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**INSTALLATION INSTRUCTIONS FOR  
SOLID FUEL-BURNING APPLIANCES**

- 1. Install per manufacturers instructions or use NFPA 211.**
- 2. Must be UL #1482 approved.**

**NOT FULL CODE TEXT. MUST MEET ALL REQUIREMENTS OF ITS LISTING**

4-3.3.2.3 Where a metal chimney serving medium-heat appliances as defined in Table 1-2(a) is located in the same story of a building as that in which the appliances connected thereto are located, it shall have a clearance of not less than 36 in. (914 mm) from a wall of wood frame construction and from any combustible material.

4-3.3.2.4 Interior metal chimneys over 18 in. (457 mm) in diameter shall have a clearance of not less than 4 in. (102 mm) from a building wall of other than wood frame construction.

4-3.3.2.5 Interior metal chimneys 18 in. (457 mm) or less in diameter shall have a clearance of not less than 2 in. (51 mm) from a building wall of other than wood frame construction.

#### 4-4 Metal Chimneys for High-Heat Appliances.

4-4.1 Construction. Metal chimneys for high-heat appliances as defined in Table 1-2(a) shall be lined with high-duty fireclay brick (ASTM C 27) or the equivalent, not less than 4 in. (114 mm) thick laid on a full width bed in refractory mortar (ASTM C 199, high duty) or the equivalent.

4-4.1.1 The lining shall start 2 ft (0.61 m) or more below the lowest chimney connector entrance and shall extend to a height of at least 25 ft (7.6 m) above the highest chimney connector entrance. Chimneys terminating 25 ft (7.6 m) or less above a chimney connector entrance shall be lined to the top.

4-4.2 Termination (Height). Metal chimneys for high-heat appliances shall extend not less than 20 ft (6.1 m) higher than any portion of any building within 50 ft (15.3 m).

4-4.3 Clearance from Combustible Material. Metal chimneys for high-heat appliances shall have sufficient clearance from buildings and structures to avoid heating combustible material to a temperature in excess of 90°F (50°C) rise above ambient and to permit inspection and maintenance operations on the chimney. They shall be located or shielded to avoid danger of burns to persons.

## Chapter 5 Chimney Connectors and Vent Connectors

5-1 Connectors Required. Connectors shall be used to connect appliances to the vertical chimney or vent unless the chimney or vent is attached directly to the appliance.

### 5-2 Materials.

5-2.1 Connectors shall be made of noncombustible, corrosion-resistant material capable of withstanding the flue gas condensate and temperatures produced by the appliances and of sufficient thickness to withstand physical damage.

5-2.2 Connectors for residential-type appliances shall conform to the following requirements.

5-2.2.1 Appliances Installed in Attics. Vent connectors for listed gas appliances and appliances listed for use with Type B gas vents that are installed in attics shall be of Type B or Type L vent material.

### 5-2.2.2 Appliances Not Installed in Attics.

5-2.2.2.1 Vent connectors for appliances listed for use with Type B gas vents and for appliances with draft hoods and equipped with listed conversion burners and that are not installed in attics shall be of Type B or Type L material or other material listed for use as connectors, or smooth interior-wall metal pipe having strength and resistance to heat and corrosion equivalent to that of galvanized sheet steel not less than 0.018 in. (0.46 mm) thick, aluminum (1100 or 3003 alloy or equivalent) not less than 0.027 in. (0.69 mm) thick, or stainless steel not less than 0.012 in. (0.31 mm) thick.

5-2.2.2.2 Listed vent connectors shall be installed in accordance with the terms of their listing and the connector manufacturer's installation instructions.

5-2.2.3 Connectors for oil appliances, solid fuel-burning appliances, domestic-type incinerators, and gas appliances other than those in 5-2.2.1 and 5-2.2.2 shall be of factory-built chimney material, Type L vent material, or steel pipe having resistance to corrosion and heat not less than that of galvanized pipe specified in Table 5-2.2.3.

Table 5-2.2.3 Metal Thickness for Galvanized Steel Pipe Connectors

Diameter of Connector, in./mm	Galvanized Sheet Gage No.	Min. Thickness in. (mm)
Less than 6/152	26	0.019 (0.48)
6/152 to 10/254	24	0.025 (0.58)
Over 10/254 to 16/406	22	0.029 (0.74)
Over 16/406	16	0.056 (1.42)

5-2.3 Connectors for low-heat appliances shall be of listed factory-built chimney material or of steel pipe having resistance to corrosion and heat not less than that of galvanized pipe specified in Table 5-2.2.3.

5-2.4 Connectors for medium-heat appliances and commercial and industrial incinerators shall be constructed of listed medium-heat chimney sections or of steel not lighter than that designated for metal chimneys in Table 4-1.2 and shall conform to the following requirements.

5-2.4.1 Connector sections of listed medium-heat chimneys shall be joined together using continuous welds, flanges, or couplings.

5-2.4.2 Steel connectors shall be lined with medium-duty fireclay brick (ASTM C 27) laid in refractory mortar (ASTM C 199, medium duty), or the equivalent.

5-2.4.2.1 The lining shall be at least 2 in. (64 mm) thick for connectors having an inside diameter or greatest inside cross-section dimension of 18 in. (457 mm) or less.

5-2.4.2.2 The lining shall be at least 4 in. (114 mm) thick laid on the 4-in. (114-mm) bed for connectors having an inside diameter or greatest inside cross-section dimension greater than 18 in. (457 mm).

5-2.5 Metal connectors for high-heat appliances shall conform to the following requirements.

5-2.5.1 Metal connectors for high-heat appliances shall be made of steel not lighter than that designated for chimneys in Table 4-1.2.

5-2.5.2 The connectors shall be lined with high-duty fire clay brick (ASTM C 27) or the equivalent having a thickness of not less than 4 in. (114 mm) laid on the 4-in. (114-mm) bed in refractory mortar (ASTM C 199, high duty), or the equivalent.

5-2.6 Masonry connectors or breeching shall be made of refractory material equivalent in resistance to heat and corrosion to high-duty fireclay brick (ASTM C 27) not less than 4 in. (114 mm) thick.

5-3 Length. A connector shall be as short and straight as practical. The appliance shall be located as close as practical to the chimney or vent.

5-3.1 The horizontal length of a connector to a natural draft chimney, or vent, serving a single appliance shall be not more than 75 percent of the height of the vertical portion of the chimney or vent above the connector.

