NFPA No.

90B

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RESIDENCE TYPE

WARM AIR HEATING & AIR CONDITIONING 1968

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Official NFPA Definitions

Adopted Jan. 23, 1964. Where variances to these definitions are found, efforts to eliminate such conflicts are in process.

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Units of Measurements

Units of measurements used here are U. S. standard. 1 U. S. gallon = 0.83 Imperial gallons = 3.785 liters. One foot = 0.3048 meters. One inch = 25.40 millimeters. One pound per square inch = 0.06805 atmospheres = 2.307 feet of water. One pound = 453.6 grams.

Standard for the Installation of

Residence Type Warm Air Heating and Air Conditioning Systems

NFPA No. 90B — 1968

1968 Edition of No. 90B

This edition of NFPA No. 90B with revisions recommended by the Committee on Air Conditioning and adopted by the Association on May 20, 1968, supersedes the 1965 edition. Prior to 1955, the subject of the present standard was Part II of the Standard on Air Conditioning, No. 90.

The following is a summary of the 1968 changes to the Standard incorporated in this edition.

Section 101 has been revised.

In 110, a new definition of "Air Filter" has been added.

Par. 121d has been revised.

A new second sentence has been added to 191.

Origin and Development of No. 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, No. 91. 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, and 1968.

For Standard for the Installation of Air Conditioning and Ventilating Systems see NFPA No. 90A.

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SCOPE: 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.

†Nonvoting.

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Standard for the Installation of Residence Type Warm Air Heating and Air Conditioning Systems

NFPA No. 90B — 1968

100. Application and Scope.

101. This standard applies to residence type central warm air heating and cooling systems including separate air cooling systems, combination heating and air conditioning systems, and to heat pump systems serving:

a. One or two family dwellings; or

b. Spaces not exceeding 25,000 cu. ft. in volume, in other occupancies.

NOTE: For other type systems, see Standard for the Installation of Air Conditioning and Ventilating Systems, NFPA No. 90A. For installation of Blower and Exhaust systems see NFPA No. 91. For Ventilation of Restaurant Cooking Equipment see NFPA No. 96.

102. This standard is intended to prescribe reasonable provisions based on minimum requirements for safety to life and property. It does not attempt to establish a procedure or code for the design of warm air heating or air conditioning systems from the standpoint of performance.

110. Definitions.

a. AIR FILTER. A Class 1 air filter is one which, when clean, does not contribute fuel when attacked by flame and emits only negligible amounts of smoke when tested by the method of Underwriters' Laboratories, Inc., Standard 900, September 1965.

A Class 2 air filter is one which, when clean, burns moderately when attacked by flame or emits moderate amounts of smoke, or both when tested by the method of Underwriters' Laboratories, Inc., Standard 900, September 1965.

b. CENTRAL WARM AIR HEATING SYSTEM. A heating system consisting of a heat exchanger with an outer casing or jacket, or an electric heating unit, connected to a supply system and a return system.

c. COMBUSTIBLE MATERIAL. Material made of or surfaced with wood, compressed paper, plant fibers or other material that will ignite and burn, whether flameproofed or not, or whether plastered or unplastered.

d. FORCED AIR SYSTEM. A central warm air heating system that is equipped with a fan or blower which provides the primary means for circulation of air.

e. GRAVITY SYSTEM. A central warm air heating system through which air is circulated by gravity. It may also use an integral fan or blower that is used only to overcome the internal furnace resistance to air flow.

f. 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.

g. HEAT PUMP. A refrigeration system arranged to accomplish either heating or cooling.

h. LISTED. Included in a list published by an approved nationally recognized testing agency*, that is qualified and equipped for experimental testing, and maintains an adequate periodic inspection of current production of listed models and whose listing states either that the device complies with nationally recognized safety requirements or has been tested and found safe for use in a specified manner.

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

j. RETURN SYSTEM. An assembly of connected ducts, air passages or plenums and fittings through which air from the space or spaces to be heated is conducted back to the heat exchanger.

