90B

NFPA 90B Standard for the Installation of Warm Air Heating and Air Conditioning Systems 1996 Edition

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An International Codes and Standards Organization

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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 90B

Standard for the Installation of

Warm Air Heating and Air Conditioning Systems

1996 Edition

This edition of NFPA 90B, *Standard for the Installation of Warm Air Heating and Air Conditioning Systems*, was prepared by the Technical Committee on Air Conditioning and acted on by the National Fire Protection Association, Inc., at its Annual Meeting held May 20–23, 1996, in Boston, MA. It was issued by the Standards Council on July 18, 1996, with an effective date of August 9, 1996, and supersedes all previous editions.

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

This edition of NFPA 90B was approved as an American National Standard on July 26, 1996.

Origin and Development of NFPA 90B

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 edition was a reconfirmation of the 1989 edition.

For *Standard for the Installation of Air Conditioning and Ventilating Systems*, see NFPA 90A.

The 1996 edition is basically a reconfirmation of the 1993 and 1989 editions. This edition contains new references to supplement documents for the construction of fiberglass ducts and editorial modifications.

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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.

Contents

NFPA 90B

Standard for the Installation of

Warm Air Heating and Air Conditioning Systems

1996 Edition

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

Information on referenced publications can be found in Chapter 5 and Appendix B.

Chapter 1 General

1-1* Scope. This standard shall apply to all systems for the movement of environmental air in structures that:

(a) Serve one- or two-family dwellings; or

(b) Serve spaces not exceeding 25,000 ft^3 (708 m^3) in volume in any occupancy.

Exception: Buildings of combustible construction over three stories in height shall be in accordance with NFPA 90A, Standard for the Installation of Air Conditioning and Ventilating Systems.

1-2 Purpose. This standard is intended to prescribe reasonable provisions based on minimum requirements for safety to life and property. Nothing in this standard is intended to prevent the use of alternative 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.

1-3 Definitions.

Air Filter. A device used to reduce or remove air-borne solids from heating, ventilating, and air conditioning systems.

Approved.* Acceptable to the authority having jurisdiction.

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

Central Warm Air Heating System. A heating system consisting of a heat exchanger with an outer casing or jacket, a solar collection system, or an electric heating unit that is connected to a supply system and a return system.

Combustible Material. Material made of or surfaced with wood, compressed paper, plant fibers, or other material that ignites and burns, whether flameproofed or not or whether plastered or unplastered.

Duct Covering. Includes materials such as adhesive, insulation, banding, coating(s), film, and jackets used to cover the outside surface of a duct, fan casing, or duct plenum.

Duct Lining. Includes materials such as adhesive, insulation, coating(s), and film used to line the inside surface of a duct, fan casing, or duct plenum.

Forced Air System. A central warm air heating system that is equipped with a fan or blower that provides the primary means for circulation of air.

Gravity System. A central warm air heating system through which air is circulated by gravity. An integral fan or blower that is used only to overcome the internal furnace resistance to airflow is permitted.

Heat Exchanger. A chamber in which heat resulting directly from combustion of fuel, or heat from a medium such as air, water, or steam, is transferred through the walls of the chamber to the air entering the supply system or in which heat from electrical resistors is transferred to the air entering the supply system.

Heat Pump. A refrigeration system arranged to accomplish either:

(a) Heating; or

(b) Heating and cooling.

Listed.* Equipment, materials, or services included in a list published by an organization 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 either that the equipment, material, or service meets identified standards or has been tested and found suitable for a specified purpose.

Noncombustible Material. A material that, in the form in which it is used and under the conditions anticipated, cannot ignite, burn, support combustion, or release flammable vapors when subjected to fire or heat. When tested in accordance with ASTM E 136, *Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 Degrees C*, materials that successfully pass the test shall be considered noncombustible.

Plenum. An air compartment or chamber to which one or more ducts are connected and that forms part of either the supply or return systems.

Return System. An assembly of connected ducts, air passages, or plenums and fittings through which air from the space or spaces to be conditioned is conducted back to the heat exchanger.

Rooms Large in Comparison with the Size of the Appliance. Rooms having a volume equal to at least 12 times the total volume of the furnace and at least 16 times the total volume of a boiler. The total volume of the furnace or the boiler is determined from exterior dimensions and is to include fan compartments and burner vestibules, where used. Where the actual ceiling height of a room is greater than 8 ft (2.44 m), the volume of a room shall be calculated on the basis of a ceiling height of 8 ft (2.44 m).

Shall. Indicates a mandatory requirement.

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

Supply Systems. An assembly of connected ducts, air passages, or plenums and fittings through which air is conducted from the heat exchanger to the space or spaces to be conditioned.

Chapter 2 System Components

2-1 Supply Systems.

2-1.1 Duct Materials.

2-1.1.1* Supply ducts shall be:

(a) Class 0 or Class 1 rigid or flexible air ducts tested in accordance with UL 181, *Standard for Safety Factory-Made Air Ducts and Air Connectors*; or

(b) Of sheet metal having a nominal thickness as shown in Table 2-1.1.1.

Exception No. 1: Supply ducts that are completely encased in not less than 2 in. (51 mm) of concrete in a floor slab shall not be required to meet the requirements of 2-1.1.1, except within 2 ft (0.61 m) of the furnace supply plenum and within 2 ft (0.61 m) of a vertical connection to a riser or register.

Exception No. 2: Supply ducts for a separate air cooling system, not interconnected to any warm air heating system, serving a single-family dwelling shall not be required to meet the requirements of 2-1.1.1, provided that they are not closer than 2 ft (0.61 m) to any furnace or its supply plenum, boiler, or other heat-producing appliances and that they comply with 2-2.1.1, 2-2.1.3, 2-2.2, 2-2.3, and 2-2.4 as specified for return ducts.

Exception No. 3: Vibration isolation connectors in duct systems shall be made of approved flame-retardant fabric or shall consist of sleeve joints with packing of approved noncombustible material. The fabric shall not exceed 10 in. (254 mm) in length in the direction of airflow.

Exception No. 4: A Class 0 or Class 1 rigid or flexible air duct shall not be used as a vertical air duct that is more than two stories in height.

Exception No. 5: A Class 0 or Class 1 rigid or flexible air duct shall not be used in an air duct containing air at a temperature in excess of 250°F (121°C).

2-1.1.2* Supply ducts shall be installed in conformance with:

(a) The conditions of their listing;

(b) SMACNA *Fibrous Glass Duct Construction Standards*;

(c) SMACNA *HVAC Duct Construction Standards — Metal and Flexible*;

(d) SMACNA *Installation Standards for Residential Heating and Air Conditioning Systems*.