*Exception\*: Where part of an engineered venting system.*

5-3.2 The horizontal length, design, and construction of combined connectors, or connectors to a manifold joining two or more appliances to a chimney or vent, shall be determined in accordance with approved engineering methods.

5-4 Size.

5-4.1 The connector, for its entire length, shall be sized in accordance with approved engineering methods.

5-4.2 As an alternate to 5-4.1, the following requirements shall be permitted to be applied.

5-4.2.1 The effective area of a connector for a single appliance shall be not less than the area of the appliance flue collar.

5-4.2.2 A connector or manifold serving two or more appliances shall have an effective area equivalent to the combined areas of the appliance flue collars or individual connectors.

5-4.2.3 Linings, if used, shall not reduce the required effective area of the connector.

5-5 Clearance.

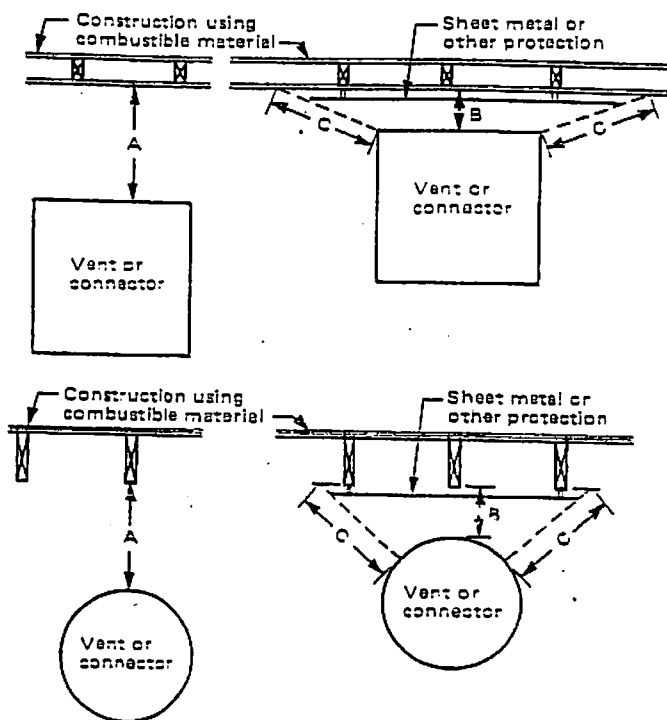
5-5.1 Clearances from connectors to combustible material shall be in accordance with the following requirements for both unprotected and protected installations.

5-5.1.1 Clearances from connectors to unprotected combustible material shall be in accordance with Table 5-5(a) and Figure 5-5.

Table 5-5(a) Chimney Connector and Vent Connector Clearances from Combustible Materials

Description of Appliance	Minimum Clearance, in. (mm) (See Note 1)
<b>RESIDENTIAL-TYPE APPLIANCES</b>	
<b>Single-Wall Metal Pipe Connectors</b>	
Gas Appliances without Draft Hoods	18 (457)
Electric, Gas, and Oil Incinerators	18 (457)
Oil and Solid-Fuel Appliances	18 (457)
Unlisted Gas Appliances with Draft Hoods	9 (229)
Boilers and Furnaces Equipped with Listed Gas Burners and with Draft Hoods	9 (229)
Oil Appliances Listed as Suitable for Use with Type L Vents	9 (229)
Listed Gas Appliances with Draft Hoods and Other Category I Gas Appliances Listed for Use with Type B Vent (See Note 3)	6 (152)
<b>Type L Vent Piping Connectors</b>	
Gas Appliances without Draft Hoods	9 (229)
Electric, Gas, and Oil Incinerators	9 (229)
Oil and Solid-Fuel Appliances	9 (229)
Unlisted Gas Appliances with Draft Hoods	6 (152)
Boilers and Furnaces Equipped with Listed Gas Burners and with Draft Hoods	6 (152)
Oil Appliances Listed as Suitable for Use with Type L Vents	(See Note 2)
Listed Gas Appliances with Draft Hoods and Other Category I Gas Appliances Listed for Use with Type B Vent	(See Note 3)
<b>Type B Gas Vent Piping Connectors</b>	
Listed Gas Appliances with Draft Hoods and Other Category I Gas Appliances Listed for Use with Type B Vent	(See Note 3)
<b>LOW-HEAT APPLIANCES</b>	
<b>Single-Wall Metal Pipe Connectors</b>	
Gas, Oil, and Solid-Fuel Boilers, Furnaces, and Water Heaters	18 (457)
Ranges, Restaurant-Type	18 (457)
Oil Unit Heaters	18 (457)
Unlisted Gas Unit Heaters	18 (457)
Listed Gas Unit Heaters with Draft Hoods	6 (152)
Other Low-Heat Industrial Appliances	18 (457)
<b>MEDIUM-HEAT APPLIANCES</b>	
<b>Single-Wall Metal Pipe Connectors</b>	
All Gas, Oil, and Solid-Fuel Appliances	36 (914)
<b>HIGH-HEAT APPLIANCES</b>	
<b>Masonry or Metal Connectors</b>	
All Gas, Oil, and Solid-Fuel Appliances	(See Note 4)

Notes to Table 5-5(a)  
 NOTE 1: These clearances apply except if the listing of an appliance specifies different clearance, in which case the listed clearance takes precedence.  
 NOTE 2: If listed Type L vent piping is used, the clearance may be in accordance with the vent listing.  
 NOTE 3: If listed Type B or Type L vent piping is used, the clearance may be in accordance with the appliance and vent listing.  
 NOTE 4: Clearances shall be based on good engineering practice and acceptable to the authority having jurisdiction.  
 The clearances from connectors to combustible materials may be reduced if the combustible material is protected in accordance with Table 5-5(b).



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

Figure 5-5 Extent of protection required to reduce clearances from chimney or vent connectors.

5-5.1.2 Clearances from connectors to combustible material may be reduced if the combustible material is protected by an engineered protection system acceptable to the authority having jurisdiction or by the use of materials or products listed for protection purposes, or in accordance with Table 5-5(b) and Figure 5-5.

5-5.2 Engineered systems installed for protection of combustible materials shall reduce the temperature rise of such materials to 90°F (50°C) above ambient. System design shall be based on applicable heat transfer principles taking into account the geometry of the system, the heat loss characteristics of the structure behind the combustible material, and possible abnormal operating conditions of heat-producing sources.

