *Standard Test Methods for Fire Tests of Building Construction and Materials*, 2012a.

ASTM E136, *Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C*, 2016.

ASTM E2231, *Standard Practice for Specimen Preparation and Mounting of Pipe and Duct Insulation Materials to Assess Surface Burning Characteristics*, 2009.

ASTM E2652, *Standard Test Method for Behavior of Materials in a Tube Furnace with a Cone-Shaped Airflow Stabilizer, at 750°C*, 2016.

2.3.3 GA Publications. Gypsum Association, 6525 Belcrest Road, Suite 480, Hyattsville, MD 20782.

GA-600, *Fire Resistance Design Manual*, 2015.

2.3.4 NAIMA Publications. North American Insulation Manufacturers Association, 11 Canal Center Plaza, Suite 103, Alexandria, VA 22314.

Fibrous Glass Duct Construction Standards, 5th edition, 2002.

2.3.5 SMACNA Publications. Sheet Metal and Air Conditioning Contractors' National Association, 4201 Lafayette Center Drive, Chantilly, VA 20151-1209.

ANSI/SMACNA 016, *HVAC Air Duct Leakage Test Manual*, 2nd edition, 2012.

Fibrous Glass Duct Construction Standards, 7th edition, 2003.

HVAC Duct Construction Standards — Metal and Flexible, 3rd edition, 2005.

2.3.6 UL Publications. Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096.

ANSI/UL 181, *Standard for Factory-Made Air Ducts and Air Connectors*, 2013.

ANSI/UL 181A, *Standard for Closure Systems for Use with Rigid Air Ducts*, 2013.

ANSI/UL 181B, *Standard for Closure Systems for Use with Flexible Air Ducts and Air Connectors*, 2013.

ANSI/UL 263, *Standard for Fire Tests of Building Construction and Materials*, 2011, revised 2015.

ANSI/UL 555, *Standard for Fire Dampers*, 2006, revised 2014.

ANSI/UL 555C, *Standard for Ceiling Dampers*, 2014.

ANSI/UL 555S, *Standard for Smoke Dampers*, 2014.

ANSI/UL 723, *Standard for Test for Surface Burning Characteristics of Building Materials*, 2008, revised 2013.

ANSI/UL 867, *Standard for Electrostatic Air Cleaners*, 2011, revised 2013.

ANSI/UL 900, *Standard for Air Filter Units*, 2015.

ANSI/UL 1598, *Luminaires*, 2012.

ANSI/UL 1820, *Standard for Fire Test of Pneumatic Tubing for Flame and Smoke Characteristics*, 2004, revised 2013.

ANSI/UL 1887, *Standard for Fire Test of Plastic Sprinkler Pipe for Visible Flame and Smoke Characteristics*, 2004, revised 2013.

ANSI/UL 1995, *Standard for Heating and Cooling Equipment*, 2015.

ANSI/UL 2024, *Standard for Cable Routing Assemblies and Communications Raceways*, 2014, revised 2015.

ANSI/UL 2043, *Standard for Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces*, 2013.

UL 2518, *Outline of Investigation for Air Dispersion System Materials*, 2005.

ANSI/UL 2846, *Fire Test of Plastic Water Distribution Plumbing Pipe for Visible Flame and Smoke Characteristics*, 2005.

ANSI/UL 2846, *Standard for Fire Test of Plastic Water Distribution Plumbing Pipe for Visible Flame and Smoke Characteristics*, 2014.

ANSI/UL 60335-2-40, *Standard for Safety of Household and Similar Electrical Appliances, Part 2-40: Particular Requirements for Electrical Heat Pumps, Air-Conditioners and Dehumidifiers*, 2012.

2.3.7 Other Publications.

Merriam-Webster's Collegiate Dictionary, 11th edition, Merriam-Webster, Inc., Springfield, MA, 2003.

2.4 References for Extracts in Mandatory Sections.

NFPA 80, *Standard for Fire Doors and Other Opening Protectives*, 2016 edition.

NFPA 90B, *Standard for the Installation of Warm Air Heating and Air-Conditioning Systems*, 2018 edition.

NFPA 101®, *Life Safety Code*®, 2018 edition.

NFPA 211, *Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances*, 2016 edition.

NFPA 5000®, *Building Construction and Safety Code*®, 2018 edition.

Chapter 3 Definitions

3.1 General. The definitions contained in this chapter shall apply to the terms used in this standard. Where terms are not defined in this chapter or within another chapter, they shall be defined using their ordinarily accepted meanings within the context in which they are used. *Merriam-Webster's Collegiate Dictionary*, 11th edition, shall be the source for the ordinarily accepted meaning.

3.2 NFPA Official Definitions.

3.2.1* Approved. Acceptable to the authority having jurisdiction.

