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NFPA 211 Chimneys, Fireplaces, Vents and Solid Fuel Burning Appliances 1984

National Fire Protection Association Batterymarch Park, Quincy, MA 02269

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Policy Adopted by NFPA Board of Directors on December 3, 1982

The Board of Directors reaffirms that the National Fire Protection Association recognizes that the toxicity of the products of combustion is an important factor in the loss of life from fire. NFPA has dealt with that subject in its technical committee documents for many years.

There is a concern that the growing use of synthetic materials may produce more or additional toxic products of combustion in a fire environment. The Board has, therefore, asked all NFPA technical committees to review the documents for which they are responsible to be sure that the documents respond to this current concern. To assist the committees in meeting this request, the Board has appointed an advisory committee to provide specific guidance to the technical committees on questions relating to assessing the hazards of the products of combustion.

Statement on NFPA Procedures

This material has been developed under the published procedures of the National Fire Protection Association, which are designed to assure the appointment of technically competent Committees having balanced representation. While these procedures assure the highest degree of care, neither the National Fire Protection Association, its members, nor those participating in its activities accepts any liability resulting from compliance or noncompliance with the provisions given herein, for any restrictions imposed on materials or processes, or for the completeness of the text.

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Standard for

Chimneys, Fireplaces, Vents and Solid Fuel Burning Appliances

NFPA 211-1984

1984 Edition of NFPA 211

This edition of NFPA 211, *Standard for Chimneys, Fireplaces, Vents and Solid Fuel Burning Appliances*, was prepared by the Technical Committee on Chimneys, Fireplaces and Venting Systems for Heat Producing Appliances, released by the Correlating Committee on Chimneys and Other Heat and Vapor Removal Equipment and acted on by the National Fire Protection Association, Inc., at its Fall Meeting held November 14-17, 1983 in Orlando, Florida. It was issued by the Standards Council on January 18, 1984, with an effective date of February 7, 1984, and supersedes all previous editions.

This 1984 edition of this standard has been submitted to the American National Standards Institute for approval as an American National Standard.

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 1984 edition is considered a major revision as many sections have been reorganized for clarity, and the many tables and figures have been improved and expanded. Chapter 8 on solid-fuel appliances has been revised to reflect current concerns within that industry, including an expanded list of wall protection materials. In addition, the chimney selection chart has been updated and revised for clarity.

Origin and Development of NFPA 211

In 1906 the NFPA Committee on Chimneys and Flues presented its first report. In 1914, under the jurisdiction of the then Committee on Field Practice, recommendations on chimneys and flues were prepared as Chapter VII of the Field Practice Manual, presented in 1914 and adopted in 1915. In 1926 the Association adopted the Chimney Construction Ordinance of the National Board of Fire Underwriters. In 1944 the Association adopted Article XI of the 1943 Edition of the Building Code of the National Board of Fire Underwriters to supersede the former chimney ordinance. This action was taken by the Board of Directors in the name of the Association, on recommendation of the Committee on Field Practice.

In 1948 the subject of Chimneys and Flues was transferred to the Committee on Building Construction. In 1950 the Association adopted Article X of the 1949 National Building Code of the National Board of Fire Underwriters, to supersede the 1944 standard, upon recommendation of the Committee on Building Construction and action by the Board of Directors.

In 1955 the subject of chimneys and flues was transferred to the newly appointed Committee on Chimneys and Heating Equipment. The 1957 revision of No. 211 was to make the text consistent with the provisions on the same subject appearing in the National Building Code of the National Board of Fire Underwriters. Standard No. 211 was revised in 1961 and completely revised in 1964. The 1964 edition included requirements for chimney connectors which were previously covered in NFPA 212. This latter standard was withdrawn in 1964. Since 1964, revised editions of the standard have been adopted by the Association in 1966, 1968, 1970, 1971, 1972, and 1977. In 1969 new text was added to cover the subject of spark arrestors which had been covered in NFPA 213, which was withdrawn in 1969.

In 1980 the scope of NFPA 211 was expanded to include solid-fuel appliances, and in this 1984 edition major revisions have been made to many sections, including important tables and graphs.

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This list represents the membership at the time the Committee was balloted on the text of this edition. Since that time, changes in the membership may have occurred.

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.

Contents

Standard for
Chimneys, Fireplaces, Vents and Solid Fuel Burning Appliances

NFPA 211-1984

NOTE: Information on referenced publications can be found in Chapter 9 and Appendix A.

Chapter 1 General

1-1 Scope. This edition of NFPA 211 contains provisions for chimneys, fireplaces, venting systems and solid fuel burning appliances including their installation. The standard applies to residential as well as commercial and industrial installations.

1-2 Purpose.