2-1.2 Air Connectors. Air connectors are limited-use, flexible air ducts that shall not be required to conform to the requirements for air ducts, provided they conform to the following provisions:

(a) Air connectors shall conform to the requirements for Class 0 or Class 1 connectors when tested in accordance with UL 181, *Standard for Safety Factory-Made Air Ducts and Air Connectors*.

(b) Class 0 or Class 1 air connectors shall not be used in ducts containing air at temperatures in excess of 250°F (121°C).

(c) An air connector run shall not exceed 14 ft (4.3 m) in length.

(d) Air connectors shall not pass through any wall, partition, or enclosure of a vertical shaft that is required to have a fire resistance rating of 1 hour or more.

(e) Air connectors shall not pass through floors.

2-1.3 Furnace Plenums. Furnace plenums shall be constructed of metal of minimum thickness as shown in Table 2-1.1.1 and located a minimum of 36 in. (914 mm) from the heat exchanger measured along the centerline of airflow. Other plenums shall conform to the requirements for supply ducts.

2-1.4 Use of Underfloor Space as a Supply Plenum. Where heated air is discharged downward into an air chamber that forms a plenum of an underfloor space, the following shall apply:

(a) Use of such spaces shall be restricted to one-story portions of single-family dwellings.

(b) Such spaces shall be cleaned of all combustible material, shall be tightly and substantially enclosed, and shall not be used for storage or habitation.

(c) The enclosing material of the underfloor space, including the sidewall insulation and ground cover, shall not be more flammable than 1-in. (25.4-mm) (nominal) wood boards. Ground cover not complying with this requirement shall be covered over with at least 2 in. (50.8 mm) of sand or other noncombustible material.

(d) Access, if provided to such spaces, shall be through an opening in the floor and shall not be greater than 24 in. x 24 in. (610 mm x 610 mm).

Table 2-1.1.1 Nominal Thickness of Sheet Metal Ducts

Diam. or Width		Galvanized Sheet				Aluminum		Tin Plate	
		Nominal Thickness		Min. Thickness		Thickness		Min. Wt. per base box	
(in.)	(mm)	(in.)	(mm)	(in.)	(mm)	(in.)	(mm)	(lb)	(kg)
Round Ducts and Enclosed Rectangular Ducts:									
14 or less	356 or less	0.016	0.406	0.013	0.330	0.016	0.406	135	61
Over 14	Over 356	0.019	0.483	0.016	0.406	0.020	0.508	—	—
Exposed Rectangular Ducts:									
14 or less	356 or less	0.019	0.483	0.016	0.406	0.020	0.508	—	—
Over 14	Over 356	0.022	0.559	0.019	0.483	0.023	0.584	—	—

(e) Units supplying warm air to such a space shall be equipped with an automatic control that starts the air circulating fan when the air in the unit bonnet reaches a temperature not higher than 150°F (66°C). The automatic control shall not have the capability to be set higher than 150°F (66°C).

(f) Units supplying warm air to such a space shall be equipped with an approved temperature limit control that limits outlet air temperature to 200°F (93°C).

(g) A noncombustible receptacle shall be placed below each floor type, opening into the air chamber. Such receptacles shall conform to the following:

1. The receptacle shall be suspended securely from the floor members and shall not be more than 18 in. (457 mm) below the floor opening.

2. The size of the horizontal projected area of the receptacle shall extend 3 in. (76 mm) beyond the opening.

3. The perimeter of the receptacle shall have a vertical lip at least 1 in. (25.4 mm) high at the open sides if it is at the level of the bottom of the joists, or 3 in. (76 mm) high if the receptacle is suspended.

(h) Floor registers shall be designed for easy removal in order to provide access for cleaning the receptacles.

(i) Exterior walls and interior stud partitions shall be firestopped at the floor.

(j) Each wall register shall be connected to the air chamber with a duct or boot complying with 2-1.1, 3-1.3.1, and 3-1.3.2.

(k) Supply ducts to the air chamber shall comply with the provisions of 2-1.1, 3-1.1, and 3-1.2 and shall terminate approximately under the center of a room above at a distance of not less than 6 ft (1.83 m) from the plenum chamber.

(l)* Furnaces, boilers, or other heat-producing appliances shall not be installed in such a supply plenum.

2-2 Return Systems.

2-2.1 Duct Material.

2-2.1.1 Return ducts shall be permitted to be constructed of metal, of 1-in. (25.4-mm) (nominal) wood boards, or of other suitable material, provided that no material more flammable than 1-in. (25.4-mm) boards shall be used.

Exception: As required by 2-2.1.2.

2-2.1.2 Portions of return ducts directly above the heating surface or closer than 2 ft (0.61 m) from the outer jacket or casing of the heater shall be constructed in accordance with provisions of 2-1.1 for supply ducts.

2-2.1.3 The interior of combustible ducts shall be lined with noncombustible material at points where there might be danger from incandescent particles dropped through the register or heater, such as directly under floor registers and the bottom of vertical ducts or directly under heaters having a bottom return.

2-2.2 Duct Openings. In buildings where vertical openings are required to be enclosed by walls or partitions having a fire resistance rating, openings in the enclosures for connections to vertical ducts carrying return air from more than one story shall be protected by approved fire dampers in such openings.

2-2.3 Continuous Ducts.

2-2.3.1 Return air shall be conducted to the appliance through continuous ducts.

Exception: As permitted in 2-2.3.2 and 2-2.3.3.

2-2.3.2* Underfloor spaces shall be permitted to be used as plenums for return of air from rooms directly above, provided such spaces are cleaned of all combustible material, are tightly and substantially enclosed, and are not used for storage or habitation. Furnaces, boilers, and other heat-producing appliances shall not be installed in such a return plenum.

2-2.3.3 In a single-story residence, the return air shall be permitted to travel through the first floor living space to the return air inlet on the furnace. (*See 4-3.3.*)

2-2.4 Public Corridors. Public corridors shall not be used as a portion of a supply, return, or exhaust air system serving adjoining areas other than toilet rooms, bathrooms, shower rooms, sink closets, and similar auxiliary spaces opening directly on the corridor.

Exception: This requirement shall not prohibit the use of a corridor as:

(a) A source of makeup air through normal leakage around doors for interior exhaust fans in kitchens, appliances, bathrooms, and toilets.

(b) A portion of a smoke control system, subject to the approval of the authority having jurisdiction.

2-2.5 Negative Pressure from Circulating Fan. The return system and circulating fan shall be arranged so that negative pressure from the circulating fan cannot affect the air supply for combustion or act to draw products of combustion from joints or openings in the furnace or flue.

2-3 Common Requirements.

2-3.1* Duct Coverings and Linings.

2-3.1.1 Duct coverings (*see definition in Section 1-3*), duct linings (*see definition in Section 1-3*), and tapes used in duct systems shall have a maximum flame spread index of 25 without evidence of continued progressive combustion and a maximum smoke developed index of 50. If coverings and linings are to be applied with adhesives, they shall be tested as applied with such adhesives, or the adhesives used shall have a maximum flame spread index of 25 and a maximum smoke developed index of 50 when in the final dry state.