3.2.2* Authority Having Jurisdiction (AHJ). An organization, office, or individual responsible for enforcing the requirements of a code or standard, or for approving equipment, materials, an installation, or a procedure.

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

3.2.4 Shall. Indicates a mandatory requirement.

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

3.2.6 Standard. An NFPA Standard, the main text of which contains only mandatory provisions using the word "shall" to indicate requirements and that is in a form generally suitable for mandatory reference by another standard or code or for adoption into law. Nonmandatory provisions are not to be considered a part of the requirements of a standard and shall be located in an appendix, annex, footnote, informational note, or other means as permitted in the NFPA Manuals of Style. When used in a generic sense, such as in the phrase "standards development process" or "standards development activities," the term "standards" includes all NFPA Standards, including Codes, Standards, Recommended Practices, and Guides.

3.3 General Definitions.

3.3.1 Accessible. Capable of being removed or exposed without damaging the building structure or finish, or not permanently closed in by the structure or finish of the building.

3.3.2 Air Cleaner. A device used to reduce or remove airborne solids from heating, ventilating, and air-conditioning systems by electrostatic means.

3.3.3* Air Connector. A conduit for transferring air between an air duct or plenum and an air terminal unit or an air inlet or air outlet.

3.3.4 Air Distribution System. A continuous passageway for the transmission of air that, in addition to air ducts, can include air connectors, air duct fittings, dampers, plenums, fans, and accessory air-handling equipment but that does not include conditioned spaces.

3.3.5 Air Duct. A conduit or passageway for conveying air to or from heating, cooling, air-conditioning, or ventilating equipment, but not including the plenum.

3.3.6 Air Duct Covering. A material such as an adhesive, insulation, banding, a coating(s), film, or a jacket used to cover the outside surface of an air duct, fan casing, or duct plenum.

3.3.7 Air Duct Lining. A material such as an adhesive, insulation, a coating(s), or film used to line the inside surface of an air duct, fan casing, or duct plenum.

3.3.8 Air Filter. A device used to reduce or remove airborne solids from heating, ventilating, and air-conditioning systems. [90B, 2018]

3.3.9* Air Inlet. Any opening through which air is removed from a space and returned to an air distribution system.

3.3.10* Air Outlet. Any opening through which air is delivered to a space from an air distribution system.

3.3.11 Air Terminal Unit. An appliance receiving, conditioning, and delivering air supplied through an air distribution system.

3.3.12 Air Transfer Opening. An opening designed to allow the movement of environmental air between two contiguous spaces.

3.3.13 Continued Progressive Combustion. A flame front progressing more than 3.2 m (10.5 ft) beyond the centerline of the burners during a test in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials*, or ANSI/UL 723, *Standard for Test for Surface Burning Characteristics of Building Materials*.

3.3.14 Damper.

3.3.14.1* Ceiling Damper. A listed device installed in a ceiling membrane of a fire resistance-rated floor-ceiling or roof-ceiling assembly to automatically limit the radiative heat transfer through an air inlet/outlet opening.

3.3.14.2 Combination Fire and Smoke Damper. A device that meets both fire damper and smoke damper requirements.

3.3.14.3* Fire Damper. A device installed in an air distribution system and designed to close automatically upon detection of heat, to interrupt migratory airflow, and to restrict the passage of flame.

3.3.14.4* Smoke Damper. A device within an air-distribution system to control the movement of smoke. [5000, 2018]

3.3.15 Environmental Air. Air that is supplied, returned, recirculated, or exhausted from spaces for the purpose of modifying the existing atmosphere within the building.

3.3.16 Fan. A blower or exhauster assembly comprising blades or runners and housings or casings. [211, 2016]

3.3.17* Fire Resistance Rating. The time, in minutes or hours, that materials or assemblies have withstood a fire exposure as established in accordance with the test procedures of ASTM E119, *Standard Test Methods for Fire Tests of Building Construction and Materials*, or ANSI/UL 263, *Standard for Fire Tests of Building Construction and Materials*.

3.3.18 Fire Wall. A wall separating buildings or subdividing a building to prevent the spread of fire and having a fire resistance rating and structural stability.

3.3.19* Flame Spread Index. A comparative measure expressed as a dimensionless number derived from visual measurements or the spread of flame versus time in ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials*, or ANSI/UL 723, *Standard for Test for Surface Burning Characteristics of Building Materials*.

3.3.20 Foam Plastic Insulation. A cellular plastic, used for thermal insulating or acoustical applications, having a density of 20 lb/ft³ (320 kg/m³) or less, containing open or closed cells, and formed by a foaming agent. [5000, 2018]

3.3.21* Limited-Combustible (Material). See 4.4.2.

3.3.22* Noncombustible Material. See 4.4.1.

3.3.23* Plenum. A compartment or chamber to which one or more air ducts are connected and that forms part of the air distribution system.