5-5.3 All clearances shall be measured from the outer surface of the connector to the combustible material, disregarding any intervening protection applied to the combustible material, but in no case shall the clearance be such as to interfere with the requirement for accessibility.

5-5.4 Materials and products listed for the purpose of reducing clearance to combustibles shall be installed in accordance with the conditions of the listing and the manufacturer's instructions.

5-5.5 For clearance reduction systems using an air space between the combustible wall and the wall protector, adequate air circulation shall be provided by one of the following methods.

5-5.5.1 Adequate air circulation may be provided by leaving all edges of the wall protector open with at least a 1-in. (25.4-mm) air gap.

5-5.5.2 If the wall protector is mounted on a single flat wall away from corners, adequate air circulation may be provided by leaving only the bottom and top edges or only the side and top edges open with at least a 1-in. (25.4-mm) air gap.

5-5.5.3 Wall protectors that cover two walls in a corner shall be open at the bottom and top edges with at least a 1-in. (25.4-mm) air gap.

5-5.6 All clearances shall be measured from the outer surface of the combustible material to the nearest point on the surface of the connector, disregarding any intervening protection applied to the combustible material.

5-6 Location. When the connector used for a gas appliance having a draft hood or for Category I appliances is located in or passes through an attic, crawl space, or other cold area, that portion of the connector shall be of listed Type B or Type L vent material or be provided with equivalent means of insulation.

5-7 Installation.

5-7.1 A connector to a masonry chimney shall extend through the wall to the inner face or liner but not beyond and shall be firmly cemented to masonry.

*Exception: A thimble shall be permitted to be used to facilitate removal of the chimney connector for cleaning, in which case the thimble shall be permanently cemented in place with high-temperature cement.*

5-7.2 A chimney connector or vent connector shall not pass through any floor or ceiling, nor through a fire wall or fire partition.

5-7.3 Connectors for listed gas appliances with draft hoods [Table 1-2(b), Column I] and oil appliances listed for Type L vents [Table 1-2(b), Column III] shall be permitted to pass through walls or partitions constructed of combustible material if:

(a) Made of listed Type B or Type L vent material for gas appliances, listed Type L vent material for oil appliances, and installed with not less than listed clearances to combustible material, or

(b) Made of single-wall metal pipe and guarded by a ventilated metal thimble not less than 4 in. (102 mm) larger in diameter than the vent connector.

5-7.4 Connectors for residential-type appliances [Table 1-2(a), Column I] shall be permitted to pass through walls or partitions constructed of combustible material if the connector is either listed for wall pass-through, or is routed through a device listed for wall pass-through, and is installed in accordance with the conditions of the listing.

Table 5-5(b) Reduction of Connector Clearance with Specified Forms of Protection<sup>1-5</sup>

Clearance reduction applied to and covering all combustible surfaces within the distance specified as required clearance with no protection [see 5-5.1 and Table 5-5(a)].	Maximum allowable reduction in clearance (percent)		When the required clearance with no protection is 18 in., the clearances below are the minimum allowable clearances. For other required clearances, calculate minimum allowable clearance from maximum allowable reduction. <sup>6</sup>	
	As Wall Protector	As Ceiling Protector	As Wall Protector	As Ceiling Protector
(a) 3/2 in. (90 mm) thick masonry wall without ventilated air space.	33%	—	12/305	—
(b) 1/2 in. (15 mm) thick non-combustible insulation board over 1 in. (25 mm) glass fiber or mineral wool batts without ventilated air space.	50%	33%	9/229	12/305
(c) 0.024 in./0.61 mm (24 gage) sheet metal over 1 in. (25 mm) glass fiber or mineral wool batts reinforced with wire, or equivalent, on rear face with ventilated air space.	66%	50%	6/152	9/229
(d) 3/2 in. (90 mm) thick masonry wall with ventilated air space.	66%	—	6/152	—
(e) 0.024 in./0.61 mm (24 gage) sheet metal with ventilated air space.	66%	50%	6/152	9/229
(f) 1/2 in. (15 mm) thick noncombustible insulation board with ventilated air space.	66%	50%	6/152	9/229
(g) 0.024 in./0.61 mm (24 gage) sheet metal with ventilated air space over 0.024 in./0.61 mm (24 gage) sheet metal with ventilated air space.	66%	50%	6/152	9/229
(h) 1 in. (25 mm) glass fiber or mineral wool batts sandwiched between two sheets 0.024 in./0.61 mm (24 gage) sheet metal with ventilated air space.	66%	50%	6/152	9/229

<sup>1</sup>Spacers and ties shall be of noncombustible material. No spacers or ties shall be used directly behind appliance or connector.

<sup>2</sup>With all clearance reduction systems using a ventilated air space, adequate air circulation shall be provided as described in 5-5.5. There shall be at least 1 in. (25 mm) between the clearance reduction system and combustible walls and ceilings for clearance reduction systems using a ventilated air space.

<sup>3</sup>Mineral wool batts (blanket or board) shall have a minimum density of 5 lb per ft<sup>3</sup> (128.7 kg/m<sup>3</sup>) and have a minimum melting point of 1500°F (816°C).

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

<sup>5</sup>If a single wall connector passes through a masonry wall used as a wall shield, there shall be at least 1/2 in. (15 mm) of open, ventilated air space between the connector and the masonry.

<sup>6</sup>There shall be at least 1 in. (25 mm) between the connector and the protector. In no case shall the clearance between the connector and the wall surface be reduced below that allowed in the table.

<sup>7</sup>All clearance and thickness are minimum; larger clearances and thicknesses are acceptable.

<sup>8</sup>To calculate the minimum allowable clearance, the following formula may be used:

$$C_p = C_{nr} \times (1 - R/100)$$

$C_p$  is the minimum allowable clearance,  $C_{nr}$  is the required clearance with no protection, and R is the maximum allowable reduction in clearance.

5-7.5 Connectors for residential-type appliances [Table 1-2(a), Column I] with inside diameters less than or equal to 10 in. (254 mm) shall be permitted to pass through walls or partitions constructed of combustible material to a masonry chimney if the connector system selected or fabricated is installed in accordance with the conditions and clearances in Table 5-7. Any unexposed metal that is used as part of a wall pass-through system and is exposed to flue gases shall be constructed of stainless steel or other equivalent material that will resist corrosion, softening, or cracking from flue gases at temperatures up to 1800°F (982°C).

5-7.6 A connector for a medium- or high-heat appliance [Table 1-2(a), Columns IV and V] shall not pass through walls or partitions constructed of combustible material.