1-2.1 The primary concern of this standard is the removal of waste gases, the reduction of fire hazards associated with the construction and installation of chimneys, fireplaces, and venting systems for residential, commercial and industrial appliances and the installation of solid fuel burning appliances.

1-2.2 Selection of a chimney or vent is dependent on the type of appliance connected thereto, the fuel used by the appliance, and the temperature of the flue gases at the appliance outlet. This standard gives minimum construction and installation requirements for chimneys and vents suitable for use with appliances classified as residential type, building heating, low, medium, and high heat appliances. Table 1-2(a) covers the selection of a chimney for various appliances. Table 1-2(b) covers the selection of a vent for certain appliances listed as suitable with such vents. Chapter 7 covers the construction and installation of fireplaces and Chapter 8 covers the installation of solid fuel burning appliances.

1-3 Definitions.

1-3.1 For other definitions particular to fireplaces and solid fuel appliances, see Chapters 7 and 8.

1-3.2 Other definitions relating to chimneys, fireplaces, and venting systems are contained in the *Glossary of Terms Relating to Chimneys, Vents, and Heat-Producing Appliances,* NFPA 97M.

1-3.3 General Definitions.

Air, Combustion. The air required to provide for the complete combustion of fuel and usually consisting of primary air, secondary air, and excess air.

Appliance. An appliance is utilization equipment, normally built in standardized sizes or types, which is installed or connected as a unit to perform one or more functions such as clothes washing, air conditioning, food mixing, cooking, heating, refrigeration, etc.

Appliance, Automatically Lighted Fuel-Burning. A fuel-burning appliance in which fuel to the main burner is normally turned on and ignited automatically.

Appliance, Building Heating. Fuel-burning and electric boilers, operating at not over 50 psig (345 kPa) pressure, central furnaces, and heaters intended primarily for heating spaces having volume exceeding 25,000 cu ft (708 m^3).

Appliance, Cooking, Floor-Mounted Restaurant-Type. A range, oven, broiler, or other miscellaneous cooking appliance, of a type designated for use in hotel and restaurant kitchens and for mounting on the floor.

Appliances, Counter, Gas. Appliances such as gas-operated coffee brewers and coffee urns and any appurtenant water heating equipment, food and dish warmers, hot plates and griddles.

Appliances, Industrial

a. Low-Heat Industrial Appliance. An industrial appliance such as a commercial cooking range, pressing machine boiler at any pressure, bake oven, candy furnace, stereotype furnace, drying and curing appliance, and other process appliances in which materials are heated or melted at temperatures (excluding flue-gas temperatures) not exceeding 600°F (316°C). Appliances otherwise classed as medium-heat appliances may be considered as low-heat appliances if not larger than 100 cu ft (2.83 m^3) in size excluding any burner equipment and blower compartment.

b. Medium-Heat Industrial Appliance. An industrial appliance such as an annealing furnace (glass or metal), charcoal furnace, galvanizing furnace, gas producer, commercial or industrial incinerator, and steam boiler operating at over 50 psig (345 kPa) pressure when such appliance is larger than 100 cu ft (2.83 m^3) in size, and other furnaces classified as medium-heat appliances in accordance with nationally recognized good practice. Appliances otherwise classed as medium-heat appliances may be considered as low-heat appliances if not larger than 100 cu ft (2.83 m^3) in size excluding any burner equipment and blower compartment.

c. High-Heat Industrial Appliance. An industrial appliance such as billet and bloom furnace, blast furnace, brass melter, cupola, glass furnace, open-hearth furnace, and ceramic kiln and vitreous enameling oven (ferrous metals) when such appliances are larger than 100 cu ft (2.83 m^3) in size, and other furnaces classified as high-heat appliances in accordance with nationally recognized good practice.

Appliance, Residential-Type Heating. Fuel-burning and electric heating appliances, except high pressure steam boilers, for heating building spaces having a volume of not more than 25,000 cu ft (708 m^3) and other heat producing appliances of the type mainly used in residences, but which may be used in other buildings, such as cooking stoves and ranges, clothes dryers, fireplace stoves, domestic incinerators, laundry stoves, water heaters, and heat pumps.

Appliance Casing (Jacket). An enclosure forming the outside of the appliance.

Appliance Flue. The flue passages within an appliance.

Approved. Acceptable to the "authority having jurisdiction."

NOTE: The National Fire Protection Association does not approve, inspect or certify any installations, procedures, equipment, or materials nor does it approve or evaluate testing laboratories. In determining the acceptability of installations or procedures, equipment or materials, the authority having jurisdiction may base acceptance on compliance with NFPA or other appropriate standards. In the absence of such standards, said authority may require evidence of proper installation, procedure or use. The authority having jurisdiction may also refer to the listings or labeling practices of an organization concerned with product evaluations which is in a position to determine compliance with appropriate standards for the current production of listed items.