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* The Underwriters' Laboratories, Inc., and the American Gas Association, Inc., Laboratories are such nationally recognized testing agencies.

k. 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. Total volume of furnace or boiler is determined from exterior dimensions and is to include fan compartments and burner vestibules, when used. When the actual ceiling height of a room is greater than 8 feet, the volume of a room shall be figured on the basis of a ceiling height of 8 feet.

l. SUPPLY SYSTEMS. An assembly of connected ducts, air passages or plenums and fittings through which air, heated in a heat exchanger, is conducted from the heat exchanger to the space or spaces to be heated.

120. Supply Systems. Minimum requirements for the construction of supply systems.

121. Material. Except as permitted by pars. 121 c, d, e and f, supply systems shall be constructed entirely of sheet metal having a nominal thickness as shown in the following Table:

a. Round Ducts & Enclosed Rectangular Ducts:

Diam. or Width, Inches	Nominal Thickness Inches	Equiv. Galvanized Sheet Gage No.	Approx. Aluminum B & S Gage	Min. Wt. Tin-Plate lbs. per base box
14 or less	0.016	30	26	135
Over 14	0.019	28	24	—

b. Exposed Rectangular Ducts:

14 or less	0.019	28	24	—
Over 14	0.022	26	23	—

c. Supply ducts that are completely encased in not less than 2 inches of concrete in a floor slab need not meet the requirements of par. 121 except within 2 feet of the furnace supply plenum, and within 2 feet of a vertical connection to a riser or register.

d. Supply ducts serving a single family dwelling having heating equipment classified as Items A, B and C only, in Table No. 1, need not meet the requirements of paragraphs

121 a and b, provided they conform to paragraphs 11 to 123 of Underwriters' Laboratories, Inc., Standard for Air Ducts, UL 181, March 1967 with the following limitations:

(1) Within the first three feet from the bonnet or plenum for systems classified under Items A and C in Table 1, and within the first six feet from the bonnet or plenum for systems classified under Item B duct materials shall meet the requirements for Class 0 or Class 1 in accordance with paragraphs 11 to 123 of Underwriters' Laboratories, Inc., Standard for Air Ducts, UL 181, March 1967.

(2) Beyond these distances, duct materials shall meet the requirements for Class 0, Class 1, or Class 2 in accordance with paragraphs 11 to 123 of Underwriters' Laboratories, Inc., Standard for Air Ducts, UL 181, March 1967.

NOTE: Air duct materials are classified in UL 181 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.

Class 2 — Air duct materials having a flame-spread rating of not over 50 without evidence of continued progressive combustion and a smoke-developed rating of not over 50 for the inside surface and not over 100 for the outside surface.

e. Supply systems for a separate air cooling system, not interconnected to any warm air heating system, serving a single family dwelling need not meet the requirements of pars. 121a, b and d provided that they are not closer than 2 feet to any furnace or its supply plenum, boiler or other heat producing appliance, and that they comply with pars. 181a and c and sections 182, 183, 184 and 185 as specified for return ducts.

f. Vibration isolation connectors in duct systems shall be made of woven asbestos or approved flameproofed fabric or shall consist of sleeve joints with packing of rope asbestos or other approved noncombustible material. Vibration isolation connectors of fabric shall not exceed 10 inches in length.

122. **Joints.** Joints and seams shall be securely fastened and made substantially air tight. Slip joints shall have a lap of at least one inch and shall be individually fastened. (See Figure 1.) Tape may be used for sealing joints but where exposed to the air in the system, it shall not be more combustible than flameproofed fabric complying with NFPA Standard No. 701, Flame-Resistant Textiles and Films.*