5-7.7 Connectors shall maintain a pitch or rise of at least 1/4 in. (6.4 mm) to the foot (horizontal length of pipe) from the appliance to the chimney.

5-7.8 Connectors shall be so installed as to avoid sharp turns or other construction features that would create excessive resistance to the flow of flue gases.

5-7.9 A device, other than a damper, that will obstruct the free flow of flue gas shall not be installed in a connector, chimney, or vent. For requirements regarding dampers, see Section 5-9.

*Exception No. 1: This requirement shall not be construed to prohibit the use of devices specifically listed for installation in a connector in accordance with the fuel-burning appliance listing, such as heat reclaimers, draft regulators, and safety controls.*

*Exception No. 2: Approved economizers, heat reclaimers, and recuperators in venting systems of equipment, not required to be equipped with draft hoods in accordance with the fuel-burning appliance listing, provided performance is in accordance with Section 1-7.*

5-7.10 Connectors shall be securely supported and joints fastened with sheet-metal screws, rivets, or other approved means.

5-7.11 The entire length of a connector shall be readily accessible for inspection, cleaning, and replacement.

5-7.12 A connector serving a gas or oil appliance shall not be connected to a chimney flue serving a factory-built fireplace.

*Exception: When the gas or oil appliance is listed for such installation and is installed in accordance with the listing.*

5-7.13 A connector serving a gas or oil appliance shall be permitted to be connected to a masonry fireplace flue, provided the fireplace opening is sealed or the chimney flue, which vents the fireplace, is permanently sealed below the connection.

*Exception: Listed gas or oil appliances shall be installed in accordance with the listing.*

5-7.14 Vent and chimney connectors shall not be covered with insulation.

*Exception: Listed insulated vent and chimney connectors shall be installed in accordance with the terms of their listing.*

## 5-8 Interconnection.

5-8.1 Connectors serving appliances operating under natural draft shall not be connected into any portion of a mechanical draft system operating under positive pressure.

5-8.2 Unless listed for such connection, solid fuel-burning appliances shall not be connected to a chimney flue serving another appliance burning other fuels.

5-8.3 Gas utilization appliances and appliances burning liquid fuel may be connected to one chimney flue through separate openings or may be connected through a single opening if joined by a suitable fitting located as close as practical to the chimney provided:

(a) Sufficient draft is available for safe combustion of each appliance and for the removal of all products of combustion, and

(b) Appliances so connected are equipped with primary safety controls.

5-8.4 If two or more openings are provided into one chimney flue, they shall be at different levels and the smaller connector shall enter at the highest level consistent with available head room or clearance to combustible material.

## 5-9 Dampers.

5-9.1 Manually operated dampers shall not be placed in chimneys, vents, or connectors of stoker fired, liquid, or gas burning appliances. Fixed baffles on the appliance side of draft hoods and draft regulators shall not be classified as dampers. Manually operated dampers shall be permitted to be installed in the chimney connector of hand-fired solid fuel-burning appliances if such dampers do not obstruct more than 80 percent of the connector area.

5-9.2 Automatically operated dampers shall be listed and shall be installed by a qualified agency in accordance with the terms of the damper and appliance listings. The installation of dampers on gas appliances shall be in accordance with NFPA 54, *National Fuel Gas Code*.

5-10 Draft Hoods. For information concerning the use and installation of draft hoods, refer to NFPA 54, *National Fuel Gas Code*.

## 5-11 Draft Regulators.

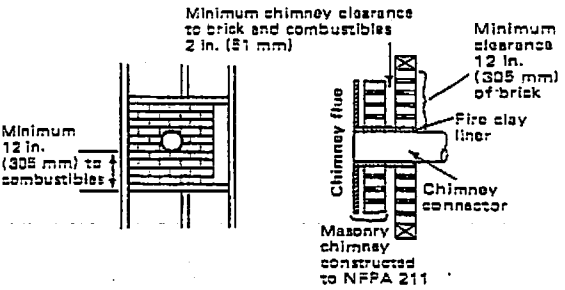
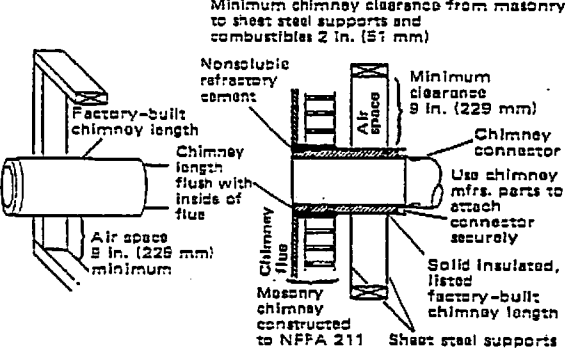
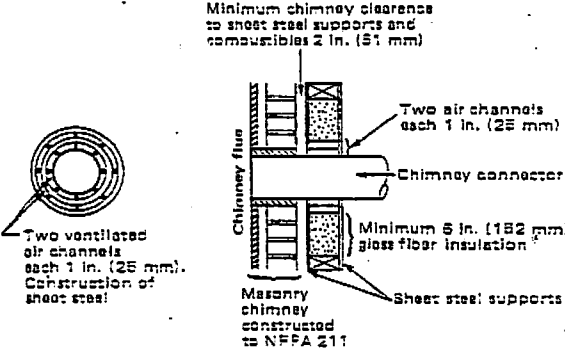
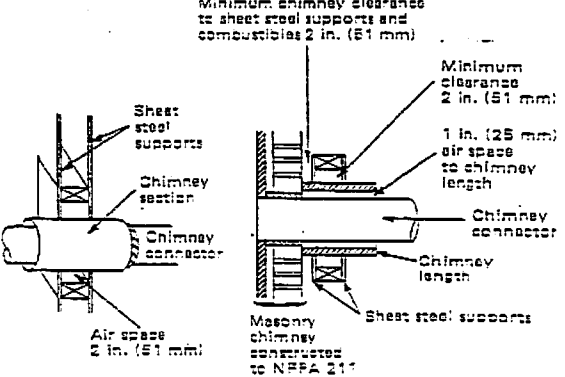
NOTE: For information concerning the use and installation of draft regulators with oil-burning appliances, refer to NFPA 51, *Standard for the Installation of Oil Burning Equipment*.