Exception: These requirements shall not apply to duct coverings (see definition in Section 1-3) where they are located entirely outside of a building, do not penetrate a wall or roof, and do not create an exposure hazard.

2-3.1.2 Duct coverings and linings shall not flame, glow, smolder, or smoke when tested in accordance with ASTM C 411, *Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation*, at the temperature to which it is exposed in service. In no case shall the test temperature be below 250°F (121°C).

2-3.1.3 Appliances, such as fan coil units, self-contained air conditioning units, and furnaces, shall be considered to meet the requirements of 2-3.1.1 if they are listed. Unlisted solar energy air distribution system components shall be

accompanied by supportive information indicating that their flame spread and smoke developed characteristics are not in excess of those of the duct system to which they are connected.

2-3.1.4 Duct coverings shall not extend through walls or floors required to be firestopped or required to have a fire resistance rating.

2-3.1.5 Duct coverings and linings shall be interrupted at the immediate area of operation of heat sources in a duct system involving electric resistance, fuel-burning heaters, or heat exchangers connected to solar energy collection systems and shall be in accordance with the manufacturer's instructions.

Exception: Solar energy heat exchangers incapable of creating sustained operating temperatures higher than 200°F (93°C).

2-3.1.6 Duct coverings shall not conceal any service opening.

Exception: Where a label is permanently attached to the covering indicating the exact location of the opening.

2-3.2* Joints. Joints and seams shall be fastened securely and made substantially airtight. Slip joints shall have a lap of at least 1 in. (25.4 mm) and shall be fastened individually (*see Figure 2-3.2*). Tape shall be permitted to be used for sealing joints but, where exposed to the air in the system, it shall not be more combustible than fabric complying with NFPA 701, *Standard Methods of Fire Tests for Flame-Resistant Textiles and Films*.

Closure systems for use with rigid air ducts tested in accordance with UL 181, *Standard for Safety Factory-Made Air Ducts and Air Connectors*, shall have been tested and listed in accordance with UL 181A, *Standard for Safety Closure Systems for Use with Rigid Air Ducts and Air Connectors*, and used in conformance with the conditions of the listing.

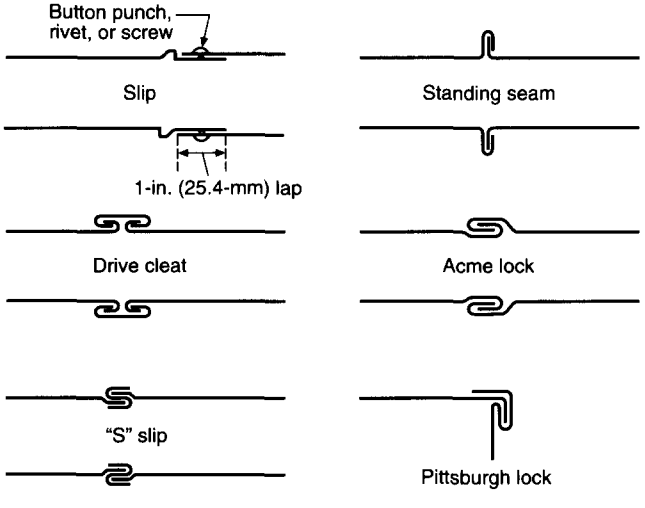


Figure 2-3.2 Types of duct joints.

2-3.3 Duct Hangers. Ducts shall be supported securely by metal hangers, straps, lugs, or brackets. No nails shall be driven through the duct walls, and no unnecessary holes shall be cut therein.

2-3.4 Protection of Vertical Ducts. Where vertical ducts are installed within closets or rooms, they shall be enclosed with materials equivalent to those used in the closet or room construction. (*See 3-1.3.*)

2-3.5 Registers for Ducts and Plenums.

2-3.5.1 Registers shall be constructed of metal or shall conform with the following:

(a) Registers shall be made of a material classified as 94 HB when tested as described in UL 94, *Standard for Safety Test for Flammability of Plastic Materials for Parts in Devices and Appliances*.

(b) Floor registers shall resist, without structural failure, a 200-lb (90.7-kg) concentrated load on a 2-in. (51-mm) diameter disc applied to the most critical area of the exposed face of the register. For this test, the register shall be at a temperature not less than 165°F (74°C) and shall be supported in accordance with the manufacturer's instructions.

2-3.5.2 Electric or fuel-fired furnace systems shall have at least one register or grill without a closable shutter, and the duct leading thereto shall be without a damper.

Exception: Where dampers and shutters cannot shut off more than 80 percent of the duct area.

2-3.5.3 Fittings connecting the registers to the duct system shall be constructed of metal or material that complies with the requirements of Class 0, Class 1, or Class 2 ducts in UL 181, *Standard for Safety Factory-Made Air Ducts and Air Connectors*.

2-3.6 Pipeless Furnace Registers. Where registers are installed in the floor over the furnace (as in the case of a "pipeless" furnace) the register box shall be of double-walled construction with an air space not less than 4 in. (102 mm) between.

Exception: Where the warm air passage is surrounded by a cold air passage.

2-3.7 Use of Concealed Ceiling Spaces as Supply or Return Plenums. Where concealed ceiling spaces are to be used for air chambers or plenums, the following shall apply:

(a) Such installations shall be limited to detached single-family dwellings, and no concealed ceiling space plenum shall serve more than one story of such a residence. This shall not preclude separate installations on each floor.

(b) The concealed space plenum shall be separated from any other concealed spaces and shall be enclosed completely with construction not more flammable than 1-in. (25.4-mm) (nominal) wood boards.

(c) Such spaces shall not be used for storage.

(d) No ventilating system shall discharge into such spaces.

(e) Units supplying such spaces shall be designed to limit the temperature of the air discharged into the supply plenum or chamber to 165°F (74°C).

(f) Where units incorporate heating elements, heated surfaces, or combustion chambers that develop temperatures higher than 165°F (74°C), such components shall be shielded to prevent direct radiation onto combustible material when the unit is installed.

(g) The installation of the unit supplying such spaces shall not produce negative pressure in the attic where the attic is the source of air for combustion for fuel-fired equipment.

Chapter 3 Fire Integrity of Building Construction

3-1 Clearances to Combustible Material.

3-1.1 General. Where ducts are adjacent to plaster on metal lath, or to other noncombustible finish attached to a combustible material, the clearance shall be measured to the combustible material.

Exception No. 1: The clearance shall be measured to the surface of the plaster or other noncombustible finish where a clearance of 2 in. (51 mm) or less is specified above a bonnet or plenum chamber or above supply ducts. This shall not be construed to prohibit the closure of openings with noncombustible material where ducts pass through walls and partitions, as provided in 3-1.2.