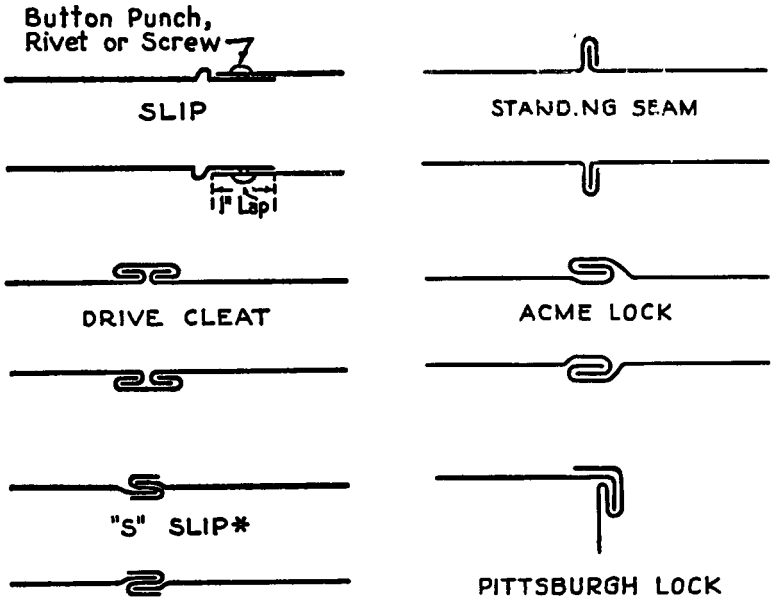

Fig. 1. Types of duct joints.

*Used where the joint is otherwise fastened on 2 sides.

123. **Duct Hangers.** Supply ducts shall be securely supported by metal hangers, straps, lugs or brackets. No nails shall be driven through the duct walls and no unnecessary holes shall be cut therein.

124. **Firestopping.** Where the installation of supply ducts in walls, floors, or partitions requires the removal of

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*See Flame-Retarded Fabrics in Building Materials List published by Underwriters' Laboratories, Inc.

any firestopping, the spaces around the duct at such points where firestopping was removed shall be sealed with asbestos, mineral wool, or other noncombustible insulating material.

125. Covering of Exposed Vertical Supply Ducts. Where vertical supply ducts are exposed in closets or rooms, they shall be covered with at least ¼-inch thick approved air cell asbestos or other equivalent fire resistant insulation.

126. Registers for Ducts.

a. Floor registers and fittings connecting the registers to the duct system shall be constructed of metal. Other types of registers shall be constructed of metal or material which complies with the requirements of Class 2 ducts under U.L. Standard 181.

b. Warm air furnace systems other than systems which are automatically fired with oil, gas, or electricity, and have listed temperature limit controls, shall have at least one register or grill without closeable shutter, and the duct leading thereto shall be without a damper, except where dampers and shutters cannot shut off more than 80 percent of the duct area.

130. Controls

131. Temperature Limit Controls. Temperature limit controls shall be of a listed type and shall be such that they cannot be set higher than the specified temperature setting.

132. Fan Control for Stoker-fired Furnaces. When a warm air furnace equipped with a fan to circulate the air is stoker-fired it shall also be equipped with an automatic over-run 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. 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 so installed as to de-energize simultaneously both the fan and the stoker.

135. Air for Combustion and Ventilation. Heating appliances shall be installed in a location in which the facilities

for ventilation permit satisfactory combustion and proper ventilation under normal conditions of operation and use.

NOTE: Operation of exhaust fans, kitchen ventilation systems or fireplaces may create conditions requiring special attention to avoid unsatisfactory appliance operation.

140. Clearances to Combustible Material.

141. General.

a. The clearances specified below apply except where an appliance, duct work, or chimney or vent connector is listed for different clearances, in which case the listed clearances take precedence.

b. 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, except that the clearance shall be measured to the surface of the plaster or other noncombustible finish where a clearance of 2 inches or less is specified above a bonnet or plenum chamber or above supply ducts. This shall not be construed to prohibit closure of openings with noncombustible material where ducts pass through walls and partitions, as provided in par. 143 e.