5-11.1 Gas appliances connected to chimneys, other than those required to be installed with draft hoods by NFPA 54, *National Fuel Gas Code*, shall be permitted to be installed with draft regulators if in accordance with the appliance manufacturer's instructions.

5-11.2 Solid fuel-burning appliances shall be permitted to be installed with draft regulators to reduce draft intensity. Such regulators shall be installed and set in accordance with the instructions furnished with the appliance or the draft regulator.

5-11.3 A barometric draft regulator, if used, shall be installed in the same room or enclosure as the appliance in such a manner that no difference in pressure between the air in the vicinity of the regulator and the combustion air supply will be permitted.

Table 5-7 Chimney Connector Systems and Clearances from Combustible Walls for Residential Heating Appliances

System	Clearance in./mm
 <p>Minimum chimney clearance to brick and combustibles 2 in. (51 mm)</p> <p>Minimum clearance 12 in. (305 mm) of brick</p> <p>Fire clay liner</p> <p>Chimney connector</p> <p>Masonry chimney constructed to NFPA 211</p>	<p><b>A</b> Minimum 3.5-in. (90-mm) thick brick masonry wall framed into combustible wall with a minimum of 12 in. (305 mm) brick separation from clay liner to combustibles. Fireclay liner (ASTM C 515 or equivalent), minimum 7/8-in. (16-mm) wall thickness, shall run from outer surface of brick wall to, but not beyond, the inner surface of chimney flue liner and shall be firmly cemented in place.</p> <p>12/305</p>
 <p>Minimum chimney clearance from masonry to sheet steel supports and combustibles 2 in. (51 mm)</p> <p>Nonsoluble refractory cement</p> <p>Air space</p> <p>Minimum clearance 9 in. (229 mm)</p> <p>Chimney connector</p> <p>Use chimney mfrs. parts to attach connector securely</p> <p>Solid insulated, listed factory-built chimney length</p> <p>Sheet steel supports</p> <p>Chimney flue</p> <p>Masonry chimney constructed to NFPA 211</p> <p>Factory-built chimney length</p> <p>Chimney length flush with inside of flue</p> <p>Air space 9 in. (229 mm) minimum</p>	<p><b>B</b> Solid insulated listed factory-built chimney length of the same inside diameter as the chimney connector and having 1 in. (25 mm) or more of insulation with a minimum 9-in. (229-mm) air space between the outer wall of the chimney length and combustibles.</p> <p>The inner end of the chimney length shall be flush with the inside of the masonry chimney flue and shall be sealed to the flue and to the brick masonry penetration with non-water-soluble refractory cement. Supports shall be securely fastened to wall surfaces on all sides.</p> <p>Fasteners between supports and the chimney length shall not penetrate the chimney liner.</p> <p>9/229</p>
 <p>Minimum chimney clearance to sheet steel supports and combustibles 2 in. (51 mm)</p> <p>Two air channels each 1 in. (25 mm)</p> <p>Chimney connector</p> <p>Minimum 6 in. (152 mm) glass fiber insulation</p> <p>Sheet steel supports</p> <p>Chimney flue</p> <p>Masonry chimney constructed to NFPA 211</p> <p>Two ventilated air channels each 1 in. (25 mm). Construction of sheet steel</p>	<p><b>C</b> Sheet steel chimney connector, minimum 24 gage [0.024 in. (0.61 mm)] in thickness, with a ventilated thimble, minimum 24 gage [0.024 in. (0.61 mm)] in thickness, having two 1-in. (25-mm) air channels, separated from combustibles by a minimum of 6 in. (152 mm) of glass fiber insulation. Opening shall be covered, and thimble supported with a sheet steel support, minimum 24 gage [0.024 in. (0.61 mm)] in thickness.</p> <p>Supports shall be securely fastened to wall surfaces on all sides and shall be sized to fit and hold chimney section. Fasteners used to secure chimney section shall not penetrate chimney flue liner.</p> <p>6/152</p>
 <p>Minimum chimney clearance to sheet steel supports and combustibles 2 in. (51 mm)</p> <p>Minimum clearance 2 in. (51 mm)</p> <p>1 in. (25 mm) air space to chimney length</p> <p>Chimney connector</p> <p>Chimney length</p> <p>Sheet steel supports</p> <p>Masonry chimney constructed to NFPA 211</p> <p>Sheet steel supports</p> <p>Chimney section</p> <p>Chimney connector</p> <p>Air space 2 in. (51 mm)</p>	<p><b>D</b> Solid insulated listed factory-built chimney length with a inside diameter 2 in. (51 mm) larger than the chimney connector and having 1 in. (25 mm) or more of insulation, serving as a pass-through for a single wall sheet steel chimney connector of minimum 24 gage [0.024 in. (0.61 mm)] thickness, with a minimum 2-in. (51-mm) air space between the outer wall of chimney section and combustibles.</p> <p>Minimum length of chimney section shall be 12 in. (305 mm). Chimney section concentric with and spaced 1 in. (25 mm) away from connector by means of sheet steel support plates on both ends of chimney section. Opening shall be covered, and chimney section supported on both sides with sheet steel supports of minimum 24 gage [0.024 in. (0.61 mm)] thickness.</p> <p>Supports shall be securely fastened to wall surfaces on all sides and shall be sized to fit and hold chimney section. Fasteners used to secure chimney sections shall not penetrate chimney flue liner.</p> <p>2/51</p>

Additional Requirements:

1. Insulation material used as part of wall pass-through system shall be of noncombustible material and shall have a thermal conductivity of 1.0 Btu-in./hr-ft<sup>2</sup>-°F (4.85 kg-cal/hr-m<sup>2</sup>-°C) or less.
2. All clearances and thicknesses are minimums; larger clearances and thicknesses are acceptable.
3. Any material used to close up an opening for the connector shall be of noncombustible material.
4. A connector to a masonry chimney, except for System B, shall extend in one continuous piece through the wall pass-through system and the chimney wall to the inner face of the flue liner, but not beyond.

## Chapter 6 Vents

### 6-1 Types and Uses. [See Table 1-2(b).]

6-1.1 Type B gas vents shall be used to vent only listed gas appliances with draft hoods and other Category I gas appliances listed for use with Type B gas vents. Type B gas vents shall not be used for venting:

(a) Vented wall furnaces listed for use with Type BW gas vents only.

(b) Incinerators.

(c) Appliances that may be converted readily to the use of solid or liquid fuels.

(d) Combination gas/oil-burning appliances.

(e) Appliances listed for use with chimneys only.