Exception No. 2: Where an appliance, ductwork, or chimney or vent connection is listed for different clearances, the listed clearances shall apply.

3-1.2 Clearances from Horizontal Supply Ducts. Minimum clearances from horizontal supply ducts shall be as follows:

(a) Within a distance of 3 ft (0.91 m) of the plenum of a system classified under A, C, or G of Table 3-1.3.1, the clearance shall be not less than that specified above the bonnet or plenum.

(b) Within a distance of 6 ft (1.83 m) of the plenum of a system classified under B or D of Table 3-1.3.1, the clearance shall be not less than 6 in. (152 mm). From ducts of furnaces classified under D, the clearance shall be not less than 1 in. (25.4 mm) beyond 6 ft (1.83 m) from the plenum to a point where there is a change in direction equivalent to 90 degrees or more.

(c) From ducts of furnaces classified under Item F of Table 3-1.3.1, the clearance shall be not less than 18 in. (457 mm) up to 3 ft (0.91 m) from the bonnet or plenum, not less than 6 in. (152 mm) for 3 ft to 6 ft (0.91 m to 1.83 m), and not less than 1 in. (25.4 mm) beyond 6 ft (1.83 m).

(d) Beyond the distances from the plenum or change in direction specified in 3-1.2(a) and (b), no clearance shall be required.

(e) Where a horizontal supply duct passes through or pierces a partition or enclosure constructed of combustible material, within the distances, or point of change in direction specified in 3-1.2(a), (b), and (c), the clearance shall be not less than that specified in those paragraphs. The ends of the space providing this clearance shall be permitted to be closed with a thimble and collar, or the wall surfaces shall be extended to the duct with noncombustible building material such as plaster on metal lath. [*See Figures 3-1.2(a) and (b).*]

(f) Separate air-cooling system ducts that are made of other than noncombustible material shall be installed with clearances to warm air ducts as required in 3-1.2(a), (b), and (c).

3-1.3 Clearances from Vertical Ducts, Risers, Boots, and Register Boxes.

3-1.3.1 Where a duct, riser, boot, or box on a system that does not require 18 in. (457 mm) clearance above the supply plenum or bonnet enters a floor, partition, or enclosure constructed of combustible material within the distances from the plenum specified in 3-1.2(a) and (b), the clearance from such duct, riser, or boot shall be not less than the distance required above the furnace bonnet or plenum (*see Table 3-1.3.1*), or the duct shall change in a direction equivalent to at least two 90-degree turns before entering such floor, partition, or enclosure. These requirements do not apply to pipeless furnaces as specified in 2-3.6.

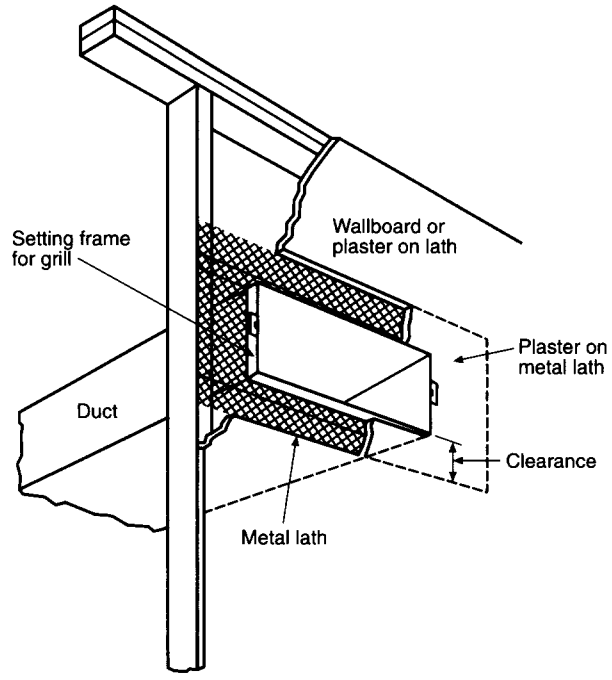


Figure 3-1.2(a) An arrangement for closing ends of clearance space around a supply duct. A similar arrangement can be used where a duct continues through the partition.

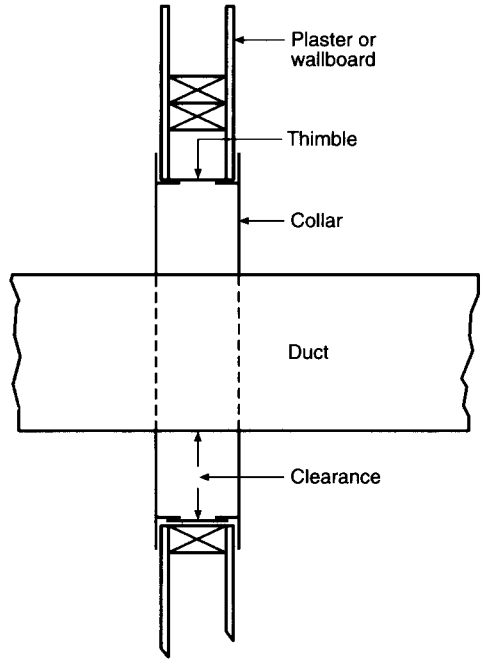


Figure 3-1.2(b) An arrangement for passing ducts through combustible walls or partitions as specified in 3-1.2(e).

Table 3-1.3.1 Clearances to Combustible Material for Furnaces, Boilers, Solar Energy Heating Devices, and Heat Exchangers Installed in Rooms that are Large in Comparison with Size of Appliance

	Minimum Clearance									
	Above & Sides of Bonnet or Plenum		Jacket Sides & Rear		Front[1]		Projecting Flue Box or Draft Hood		Chimney or Vent Connector	
	(in.)	(mm)	(in.)	(mm)	(in.)	(mm)	(in.)	(mm)	(in.)	(mm)
A. Listed automatically fired, forced air or gravity system with 250°F (121°C) temperature limit control:										
Burning liquid fuel	2[2]	51	6	152	24	610	18	457	18	457
Burning gas fuel	2[2]	51	6	152	18	457	6	152	6	152
Utilizing electricity	2[2]	51	6	152	18	457	—	—	—	—
B. Unlisted automatically fired, forced air or gravity system with temperature limit control that cannot be set higher than 250°F (121°C):										
Burning liquid fuel	6	152	6	152	24	610	18	457	18	457
Burning gas fuel	6	152	6	152	18	457	18[3]	457	18[3]	457
Utilizing electricity	6	152	6	152	18	457	—	—	—	—
C. Steam or hot water heat exchanger — steam not over 15 psi (103 kPa) pressure and hot water not more than 250°F (121°C).	2	51	2	51	2	51	—	—	—	—
D. Automatically stoker-fired, forced air system equipped with 250°F (121°C) temperature limit control with a barometric draft control in accordance with footnote 4:										
Burning solid fuel	6	152	6	152	48	1219	18	457	18	457
E. Heating boilers used in central warm air heating systems — steam boiler operating at not over 15 psi (103 kPa) gauge pressure and hot water boilers operating at not in excess of 250°F (121°C) of the water-wall type or having a jacket or lining of masonry or other satisfactory material:										
Burning liquid fuel	6[5]	152	6	152	24	610	18	457	18	457
Burning gas fuel	6[5]	152	6	152	18	457	9[6]	229	9[6]	229
Burning solid fuel	6[5]	152	6	152	48	1219	18	457	18	457
Utilizing electricity	6[5]	152	6	152	18	457	—	—	—	—
F. Furnaces and heating boilers used in central warm air heating systems, other than above:										
Burning liquid fuel	18	457	18	457	48	1219	18	457	18	457
Burning gas fuel	18	457	18	457	18	457	18[3]	457	18[3]	457
Burning solid fuel	18	457	18	457	48	1219	18	457	18	457
G. Solar energy heat exchangers operating at a temperature not in excess of 250°F (121°C).	2[7]	51	2[7]	51	2[7]	51	—	—	—	—