142. Furnaces, Boilers, Heat Exchangers, Heat Pumps, and Cooling Units.

a. Except as provided in pars. 141 a and 142 b, minimum clearances from furnaces, boilers, heat exchangers and their chimney or vent connectors installed in rooms which are large in comparison with the size of the appliance shall be as given in Table 1.

b. Heating furnaces and boilers used in residence type central warm air heating systems may be installed in rooms which are large in comparison with the size of the appliance with clearances reduced as designated in Table 2 where combustible material is protected in the manner specified. Such reductions shall not apply to installations in alcoves or closets.

c. 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 unless specifically approved for such installation and then only when 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.

d. Equipment involving furnaces, boilers, or electric resistance heating, shall not be installed in an attic or in a space in the building construction used as a supply or return plenum and cooling units or heat pumps shall not be installed in such a supply or return plenum unless specifically approved for such use as a result of tests and listing by a nationally recognized testing laboratory. Such units or equipment shall be installed in accordance with the conditions of such approval.

e. Furnaces, boilers, heat exchangers, heat pumps, and air conditioning and cooling units shall be installed so as 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.

143. Clearances From Horizontal Supply Ducts. Minimum clearances from horizontal supply ducts shall be as follows:

a. Within a distance of 3 feet of the plenum of a system classified under A or C of Table 1, the clearance shall be not less than that specified above the bonnet or plenum.

b. Within a distance of 6 feet of the plenum of a system classified under B or D of Table 1, the clearance shall be not less than 6 inches. From ducts of furnaces classified under D, the clearance shall be not less than one inch beyond 6 feet 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 1 the clearance shall be not less than 18 inches out to 3 feet from the bonnet or plenum, not less than 6 inches from 3 feet to 6 feet, and not less than one inch beyond 6 feet.

d. Beyond the distances from the plenum or change in direction specified in pars. 143 a and b, no clearance is required.

Table 1.

Clearances to Combustible Material for Residential-Type Furnaces, Boilers and Heat Exchangers Installed in Rooms which are Large in Comparison with Size of Appliance (and for flue box, draft hood, or chimney or vent connectors serving such appliances), except as provided in Paragraph 141a.

	Minimum Clearance, Inches				
	Above & Sides of Bonnet or Plenum	Jacket Sides & Rear	Front[1]	Projecting Flue Box or Draft Hood	Chimney or Vent Connector
A. Listed automatically fired, forced air or gravity system, with 250°F temperature limit control.					
Burning Liquid Fuel	2[6]	6	24	18	18
Burning Gas Fuel	2[6]	6	18	6	6
Utilizing Electricity	2[6]	6	18	—	—
B. Unlisted automatically fired, forced air or gravity system equipped with temperature limit control which cannot be set higher than 250°F.					
Burning Liquid Fuel	6	6	24	18	18
Burning Gas Fuel	6	6	18	18[4]	18[4]
Utilizing Electricity	6	6	18	—	—
C. Steam or Hot Water Heat Exchanger — Steam not over 15 psi pressure and hot water not more than 250°F.	2	2	2	—	—
D. Automatically stoker fired, forced air system equipped with 250°F temperature limit control and with a barometric draft control in accordance with Note 2.					
Burning Solid Fuel	6	6	48	18	18
E. Heating Boilers Used in Residence-Type Central Warm Air Heating Systems — Steam boilers operating at not over 15 psi gauge pressure and hot water boilers operating at not in excess of 250°F of the water-wall type or having a jacket or lining of masonry or other satisfactory material.					
Burning Liquid Fuel	6[5]	6	24	18	18
Burning Gas Fuel	6[5]	6	18	9[3]	9[3]
Burning Solid Fuel	6[5]	6	48	18	18
Utilizing Electricity	6[5]	6	18	—	—

Table 1. continued

	Minimum Clearance, Inches				
	Above & Sides of Bonnet or Plenum	Jacket Sides & Rear	Front[1]	Projecting Flue Box or Draft Hood	Chimney or Vent Connector
F. Furnaces and Heating Boilers Used In Residence-Type Central Warm Air Heating Systems, other than above.					
Burning Liquid Fuel	18	18	48	18	18
Burning Gas Fuel	18	18	18	18[4]	18[4]
Burning Solid Fuel	18	18	48	18	18

Notes for Table 1.