(f) Listed Category II, III and IV gas appliances.

6-1.2 Type BW vents shall be used only with listed vented gas wall furnaces having a capacity not greater than that of the listed Type BW gas vent.

6-1.3 A special gas vent shall be listed and used in accordance with the terms of its listing and the appliance and vent manufacturers' instructions.

6-1.4 Type L vents shall be used only with appliances listed as suitable for such use and gas appliances listed as suitable for use with Type B gas vents.

6-1.5 Single-wall metal pipe other than special gas vents used to vent Category II, III, and IV gas appliances shall conform to the following requirements.

6-1.5.1 Single-wall metal pipe shall not be used to vent incinerators.

6-1.5.2 The pipe shall be of sheet copper with a thickness not less than 24 B & S gage [0.0201 in. (0.533 mm)] or galvanized steel with a thickness not less than 20 gage [0.036 in. (0.914 mm)].

6-1.5.3 Single-wall metal pipe shall be used only for runs directly from the space in which the appliance is located through the roof or exterior wall to the outer air.

6-1.5.4 Single-wall metal pipe shall not originate in any unoccupied attic or concealed space and shall not pass through any attic, inside wall, or concealed space nor through any floor or ceiling.

6-2 Size. Vents shall be sized and configured in accordance with approved methods and the appliance and vent manufacturers' instructions.

6-2.1 Gas Vents. Gas vents shall be sized in accordance with Part 11 of NFPA 54, *National Fuel Gas Code*, or other approved methods, and the appliance and vent manufacturers' instructions.

6-3 Location. Single-wall outside vents for appliances used in cold climates shall be insulated.

### 6-4 Termination (Height).

6-4.1 All vents shall terminate above the roof surface.

*Exception: As provided in 6-4.5 and Section 6-7.*

6-4.1.1 Vents installed with mechanical exhausters shall terminate not less than 12 in. (305 mm) above the highest point where they pass through the roof surface.

6-4.1.2 Vents installed with listed caps shall terminate in accordance with the terms of the caps' listing.

6-4.1.3 Vents installed without listed caps or mechanical exhausters shall extend 2 ft (0.61 m) above the highest point where they pass through the roof surface of a building and at least 2 ft (0.61 m) higher than any portion of a building within 10 ft (3.1 m). [See Figures 1-8(a) and (b).]

6-4.2 Natural draft vents for gas appliances shall terminate at an elevation not less than 5 ft (1.53 m) above the highest connected appliance outlet.

*Exception: As provided in 6-4.3 and 6-7.2.*

6-4.3 Natural draft gas vents serving vented wall furnaces shall terminate at an elevation not less than 12 ft (3.7 m) above the bottom of the furnace.

6-4.4 Vents passing through roofs shall extend through roof flashing.

6-4.5 Mechanical draft systems need not comply with 6-4.1 and 6-4.3 provided they comply with the following:

(a) The exit terminal of a mechanical draft system, other than a direct vent appliance (sealed combustion system appliance), shall be located in accordance with the following:

1. Not less than 3 ft (0.91 m) above any forced air inlet located within 10 ft (3 m).

2. Not less than 4 ft (1.2 m) below, 4 ft (1.2 m) horizontally from, or 1 ft (305 mm) above any door, window, or gravity air inlet into any building, and

3. Not less than 2 ft (0.61 m) from an adjacent building and not less than 7 ft (2.1 m) above grade when located adjacent to public walkways.

(b) The exit terminal shall be so arranged that flue gases are not so directed as to jeopardize people, overheat combustible structures, or enter buildings.

(c) Forced draft systems and all portions of induced draft systems under positive pressure during operation shall be so designed and installed as to be gastight or as to prevent leakage of combustion products into a building.

(d) Through-the-wall vents for gas appliances shall not terminate over public walkways or over an area where condensate or vapor could create a nuisance or hazard or could be detrimental to the operation of regulators, relief valves, or other equipment.

### 6-5 Notice of Usage.

6-5.1 In those localities where solid and liquid fuels are used extensively, gas vents shall be plainly and permanently identified by a label attached to the wall or ceiling at a point where the vent connector enters the gas vent. The label shall read: "This gas vent is for appliances that burn gas. Do not connect to solid or liquid fuel-burning appliances or incinerators."

be placed on floors of combustible construction provided the floor under the appliance is protected with one course of hollow masonry units not less than 4 in. (102 mm) in thickness. The masonry units shall be laid with ends unsealed and joints matched in such a way as to provide a free circulation of air through the core spaces of the masonry. The top surface of the masonry shall be covered with a steel plate not less than  $\frac{3}{16}$  in. (4.8 mm) in thickness. The floor protection shall extend not less than 3 ft (0.92 m) beyond the appliance on all sides and 8 ft (2.45 m) beyond the front or side where ashes are removed.

**8-5.3.4 Medium-heat industrial-type solid fuel-burning appliances that are set on legs or pedestals that provide 18 to 24 in. (457 to 610 mm) of ventilated open space beneath the firechamber or base of the appliance are permitted to be placed on floors of combustible construction provided the floor under the appliance is protected with two courses of hollow masonry units, each not less than 4 in. (102 mm) in thickness. The masonry units shall be laid with ends unsealed and joints matched in such a way as to provide a free circulation of air through the core spaces of the masonry. The top surface of the masonry shall be covered with a steel plate not less than  $\frac{3}{16}$  in. (4.8 mm) in thickness. The floor protection shall extend not less than 3 ft (0.92 m) beyond the appliance on all sides and 8 ft (2.45 m) beyond the front or side where ashes are removed.**

**8-5.3.5 Medium-heat industrial-type solid fuel-burning appliances with legs or pedestals that provide less than 18 in. (457 mm) of ventilated open space beneath the firechamber or base of the appliance shall not be placed on floors of combustible construction.**

#### 8-5.4 Mounting of High-Heat Industrial-type Appliances.

**8-5.4.1 High-heat industrial-type solid fuel-burning appliances shall be placed in one of the following manners:**

(a) On concrete bases adequately supported on compacted soil, crushed rock, or gravel.

(b) On floors constructed of noncombustible materials and having a fire resistance rating of not less than 2 hr. This construction shall extend not less than 10 ft (3.1 m) beyond the appliance on all sides and not less than 30 ft (9.2 m) beyond the front or side where hot products are removed.

(c) On properly stabilized ground that can support the load of the appliance.