[1] Front clearance shall be sufficient for servicing the burner and furnace or boiler.
[2] This clearance shall be permitted to be reduced to 1 in. (25.4 mm) for a listed forced air or gravity furnace equipped with a limit control that limits outlet air temperatures to 200°F (93°C).
[3] For unlisted gas appliances equipped with an approved draft hood, this clearance shall be permitted to be reduced to 9 in. (229 mm).
[4] Barometric draft control operated by draft intensity and permanently set to limit the draft to a maximum intensity of 0.13 in. (32.4 Pa) of water gauge.
[5] This clearance is above top of boiler.
[6] This clearance shall be permitted to be reduced to 6 in. (152 mm) for listed gas burning furnaces and boilers.
[7] This clearance also shall apply to ducts from solar collectors to heat exchangers or thermal storage systems.

3-1.3.2 Where a supply duct enters the floor of the first story above that story on which the furnace is located, the space around the duct at such points shall be sealed with noncombustible material.

3-1.3.3 Where a duct, riser, boot, or box on a system that requires 18 in. (457 mm) of clearance above the supply plenum or bonnet enters a floor, partition, or enclosure constructed of combustible material within a horizontal distance of 6 ft (1.83 m) of the furnace, the duct shall be arranged so that heated air travels at least 6 ft (1.83 m) from the closest primary heating surface and changes direction equivalent to at least one 90-degree turn before entering such a floor, partition, or enclosure.

3-1.3.4 Where a duct, riser, boot, or box on a system that requires 18 in. (457 mm) of clearance above the supply plenum or bonnet enters the floor of the first story above that story on which the furnace is situated, the clearance shall be at least $^3/_{16}$ in. (4.76 mm) from all combustible material in the floor construction.

Exception: Where the duct is of double-wall construction with a continuous air space of not less than $^3/_{16}$ in. (4.76 mm) between the inner and outer walls.

3-1.3.5 Where a duct or riser on a system that requires 18 in. (457 mm) of clearance above the supply plenum or bonnet is enclosed in a partition, wall, or concealed space,

constructed in whole or in part of combustible material, the following shall apply:

(a) It shall be installed with an air space of not less than $^3/_{16}$ in. (4.76 mm) between the duct and combustible material; or

Exception: Where a noncombustible insulating covering of the cellular type at least $^1/_8$ in. (3.175 mm) thick is provided using metal lath and plaster partitions, no air space shall be required except from wood studs.

(b) Such duct shall be double-walled with a continuous air space of not less than $^3/_{16}$ in. (4.76 mm) between the inner and outer walls.

3-1.3.6 Where a register on a system that requires 18 in. (457 mm) of clearance above the supply plenum or bonnet is placed in a floor or wall constructed of combustible material, the register box shall be installed with a clear space of not less than $^3/_{16}$ in. (4.76 mm) between the top and sides of the box and any combustible material.

3-1.4 Clearances from Furnaces, Boilers, Heat Exchangers, Heat Pumps, and Cooling Units.

3-1.4.1 Minimum clearances from furnaces, boilers, heat exchangers and their flue box, draft hood, or chimney or vent connectors installed in rooms that are large in comparison with the size of the appliance shall be as specified in Table 3-1.3.1.

Exception: As provided in 3-1.1 and 3-1.4.2.

3-1.4.2 Heating furnaces and boilers used in residence-type central warm air heating systems shall be permitted to be installed in rooms that are large in comparison with the size of the appliance with clearances reduced as designated in Table 3-1.4.2 where combustible material is protected in the manner specified.

Exception: The reductions specified in Table 3-1.4.2 shall not apply to installations in alcoves or closets.

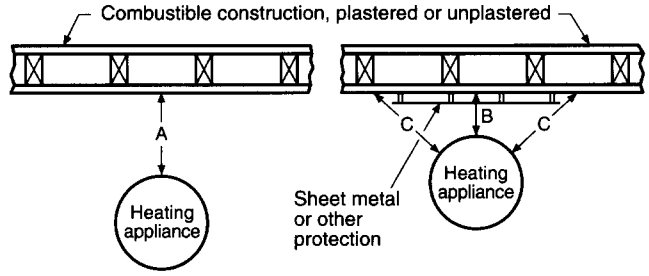
3-1.4.3 Furnaces and boilers used in residence-type central warm air heating systems shall not be installed in a confined space such as an alcove or closet.

Exception: Furnaces and boilers specifically approved for such installations, where installed in compliance with the approval and with the clearances from the walls and ceiling of the alcove or closet not less than specified, regardless of the type of construction.

3-1.4.4 Cooling units, heat pumps, and equipment involving furnaces, boilers, or electric resistance heating shall not be installed in an attic or in any other space in the building construction used as a supply or return plenum.

Exception: Cooling units, heat pumps, and heating equipment shall be permitted to be installed in such a supply or return plenum where specifically approved for such use as a result of tests and listing by an approved testing laboratory. Such units or equipment shall be installed in accordance with the conditions of such approval.

3-1.4.5 Furnaces, boilers, heat exchangers, heat pumps, solar energy system components, and air conditioning and cooling units shall be installed to provide reasonable accessibility for cleaning heating surfaces, removing and replacing burners, motors, compressors, controls, air filters, draft regulators, and other working parts, and for adjusting, cleaning, and lubricating parts requiring such attention.