1) Front clearance shall be sufficient for servicing the burner and furnace or boiler.
2) Barometric draft control operated by draft intensity and permanently set to limit the draft to a maximum intensity of 0.13 inches of water gauge.
3) This clearance may be reduced to 6 inches for listed gas burning furnaces and boilers.
4) For unlisted gas appliances equipped with an approved draft hood, this clearance may be reduced to 9 inches.
5) This clearance is above top of boiler.
6) This clearance may be reduced to one inch for a listed forced air or gravity furnace equipped with: (a) a limit control that cannot be set higher than 200°F., or (b) a marking to indicate that the outlet air temperature cannot exceed 200°F.

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 pars. 143 a, b, and c, the clearance shall be not less than that specified in those paragraphs. The ends of the space providing this clearance may be closed with a thimble and collar or the wall surfaces extended to the duct with noncombustible building material such as plaster on metal lath (see Figures 3 and 4).

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 pars. 143 a, b, and c.

144. Clearances from Vertical Ducts, Risers, Boots and Register Boxes.

a. Where a duct, riser, boot or box on a system that does not require 18-inch clearance above the supply plenum

Table 2.
Clearances, Inches, with Specified Forms of Protection.*

Type of Protection Applied to the combustible material unless otherwise specified and covering all surfaces within the distance specified as the required clearance with no protection (see Fig. 2). Thicknesses are minimum	where the required clearance with no protection is: 18 inches Above	18 inches Sides & Rear	18 inches Chimney or Vent Connector	9 inches Chimney or Vent Connector	6 inches Above	6 inches Sides & Rear	6 inches Vent Connector
a) ¼ in. asbestos millboard spaced out 1 in.†	15	9	12	6	3	2	3
b) 28 gage sheet metal on ¼ in. asbestos millboard	12	9	12	4	3	2	2
c) 28 gage sheet metal spaced out 1 in.†	9	6	9	4	2	2	2
d) 28 gage sheet metal on ⅛ in. asbestos millboard spaced out 1 in.†	9	6	9	4	2	2	2
e) 1½ in. asbestos cement covering on heating appliance	9	6	18	9	2	1	6
f) ¼ in. asbestos millboard on 1 in. mineral fiber bats reinforced with wire mesh or equivalent	6	6	6	4	2	2	2
g) 22 gage sheet metal on 1 in. mineral fiber bats reinforced with wire mesh or equivalent	4	3	3	2	2	2	2
h) ¼ in. asbestos cement board or ¼ in. asbetos millboard	18	18	18	9	4	4	4
i) ¼ in. cellular asbestos	18	18	18	9	3	3	3

*Except for the protection indicated in (e), all clearances shall be measured from the outer surface of the appliance to the combustible material disregarding any intervening protection applied to the combustible material.

†Spacers shall be of noncombustible material.

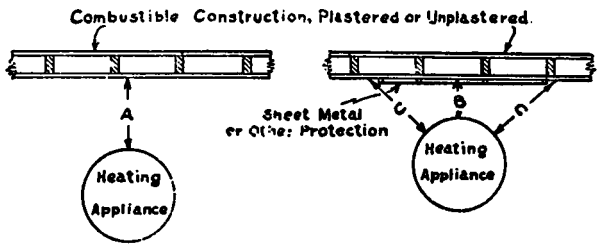

Figure 2. Sheet metal or other protection to reduce required clearance from heating appliance.

A equals the required clearance with no protection specified in Table 1.