**8-5.4.2 Concrete bases and floors shall be designed and constructed to support the appliances.**

**8-5.4.3 High-heat industrial-type solid fuel-burning appliances shall not be placed on floors of combustible construction.**

#### 8-6 Clearances from Solid Fuel-Burning Appliances.

**8-6.1 Solid fuel-burning appliances shall be installed so that their use will not create a hazard to person or property. The clearance shall be not less than specified in Table 8-6(a).**

*Exception No. 1: Appliances listed for installation with clearances less than specified in Table 8-6(a) shall be permitted to be installed in accordance with the terms of their listing and the manufacturer's instructions.*

**Table 8-6(a) Standard Clearances for Solid Fuel-Burning Appliances**

For Reduced Clearances, see Table 8-6(b).  
These clearances apply to appliances installed in rooms that are large in comparison with the size of the appliances.

Kind of Appliance	Above Top of Casing or Appliance. Above Top and Sides of Furnace Plenum or Bonnet			
	in./mm	From Front in./mm	From Back <sup>3</sup> in./mm	From Sides <sup>2</sup> in./mm
<b>Residential Appliances</b>	6/152	48/1219	6/152 <sup>2</sup>	6/152 <sup>2</sup>
Steam Boilers — 15 psi				
Water Boilers — 250°F max.				
Water Boilers — 200°F max.				
All Water Walled or Jacketed.				
<b>Furnaces</b>				
Gravity and Forced Air <sup>4</sup>	18/457	48/1219	18/457	18/457
<b>Room Heaters, Fireplace Stoves, Combinations</b>	36/914	36/914	36/914	36/914
<b>Ranges</b>			Firing Side	Opp. Side
Lined Firechamber	30/762 <sup>1</sup>	36/914	24/610	18/457
Unlined Firechamber	30/762 <sup>1</sup>	36/914	36/914	18/457

<sup>1</sup>To combustible material or metal cabinets. If the underside of such combustible material or metal cabinet is protected with sheet metal of not less than 24 gage (0.024 in.) (0.610 mm) spaced out 1 in. (25.4 mm), the distance may be reduced to not less than 24 in. (610 mm).

<sup>2</sup>Adequate clearance for cleaning and maintenance shall be provided.

<sup>3</sup>Provisions for fuel storage shall be located at least 36 in. (914 mm) from any side of the appliance.

<sup>4</sup>For clearances from air ducts, see NFPA 90B.

*Exception No. 2: Heating furnaces and boilers and water heaters specifically listed for installation in spaces such as alcoves shall be permitted to be so installed in accordance with the terms of their listing provided the specified clearance is maintained regardless of whether the enclosure is of combustible or noncombustible material.*

#### 8-6.2 Clearance Reduction.

**8-6.2.1 Clearances from listed and unlisted solid fuel-burning appliances to combustible material shall be permitted to be reduced if the combustible material is protected as described in Table 8-6(b) and in Figures 8-5(a) through 8-5(d).**

After reduction, clearance shall be not less than 12 in. (305 mm) to combustible walls and not less than 18 in. (457 mm) to combustible ceilings.

*Exception: Appliances listed for installation with a clearance less than 12 in. (305 mm) to a combustible wall or less than 18 in. (457 mm) to combustible ceiling shall be installed in accordance with the terms of their listing and the manufacturer's instructions.*

Table 8-6(b) Reduction of Appliance Clearance with Specified Forms of Protection<sup>1-10</sup>

Clearance reduction system applied to and covering all combustible surfaces within the distance specified as required clearance with no protection (see 8-6.1).	Maximum allowable reduction in clearance (percent)		When the required clearance with no protection is 36 in., the clearances below are the minimum allowable clearance. For other required clearances with no protection, calculate minimum allowable clearance from maximum allowable reduction. <sup>9,10</sup>	
	As Wall Protector	As Ceiling Protector	As Wall Protector (in./mm)	As Ceiling Protector (in./mm)
(a) 3½ in. (90 mm) thick masonry wall without ventilated air space	33%	—	24/610	—
(b) ½ in. (13 mm) thick noncombustible insulation board over 1 in. (25 mm) glass fiber or mineral wool batts without ventilated air space	50%	33%	18/457	24/610
(c) 0.024 in. (0.61 mm) (24 gage) sheet metal over 1 in. (25 mm) glass fiber or mineral wool batts reinforced with wire, or equivalent, on rear face with ventilated air space	66%	50%	12/305	18/457
(d) 3½ in. (90 mm) thick masonry wall with ventilated air space	66%	—	12/305	—
(e) 0.024 in. (0.61 mm) (24 gage) sheet metal with ventilated air space	66%	50%	12/305	18/457
(f) ½ in. (13 mm) thick noncombustible insulation board with ventilated air space.	66%	50%	12/305	18/457
(g) 0.024 in. (0.61 mm) (24 gage) sheet metal with ventilated air space over 0.024 in. (0.61 mm) (24 gage) sheet metal with ventilated air space	66%	50%	12/305	18/457
(h) 1 in. (25 mm) glass fiber or mineral wool batts sandwiched between two sheets 0.024 in. (0.61 mm) (24 gage) sheet metal with ventilated air space	66%	50%	12/305	18/457

<sup>1</sup>Spacers and ties shall be of noncombustible material. No spacers or ties shall be used directly behind appliance or conductor.

<sup>2</sup>With all clearance reduction systems using a ventilated air space, adequate air circulation shall be provided as described in 8-6.2.4. There shall be at least a 1 in. (25 mm) between the clearance reduction system and combustible walls and ceilings for clearance reduction systems using a ventilated air space.

<sup>3</sup>Mineral wool batts (blanket or board) shall have a minimum density of 8 lb per ft<sup>3</sup> (125.7 kg/m<sup>3</sup>) and have a minimum melting point of 1500°F (816°C).

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

<sup>5</sup>If a single wall connector passes through a masonry wall used as a wall shield, there shall be at least ½ in. (13 mm) of open, ventilated air space between the connector and the masonry.