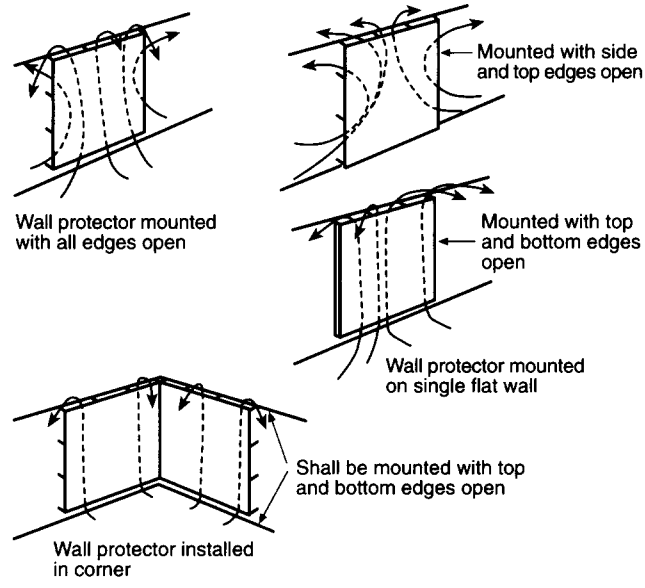


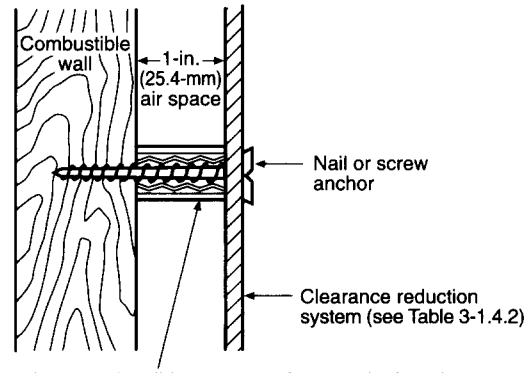
"A" equals the required clearance with no protection specified in Table 3-1.3.1.

"B" equals the reduced clearance permitted in accordance with Table 3-1.4.2.

The protection applied to construction using combustible material shall be required to extend far enough in each direction so that "C" equals "A."

Figure 3-1.4.2(a) Sheet metal or other protection to reduce required clearance from heating appliance.





1-in. (25.4-mm) noncombustible spacer such as stacked washers, small-diameter pipe, tubing, or electrical conduit.

Masonry walls shall be permitted to be attached to combustible walls using wall ties.

Spacers shall not be used directly behind appliance or connector.

Figure 3-1.4.2(b) Wall protector clearance reduction system.

Table 3-1.4.2 Reduction of Clearances with Specified Forms of Protection

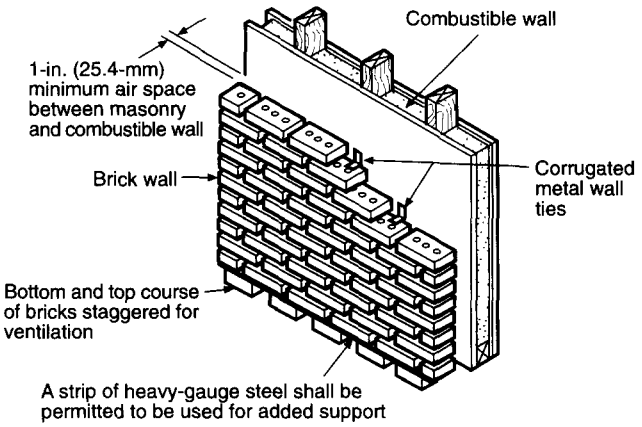
	Required Clearance with No Protection from Appliance and Vent Connector for Single Wall Metal Pipe																	
	36 in. (914 mm)				18 in. (457 mm)				12 in. (305 mm)				9 in. (229 mm)				6 in. (52 mm)			
Type of Protection	Allowable Clearance with Specified Protection																			
Applied to and covering all surfaces of combustible material within the distance specified as the required clearance with no protection.	Above		Sides & Rear		Above		Sides & Rear		Above		Sides & Rear		Above		Sides & Rear		Above		Sides & Rear	
	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
(a) 3½-in. (89-mm) thick masonry wall without ventilated air space	—	—	24	610	—	—	12	305	—	—	9	229	—	—	6	152	—	—	5	122
(b) ½-in. (12.7-mm) insulation board over 1-in. (25.4-mm) glass fiber or mineral wool batts	24	610	18	457	12	305	9	229	9	229	6	52	6	152	5	122	4	102	3	76
(c) 0.024-in. (0.6-mm) (24-gauge) sheet metal over 1-in. (25.4-mm) glass fiber or mineral wool batts reinforced with wire on rear face, with ventilated air space	18	457	12	305	9	229	6	52	6	52	4	102	5	122	3	76	3	76	3	76
(d) 3½-in. (89-mm) thick masonry wall with ventilated air space	—	—	12	305	—	—	6	52	—	—	6	52	—	—	6	152	—	—	6	152
(e) 0.024-in. (0.6-mm) (24-gauge) sheet metal with ventilated air space	18	457	12	305	9	229	6	52	6	52	4	102	5	122	3	76	3	76	2	51
(f) ½-in. (12.7-mm) insulation board with ventilated air space	18	457	12	305	9	229	6	52	6	52	4	102	5	122	3	76	3	76	3	76
(g) 0.024-in. (0.6-mm) (24-gauge) sheet metal with ventilated air space over 0.024-in. (0.6 mm) (24-gauge) sheet metal with ventilated air space	18	457	12	305	9	229	6	52	6	52	4	102	5	122	3	76	3	76	3	76
(h) 1-in. (25.4-mm) glass fiber or mineral wool batts sandwiched between two sheets 0.024-in. (0.6-mm) (24-gauge) sheet metal with ventilated air space	18	457	12	305	9	229	6	52	6	52	4	102	5	122	3	76	3	76	3	76

NOTE 1: Reduction of clearances from combustible materials shall not interfere with combustion air, draft hood clearance and relief, and accessibility of servicing.
NOTE 2: All clearances shall be measured from the outer surface of the combustible material to the nearest point on the surface of the appliance, disregarding any intervening protection applied to the combustible material.
NOTE 3: Spacers and ties shall be of noncombustible material. No spacer or tie shall be used directly opposite an appliance or connector.
NOTE 4: With all clearance reduction systems using a ventilated air space, adequate provision for air circulation shall be provided as described. [*See Figures 3-1.4.2(b) and (c).*]
NOTE 5: There shall be at least 1 in. (25.4 mm) of clearance between the reduction system and combustible walls and ceilings for reduction systems using ventilated air space.
NOTE 6: If a wall protector is mounted on a single flat wall away from corners, adequate air circulation shall be permitted to 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.
NOTE 7: Mineral wool batts (blanket or board) shall have a minimum density of 8 lb/ft^3 (128 kg/m^3) and a minimum melting point of 1500°F (816°C).
NOTE 8: Insulation material used as part of the clearance reduction system shall have a thermal conductivity of 1.0 (Btu–in.)/(ft^2–hr–°F) or less.
NOTE 9: There shall be at least 1 in. (25.4 mm) between the appliance and the protector. In no case shall the clearance between the appliance and the combustible surface be reduced below that permitted by the table.
NOTE 10: All clearances and thicknesses are minimum; larger clearances and thicknesses shall be permitted.