B equals the reduced clearance permitted in accordance with Table 2. The protection applied to construction using combustible material is required to extend far enough in each direction to make "C" equal to "A".

or bonnet enters a floor, partition, or enclosure constructed of combustible material within the distance from the plenum specified in pars. 143 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 1) or the duct shall change direction equivalent to at least two 90 degree turns before entering such floor, partition, or enclosure. The above does not apply to pipeless furnaces covered in par. 145.

b. Where a supply duct enters the floor of the first story above that in which the furnace is located, the space around the duct at such points shall be sealed with asbestos cement or other noncombustible material.

c. Where a duct, riser, boot or box on a system that requires 18-inch clearance above the supply plenum or bonnet enters a floor, partition, or enclosure constructed of combustible material within a horizontal distance of 6 feet of the furnace, the duct shall be so arranged that heated air must travel at least 6 feet from the closest primary heating surface and change direction equivalent to at least one 90 degree turn before entering such floor, partition or enclosure.

d. Where a duct, riser, boot or box on a system that requires 18-inch clearance above the supply plenum or bonnet enters the floor of the first story above that in which the furnace is situated, the clearance shall be at least 3/16 of an inch from all combustible material in the floor construction, unless the duct is of double wall construction with a continuous air space of not less than 3/16 of an inch between the inner and outer walls.

e. Where a duct or riser on a system that requires 18-inch 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,

(1) It shall be installed with an air space of not less than 3/16 of an inch between the duct and combustible material, unless a noncombustible insulating covering of cellular type at least 1/8 inch thick is provided (in metal lath and plaster partitions no air space is needed except from wood studs);

(2) Or, such duct shall be made double with a con-

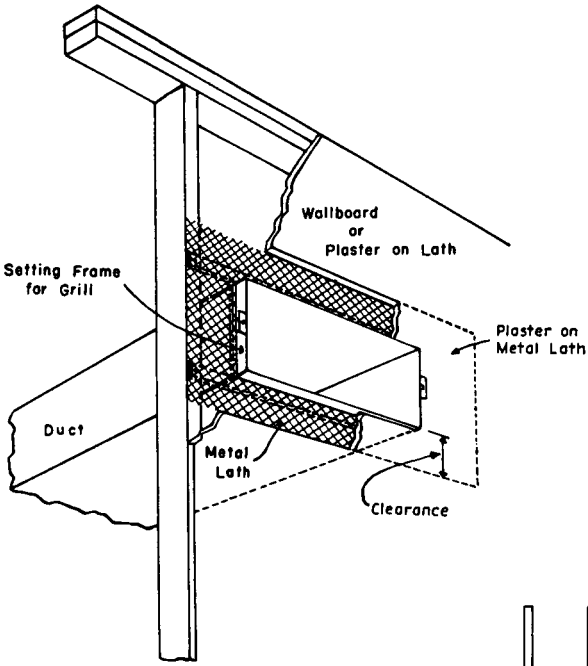

Figure 3. An arrangement for closing ends of clearance space around a supply duct. A similar arrangement can be used where a duct continues on through the partition.

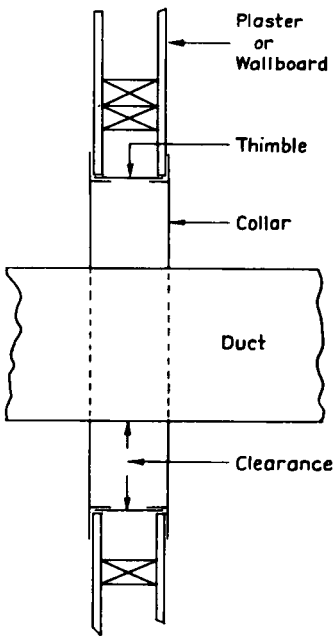

Figure 4. An arrangement for passing ducts through combustible walls or partitions as specified in par. 143 e.

tinuous air space of not less than 3/16 of an inch between the inner and outer walls.

f. Where a register on a system that requires 18-inch 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 inch between the top and sides of the box and any combustible material.

145. Pipeless Furnace Registers. Where registers are installed in the floor over the furnace (as in the "pipeless" furnace) the register box shall be constructed double with an air space not less than 4 inches between, except where the warm air passage is surrounded by a cold air passage.