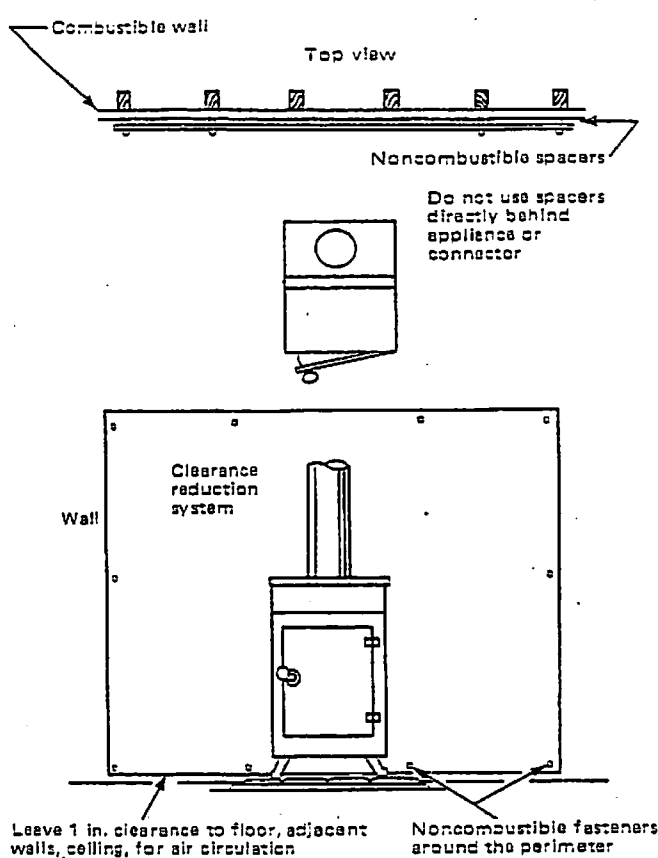
<sup>6</sup>There shall be at least 1 in. (25 mm) between the appliance and the protector. In no case shall the clearance between the appliance and the wall surface be reduced below that allowed in the table.

<sup>7</sup>Clearances in front of the loading door and/or ash removal door of the appliance shall not be reduced from those in Section 8-5.

<sup>8</sup>All clearances and thicknesses are minimums; larger clearances and thicknesses are acceptable.

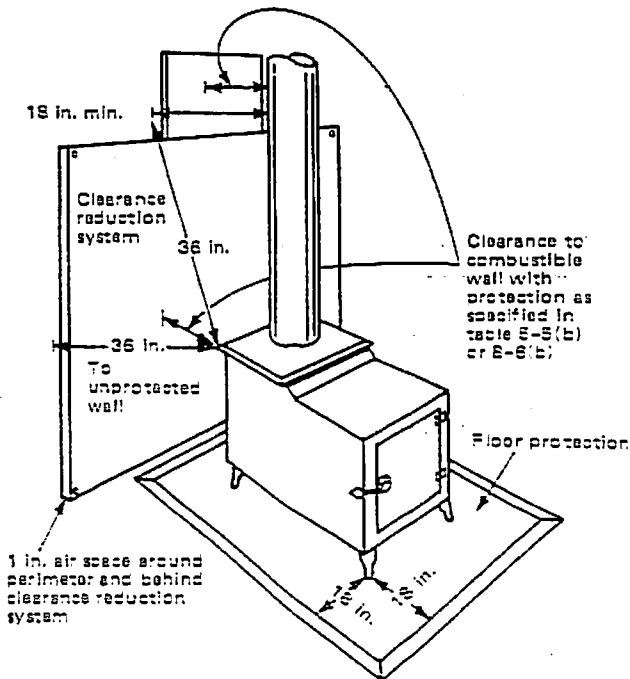
<sup>9</sup>To calculate the minimum allowable clearance, the following formula may be used:  $C_{pr} = C_{m} \times (1 - R/100)$ .  $C_{pr}$  is the minimum allowable clearance,  $C_{m}$  is the required clearance with no protection, and  $R$  is the maximum allowance reduction in clearance.

<sup>10</sup>Refer to Figures 8-5(f) and 8-5(g) for other reduced clearances using materials (e) through (h).



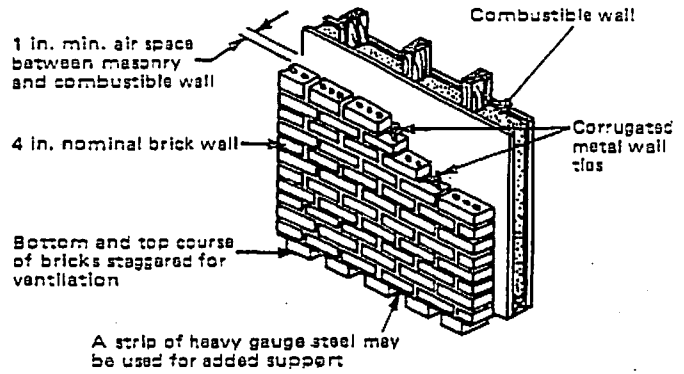
For SI Units: 1 in. = 25.4 mm.

Figure 5-6(a).



For SI Units: 1 in. = 25.4 mm.

Figure 5-6(b).

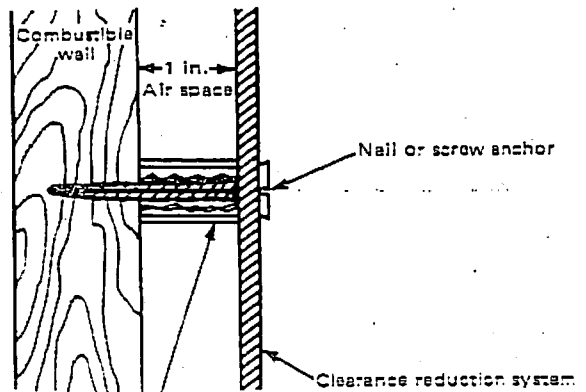
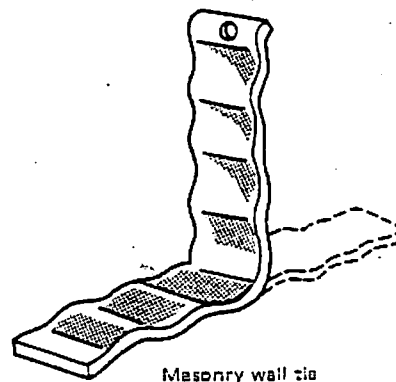


Note: Do not place masonry wall ties directly behind appliance or connector

Masonry Clearance Reduction System

For SI Units: 1 in. = 25.4 mm.

Figure 5-6(c).



1 in. Noncombustible spacer such as stacked washers, small diameter pipe, tubing, or electrical conduit.

Masonry walls may be attached to combustible walls using wall ties.

Do not use spacers directly behind appliance or connector.

For SI Units: 1 in. = 25.4 mm.

Figure 5-6(d).