3-2 Firestopping.

3-2.1 Where the installation of ducts in walls, floors, or partitions necessitates the removal of any firestopping, the spaces around the duct at such points where firestopping was removed shall be sealed with noncombustible insulating material.

3-2.2 Where spaces between studs in walls or partitions are used as return ducts, the portions of such spaces so used shall be cut off from all remaining unused portions by tight-fitting stops of sheet metal or of wood of not less than 2 in. (51 mm) (nominal) thickness. Such spaces shall not be used as a supply duct.



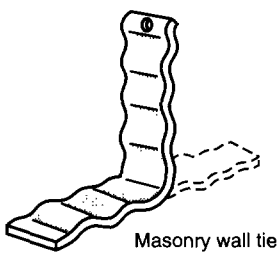


Figure 3-1.4.2(c) Masonry clearance reduction system.

Chapter 4 Equipment, Wiring, and Controls

4-1 Equipment.

4-1.1 Heating Panels.

4-1.1.1 Air chambers having one or more external surfaces designed for use as heating panels shall be used only with the following:

(a) Automatically fired gas-burning or oil-burning forced warm air systems equipped with temperature limit controls that limit furnace outlet air temperature to 200°F (93°C); or

(b) Forced warm air systems equipped with heat exchangers utilizing steam that cannot exceed 15 lb (103 kPa) gauge pressure or hot water that cannot exceed a temperature of 250°F (121°C).

4-1.1.2 Connection. Heating panels shall be connected to supply and return air ducts conforming to this standard.

4-1.1.3 Construction.

(a) Where the warm air supply is from a warm air furnace, heating panels shall be enclosed on all sides with material that is wholly noncombustible or that possesses a flame spread classification of not over 25 as determined in accordance with NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials*. This enclosing material shall be attached securely to the building structure; joints and seams shall be substantially airtight. Braces and hangers inside the chamber shall be noncombustible.

(b) Where the warm air supply is from a steam or hot water heat exchanger, heating panels shall either comply with 4-1.1.3(a) or shall be enclosed on all sides with material not more flammable than 1-in. (25.4-mm) (nominal) wood boards. This enclosing material shall be attached securely to the building structure; joints and seams shall be substantially airtight. No single vertical heating panel shall serve more than one story.

4-1.2 Down-Flow Systems.

4-1.2.1 General. Down-flow heating equipment shall be designed or equipped so that the outlet air temperature shall not exceed 200°F (93°C).

Exception: For systems installed under the provisions of 2-3.7, the outlet air temperature shall be limited to 165°F (74°C).

4-1.2.2 Equipment shall be designed to prevent unsafe temperature in the event of reverse flow or fan failure.

4-1.3 Air Filters.

4-1.3.1 Air filters shall have either a Class 1 or Class 2 rating in accordance with UL 900, *Standard for Safety Air Filter Units*, 1994.

4-1.3.2 An evaporative cooler containing a combustible filter and water evaporation medium, such as excelsior, shall not be used.

4-1.3.3 Liquid adhesive coatings used on filters shall have a flash point not less than 325°F (163°C) in accordance with ASTM D 93, *Standard Test Methods for Flash Point by Pensky–Martens Closed Cup Tester*.

4-1.4 Air-Cooling Equipment. Mechanical refrigeration used with air duct systems shall be installed in accordance with ANSI/ASHRAE 15, *Safety Code for Mechanical Refrigeration*.

4-1.4.1 Evaporative coolers containing a combustible evaporating medium, such as excelsior, shall not be used. This requirement does not preclude the use of evaporation media meeting the requirements of 4-1.3.1.

4-1.5 Furnaces Used with Cooling Units.

4-1.5.1 Combination units in which a refrigeration coil is provided shall have the refrigeration coil located downstream from the heating furnace, or the coil shall be located parallel to the heating furnace.

Exception: Where the heating furnace is specifically approved for installation downstream from the coil.

4-1.5.1.1 Where the heating furnace is located upstream from the coil, the coil shall be designed or equipped to prevent the development of excessive temperatures or pressures. In those cases where the coil is located parallel to the heating furnace, dampers or other means used to control the flow of air shall be adequate to prevent chilled air from entering the furnace section. Adequate means shall be provided for the disposal of condensate and to prevent dripping of condensate on the heating element.

Exception: Manually operated dampers shall not be required to be provided with means to prevent operation of either unit, provided the damper is in the full heat or cool position.

4-1.5.2 Furnaces (including duct furnaces) shall be permitted to be installed downstream from evaporative coolers or air washers, provided that the condensate cannot fall into any portion of burners, pilots, or burner carryover arms and

provided that the heating element is made of corrosion-resistant material, such as stainless steel, ceramic-coated steel, or an aluminum-coated steel in which the bond between the steel and the aluminum is an iron-aluminum alloy.

4-1.5.3 Air washers operating with chilled water that delivers air below the dew point of the ambient air at the appliance shall be considered as refrigeration systems.

4-1.5.4 The capacity of the blower shall be adequate to overcome the external static resistance imposed by the combined heating and cooling units at the air throughput required for heating or cooling, whichever is greater.

4-1.6 Boilers Used with Cooling Units.

4-1.6.1 Where the same coil is used for both heating and cooling, valves shall be provided to prevent chilling of the boiler during the operation of the cooling system.

4-1.6.2 Where hot water heating boilers are connected to heating coils located in air-handling units and where they are exposed to refrigerated air circulation, such boiler piping systems shall be equipped with flow control valves or other automatic means to prevent gravity circulation of the boiler water during the cooling cycle.

4-1.7 Heat Pump Systems. Heat pump systems involving units or equipment installed in attics or in a space in the building construction used as a supply or return plenum shall conform to the appropriate provisions of 2-3.7 and 3-1.4.

4-1.8 Solar Systems.

4-1.8.1 Solar systems or solar assisted systems shall be designed, constructed, and controlled so that the air temperature in the supply system shall not exceed 250°F (121°C).

4-1.8.2 A flammable or combustible heat transfer fluid from a solar energy system shall not be used in a heat exchanger located in a duct system.

4-2 Electric Wiring and Equipment. Electric wiring and equipment shall be adequate for safe operation and shall be installed in accordance with NFPA 70, *National Electrical Code®*. In addition, a disconnecting means shall be installed within sight and easy reach in the ungrounded leads of each power circuit to electrically operated components that are in unprotected locations and in other locations not readily accessible for service.

4-3 Controls.