3.3.23.1 Air-Handling Unit Room Plenum. An individual room containing an air-handling unit(s) used to gather air from various sources and combine the air within the room before returning it to the air-handling unit.

3.3.23.2 Apparatus Casing Plenum. A sheet metal construction attached directly to a fan enclosure, fan coil unit, air-handling unit, or furnace bonnet for the purpose of connecting distribution ducts.

3.3.23.3 Ceiling Cavity Plenum. The space between the top of the finished ceiling and the underside of the floor above or the roof and used to supply air to the occupied area or to return air to or exhaust air from the occupied area.

3.3.23.4 Raised Floor Plenum. The space between the top of the finished floor and the underside of a raised floor and used to supply air to the occupied area or to return air to or exhaust air from the occupied area.

3.3.24 Smoke. The airborne solid and liquid particulates and gases evolved when a material undergoes pyrolysis or combustion, together with the quantity of air that is entrained or otherwise mixed into the mass.

3.3.25* Smoke Barrier. A continuous membrane, or a membrane with discontinuities created by protected openings, where such membrane is designed and constructed to restrict the movement of smoke. [5000, 2018]

3.3.26 Smoke Control. A system that utilizes fans to produce pressure differences so as to manage smoke movement.

3.3.27* Smoke Detector. A device that senses visible or invisible particles of combustion.

3.3.28* Smoke Developed Index. A comparative measure expressed as a dimensionless number, derived from measurements of smoke obstruction versus time in ASTM E84 *Standard Test Method for Surface Burning Characteristics of Building Materials*, or ANSI/UL 723, *Standard for Test for Surface Burning Characteristics of Building Materials*.

Chapter 4 HVAC Systems

4.1 General Requirements for Equipment.

4.1.1 Access. Equipment shall be arranged to afford access for inspection, maintenance, and repair.

4.1.2 Equipment shall be selected and installed based on its application with respect to the manufacturer's installation instructions and listing, as applicable.

4.1.3 Protection.

4.1.3.1 Equipment shall be guarded for personnel protection.

4.1.3.2 Equipment shall be guarded against the intake of foreign matter into the system.

Δ 4.1.4 Electrical wiring and equipment shall be installed in accordance with NFPA 70.

4.1.5 Air-handling equipment rooms shall meet the requirements of Section 5.1.

4.2 System Components.

4.2.1 Outside Air Intakes.

4.2.1.1 Outside air intakes shall be protected by screens of corrosion-resistant material not larger than 12.7 mm (0.5 in.) mesh.

4.2.1.2* Outside air intakes shall be located so as to minimize the introduction of fire or smoke into the building.

4.2.1.2.1 Outside air intakes shall be equipped with an approved fire and/or smoke damper where not located to meet the requirements of 4.2.1.2. (See Section 6.3 for smoke damper operation to restrict the intake of smoke.)

4.2.2 Air Cleaners and Air Filters.

4.2.2.1 Electrostatic air cleaners shall be listed in accordance with ANSI/UL 867, *Standard for Safety Electrostatic Air Cleaners*.

4.2.2.1.1 Electrostatic air cleaners shall be installed in conformance with the conditions of the manufacturer's listing.

4.2.2.2* Air filters shall comply with ANSI/UL 900, *Standard for Safety Air Filter Units*.

4.2.2.3 Liquid adhesive coatings used on air filters shall have a minimum flash point of 163°C (325°F) as determined by ASTM D93, *Standard Test Methods for Flashpoint by Pensky-Martens Closed Cup Tester*.

4.2.2.4 Where air filters are flushed with liquid adhesives, the system shall be arranged so that the air cleaner cannot be flushed while the fan is in operation.

Δ 4.2.2.5 Combustible adhesive coatings shall be stored in accordance with NFPA 30.

4.2.3 Fans.

4.2.3.1 Installation.

4.2.3.1.1 Fans shall be installed in accordance with the applicable NFPA standards and the manufacturer's instructions.

4.2.3.1.2 Fans shall be approved for the specific installation.

4.2.3.2 Access. Fans shall be located, arranged, and installed to afford access for inspection and maintenance.

4.2.3.3 Exposed Inlets. Exposed fan inlets shall be protected with metal screens to prevent the entry of paper, trash, and foreign materials.

4.2.4 Air-Cooling and Heating Equipment.

4.2.4.1 Installation.

4.2.4.1.1 Heating and cooling equipment shall be installed in accordance with the applicable NFPA standards and the manufacturer's instructions.

4.2.4.1.2 The equipment shall be approved for the specific installation. (See 4.3.3.1.)

4.2.4.2 Materials. Materials used in the manufacturing of fan coil units, self-contained air-conditioning units, furnaces, heat pumps, humidifiers, and all similar equipment shall meet the requirements of 4.3.3.1 and 4.3.3.2 unless otherwise specified in 4.2.4.2.1 or 4.2.4.2.2.