150. Heating Panels. Air chambers having one or more external surfaces designed for use as heating panels shall comply with the following:

151. Use. Heating panels shall be used only with

a. Automatically fired gas or oil burning forced warm air systems equipped with temperature limit controls that cannot be set above 200°F.;

b. Or, forced warm air systems equipped with heat exchangers utilizing steam which cannot exceed 15 pounds gauge pressure or hot water which cannot exceed a temperature of 250°F.

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

153. Construction.

a. Where warm air supply is from a warm air furnace, heating panels shall be enclosed on all sides with material which is wholly noncombustible or which possesses a flame spread classification of not over 20 as determined in accordance with the Method of Test of Surface Burning Characteristics of Building Materials, NFPA No. 255, ASTM E84, UL 723. This enclosing material shall be securely attached to the building structure; joints and seams shall be substantially airtight. Braces and hangers inside the chamber shall be noncombustible.

b. Where warm air supply is from a steam or hot water heat exchanger, heating panels shall either comply with

par. 153 a or shall be enclosed on all sides with material not more flammable than 1-inch (nominal) wood boards (Flame spread classification of 200). This enclosing material shall be securely attached to the building structure; joints and seams shall be substantially air tight. No single vertical heating panel shall serve more than one story.

160. Down-Flow Systems.

161. General — Down-flow heating or air conditioning systems shall employ automatically operated heat pumps or oil, gas, or electric furnaces. Such heat pumps or furnaces shall be designed or equipped so that the outlet air temperature will not exceed 200°F., except that for systems installed under the provisions of paragraph 170 the outlet air temperature shall be limited to 165°F. Equipment shall be designed to prevent unsafe temperature in event of reverse flow. Listed oil, gas and electric down-flow furnaces, and down-flow air conditioning units incorporating heating function conform to this requirement. Air conditioning units which do not incorporate heating need not be listed specifically for down-flow application.

165. Use of Under Floor Space as Supply Plenum. When heated air is discharged downward into an air chamber which forms a plenum of an under floor 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 not more than 24 inches in height to the bottom of floor joists, shall be cleaned of all combustible material and shall be tightly and substantially enclosed.

c. The enclosing material of the under floor space including the side wall insulation shall be not more flammable than one-inch (nominal) wood boards (Flame spread classification of 200). Combustible ground cover shall be covered over with at least 2 inches 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 by 24 inches.

e. The furnace supplying warm air to such space shall be equipped with an automatic control that will start the

air circulating fan when the air in the furnace bonnet reaches a temperature not higher than 150°F. Such control shall be one that cannot be set higher than 150°F.

f. The furnace supplying warm air to such space shall be equipped with an approved temperature limit control that will limit outlet air temperature to 200°F.

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 securely suspended from the floor members and shall not be more than 18 inches below the floor opening.

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

(3) The perimeter of the receptacle shall have a vertical lip at least one inch high at the open sides if it is at the level of the bottom of the joists, or 3 inches high if the receptacle is suspended.

h. Floor registers shall be designed for easy removal in order to give 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 pars. 121, 144a and b.

k. Supply ducts to the air chamber shall comply with the provisions of pars. 121 and 143 (see also 141) and shall terminate approximately under the center of a room above, at a distance of not less than 6 feet from the plenum chamber.

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

170. Use of Concealed Ceiling Spaces As Supply or Return Plenums.

171. When 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 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 completely enclosed with construction not more flammable than 1 inch (nominal) wood boards. (Flamespread classification not exceeding 200.)

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.

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

g. Any duct used to convey heated air to or from the air chamber or plenum to distant rooms shall conform to Section 120 and Paragraph 143.

h. The installation of the unit supplying such spaces shall not produce negative pressure in the attic when the attic is the source of air for combustion for fuel fired equipment.

180. Return Ducts.

181. Duct Material.

a. Return ducts, except as required by par. 181 b, may be constructed of metal, of one-inch (nominal) wood boards (Flame spread classification of 200), or other suitable material, provided that no material more flammable than one-inch boards shall be used.

b. Portions of return ducts directly above the heating surface, or closer than 2 feet from the outer jacket or casing of the heater shall be constructed in accordance with provisions of par. 121 for supply ducts.