4-3.1 Temperature Limit Controls. Temperature limit controls shall be of a listed type and shall be such that they cannot be set higher than a specified temperature setting and shall be located no more than 2 ft (0.61 m) downstream from the heat exchanger.

4-3.2 Fan Control for Stoker-Fired Furnaces. Where a warm air furnace equipped with a fan to circulate the air is stoker-fired, it also shall be equipped with an automatic overrun control to start the fan when the air in the furnace bonnet or at the beginning of the main supply duct at a point not affected by radiated heat reaches a temperature not higher than 200°F (93°C) after the stoker and fan (in its normal operation) have been shut down as a result of a satisfied thermostat. If a manual disconnect is installed in the air circulating fan electrical circuit, it shall be installed to deenergize both the fan and the stoker simultaneously.

4-3.3* Air for Combustion and Ventilation. Heating appliances shall be installed in a location in which the facilities for ventilation allow satisfactory combustion and proper ventilation under normal conditions of operation and use.

4-3.4 Thermostatically Controlled, Hand-Fired, Solid-Fuel Burning Furnaces. Hand-fired, solid-fuel burning furnaces on which the furnace draft is controlled by a thermostat shall be equipped with the following:

(a) A fail-safe 250°F (121°C) limit control installed not more than 10 in. (254 mm) above the top surface of the heat exchanger in a supply plenum that extends at least 12 in. (305 mm) above the top surface of the heat exchanger; and

(b) A barometric draft control operated by draft intensity and permanently set to limit the draft to a maximum intensity of 0.13 in. (32.4 Pa) of water gauge. A fail-safe limit control is a limit control that automatically checks the furnace in the event of power failure or shutoff or that automatically checks the furnace when a temperature of 250°F (121°C) is reached, whether or not power is available.

4-3.5 Air-Circulating Fan Controls. Where a hand-fired, solid-fuel burning furnace is equipped with a fan to circulate the air, it shall be equipped with fan controls as required for stoker-fired furnaces by 4-3.2.

4-3.6 Accessory Equipment. Material used in the construction of accessory equipment attached to or installed in a supply or return system shall comply with the requirements for the materials of that portion of the system to which it is attached. This shall not preclude the attachment to a plenum or duct of small devices, such as humidifiers, specifically listed for such use. Motors and electrical wiring and equipment shall comply with Section 4-2.

Chapter 5 Referenced Publications

5-1 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.

5-1.1 NFPA Publications. National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101.

NFPA 70, *National Electrical Code*, 1996 edition.

NFPA 90A, *Standard for the Installation of Air Conditioning and Ventilating Systems*, 1996 edition.

NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials*, 1996 edition.

NFPA 701, *Standard Methods of Fire Tests for Flame-Resistant Textiles and Films*, 1996 edition.

5-1.2 Other Publications.

5-1.2.1 ANSI/ASHRAE Publication. American National Standards Institute, 1430 Broadway, New York, NY 10018.

ANSI/ASHRAE 15, *Safety Code for Mechanical Refrigeration*, 1994.

5-1.2.2 ASTM Publications. American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

ASTM C 411, *Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation*, 1982.

ASTM D 93, *Standard Test Methods for Flash Point by Pensky–Martens Closed Cup Tester*, 1994.

ASTM E 136, *Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 Degrees C*, 1994.

5-1.2.3 SMACNA Publications. Sheet Metal and Air Conditioning Contractors' National Association, Inc., 4201 Lafayette Center Drive, Chantilly, VA 22021-1209.

Fibrous Glass Duct Construction Standards, 6th edition, 1992.

HVAC Duct Construction Standards—Metal and Flexible, 1st edition, 1985.

Installation Standards for Residential Heating and Air Conditioning Systems, 6th edition, 1988.

5-1.2.4 UL Publications. Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062.

UL 94, *Standard for Safety Test for Flammability of Plastic Materials for Parts in Devices and Appliances*, 1991.

UL 181, *Standard for Safety Factory-Made Air Ducts and Air Connectors*, 1994.

UL 181A, *Standard for Safety Closure Systems for Use with Rigid Air Ducts and Air Connectors*, 1994.

UL 900, *Standard for Safety Air Filter Units*, 1994.

Appendix A Explanatory Material

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

A-1-1 For other types of systems, see NFPA 90A, *Standard for the Installation of Air Conditioning and Ventilating Systems*. For installation of blower and exhaust systems, see NFPA 91, *Standard for Exhaust Systems for Air Conveying of Materials*. For removal of smoke and grease-laden vapors from commercial cooking equipment, see NFPA 96, *Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations*.

A-1-3 Approved. 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.

A-1-3 Authority Having Jurisdiction. 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.

A-1-3 Listed. 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.

A-2-1.1.1 Air duct materials are classified in UL 181, *Standard for Safety Factory-Made Air Ducts and Air Connectors*, as follows:

Class 0 — Air duct materials having a fire hazard classification of zero (flame spread and smoke developed).

Class 1 — Air duct materials having a flame spread rating of not over 25 without evidence of continued progressive combustion and a smoke developed rating of not over 50.

A-2-1.1.2 See NAIMA *Fibrous Glass Duct Construction Standard* for additional information.

A-2-1.4(l) Additional information can be found in NFPA 31, *Standard for the Installation of Oil-Burning Equipment*, and NFPA 54, *National Fuel Gas Code*.

A-2-2.3.2 Additional information can be found in NFPA 31, *Standard for the Installation of Oil-Burning Equipment*, and NFPA 54, *National Fuel Gas Code*.

A-2-3.1 See NAIMA *Fibrous Glass Duct Liner Standard* for additional information.

A-2-3.2 Additional information can be found in the category "Fabrics" in the *Building Materials Directory*, published by Underwriters Laboratories Inc.

A-4-3.3 Additional information can be found in NFPA 31, *Standard for the Installation of Oil-Burning Equipment*, and NFPA 54, *National Fuel Gas Code*.

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 31, *Standard for the Installation of Oil-Burning Equipment*, 1992 edition.

NFPA 54, *National Fuel Gas Code*, 1996 edition.

NFPA 90A, *Standard for the Installation of Air Conditioning and Ventilating Systems*, 1996 edition.

NFPA 91, *Standard for Exhaust Systems for Air Conveying of Materials*, 1995 edition.

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

B-1.2 Other Publications.

B-1.2.1 NAIMA Publications. North American Insulation Manufacturers Association, 44 Canal Center Plaza, Suite 310, Alexandria, VA 22714.

Fibrous Glass Duct Construction Standard, 2nd edition, 1993.

Fibrous Glass Duct Liner Standard, 1st edition, 1994.

B-1.2.2 UL Publications. Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062.

UL 181, *Standard for Safety Factory-Made Air Ducts and Air Connectors*, 1994.

UL *Building Materials Directory*, 1995.

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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.