4.2.4.2.1 The requirements of 4.3.3.1 and 4.3.3.2 shall not apply to equipment tested and listed in accordance with ANSI/UL 1995, *Standard for Safety Heating and Cooling Equipment*, or ANSI/UL 60335-2-40, *Standard for Safety of Household and Similar Electrical Appliances, Part 2-40: Particular Requirements for Electrical Heat Pumps, Air-Conditioners and Dehumidifiers*.

4.2.4.2.2 Unlisted solar energy air distribution system components shall be accompanied by supportive information demonstrating that the components have flame spread and smoke developed indexes that are not in excess of those of the air duct system permitted by this standard.

4.2.4.3 Mechanical Cooling.

4.2.4.3.1 Mechanical refrigeration used with air duct systems shall be installed in accordance with recognized safety practices.

4.2.4.3.2 Installations conforming to ASHRAE 15 (packaged with ASHRAE 34), *Safety Standard for Refrigeration Systems and Designation and Classification of Refrigerants*, shall be considered to be in compliance with the requirement in 4.2.4.3.1.

4.2.4.4 Furnaces.

▲ **4.2.4.4.1** Oil-burning heating furnaces combined with cooling units in the same air duct system shall be installed in accordance with NFPA 31.

▲ **4.2.4.4.2** Gas-burning heating furnaces combined with cooling units in the same air duct system shall be installed in accordance with NFPA 54.

4.2.4.5 Duct Heaters.

4.2.4.5.1 Where electrical resistance or fuel-burning heaters are installed in air ducts, the air duct coverings and their installation shall comply with the provisions of 4.3.5.3.

▲ **4.2.4.5.2** The installation of electrical duct heaters shall comply with the provisions of NFPA 70, Article 424, Part VI, "Duct Heaters."

4.2.4.6 Evaporative Coolers. Combustible evaporation media shall not be used unless they meet the requirements of 4.2.2.2.

4.2.4.7 Heat Recovery Equipment. Equipment not covered by other provisions of this standard and used for heat transfer or air movement shall be constructed so that all material in the air path meets the requirements of Section 4.2.

4.3* Air Distribution.

4.3.1 Air Ducts.

4.3.1.1 Air ducts shall be constructed of iron, steel, aluminum, copper, concrete, masonry, or clay tile, except as otherwise permitted in 4.3.1.2 or 4.3.1.3.

4.3.1.2 Class 0 or Class 1 rigid or flexible air ducts tested in accordance with ANSI/UL 181, *Standard for Safety Factory-Made Air Ducts and Air Connectors*, and installed in conformance with the conditions of listing shall be permitted to be used for ducts where air temperature in the ducts does not exceed 121°C (250°F) or where used as vertical ducts serving not more than two adjacent stories in height.

4.3.1.3 Gypsum Board Air Ducts.

4.3.1.3.1 Gypsum board having a flame spread index not exceeding 25 without evidence of continued progressive combustion and a smoke developed index not exceeding 50 when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials*, or ANSI/UL 723, *Standard for Test for Surface Burning Characteristics of Building Materials*, shall be permitted to be used for negative pressure exhaust and return ducts where the temperature of the conveyed air does not exceed 52°C (125°F) in normal service.

4.3.1.3.2 The air temperature limits of 4.3.1.3.1 shall not apply where gypsum board material is used for emergency smoke exhaust air ducts.

4.3.1.4 All air duct materials shall be suitable for continuous exposure to the temperature and humidity conditions of the environmental air in the air duct.

4.3.1.5 The materials, thickness, construction, and installation of ducts shall provide structural strength and durability in conformance with recognized good practice.

4.3.1.5.1 Air ducts shall be considered to be in compliance with 4.3.1.5 where constructed and installed in accordance with the ASHRAE Handbook — HVAC Systems and Equipment and with one of the following as applicable:

- (1) NAIMA *Fibrous Glass Duct Construction Standards*
- (2) SMACNA *Fibrous Glass Duct Construction Standards*
- (3) SMACNA *HVAC Duct Construction Standards — Metal and Flexible*
- (4) ANSI/SMACNA *HVAC Air Duct Leakage Test Manual*

4.3.1.6 Where no standard exists for the construction of air ducts, the ducts shall be constructed to withstand both the maximum positive and the maximum negative pressures of the system at fan shutoff.

4.3.1.7 A duct enclosure used for the multiple distribution or gathering of ducts or connectors shall be constructed of materials and methods specified in 4.3.1.

4.3.1.7.1 Electrical wires and cables and optical fiber cables within a duct enclosure shall comply with 4.3.4.

4.3.1.8 Air Dispersion Systems. Air dispersion systems shall meet the following criteria:

- (1) They shall only be installed in entirely exposed locations.
- (2) They shall always operate under positive pressure.
- (3) They shall not penetrate fire resistance-rated construction.