Ash. Solid residue which remains after combustion is complete.

Ash Receptacle Door. A door below the grade level providing access to the ash receptacle.

Attic-Type Heating Appliance. A heating appliance designed specifically for installation in an attic or in a space with low headroom, normally unoccupied.

Authority Having Jurisdiction. The "authority having jurisdiction" is the organization, office or individual responsible for "approving" equipment, an installation or a procedure.

NOTE: The phrase "authority having jurisdiction" is used in NFPA documents in a broad manner since jurisdictions and "approval" agencies vary as do their responsibilities. Where public safety is primary, the "authority having jurisdiction" may be a federal, state, local or other regional department or individual such as a fire chief, fire marshal, chief of a fire prevention bureau, labor department, health department, building official, electrical inspector, or others having statutory authority. For insurance purposes, an insurance inspection department, rating bureau, or other insurance company representative may be the "authority having jurisdiction." In many circumstances the property owner or his designated agent assumes the role of the "authority having jurisdiction"; at government installations, the commanding officer or departmental official may be the "authority having jurisdiction."

Automatic Electric Igniter. A device for fuel burners designed to utilize electric energy for ignition of a fuel-air mixture at the burner.

Baffle. An object placed in an appliance to change the direction or retard the flow of air, air-fuel mixtures, or flue gases.

Boiler. A closed vessel for heating water or a liquid or for generating steam or vapor by direct application of heat. It is usually an indirect-fired fuel-burning or electrically heated appliance.

Boiler, Combination — Fuel. A single boiler unit designed to burn more than one type of fuel (gas, oil or solid), either separately or simultaneously, using either separate or common combustion chambers and flues.

Boiler, High Pressure. A boiler for generating steam at pressures in excess of 15 psig (103 kPa), or for heating water to a temperature in excess of 250 °F (121 °C) or at a pressure in excess of 160 psig (1103 kPa).

Boiler, Hot Water Supply. A low-pressure hot water boiler having a volume exceeding 120 gal (454 L), or a heat input exceeding 200,000 Btus per hour (58.6 kwh) or an operating temperature exceeding 200 °F (93 °C) that provides hot water to be used externally to itself.

Boiler, Low Pressure. A boiler for generating steam at pressures not in excess of 15 psig (103 kPa) or for furnishing water at a temperature not in excess of 250 °F (121 °C) at pressures not in excess of 160 psig (1103 kPa).

Boiler, Supplementary. A boiler designed to burn one type of fuel (gas, oil or solid) that is intended for supplementing a boiler burning another type of fuel (gas, oil or solid) by means of a common heat transfer medium.

Bond. As referring to bricklaying and masonry chimneys, that connection between brick, stone or other masonry units, formed by lapping them upon one another in carrying up the work, so as to form an inseparable mass.

Breeching. The conduit conveying flue gas from the appliance to the chimney.

Btu. Abbreviation for British Thermal Unit. The quantity of heat required to raise the temperature of 1 pound of water 1 °F.

Burner, Mechanical Draft Type. A burner which includes a power-driven fan, blower or other mechanism as the primary means for supplying the air for combustion.

Burner, Natural Draft Type. A burner which depends primarily upon the natural draft created in the chimney or venting system to induce the air required for combustion into the burner.

Chimney. (See also "Gas Vent" and "Venting System.") One or more passageways, vertical or nearly so, for conveying flue gases to the outside atmosphere.

a. Factory-Built Chimney. A chimney composed of listed factory-built components assembled in accordance with the terms of listing to form the completed chimney.

b. Masonry Chimney. A field-constructed chimney of solid masonry units, bricks, stones, listed masonry chimney units or reinforced portland cement concrete, lined with suitable chimney flue liners built in accordance with applicable Building Code requirements.

c. Metal Chimney. A field-constructed chimney of metal made in accordance with applicable Building Code requirements.

Chimney Cap. A protective covering or housing for the top of a chimney intended for preventing the entry of rain, snow, animals, birds, etc., and for preventing downdrafts.

Chimney Connector. The pipe which connects a fuel-burning appliance to a chimney.

Cleanout Opening. An opening or hole in a chimney, usually located near its base, designed to allow access to the flue for purposes of removing ash, creosote, soot and other extraneous matter that may become trapped.

Clearance. The distance between a heat producing appliance, chimney, chimney connector, vent, vent connector, or plenum, and other surfaces.

Clothes Dryer. A device used to dry wet laundry by means of heat derived from the combustion of fuel or from electric heating elements. Dryer classifications are as follows:

a. Type 1. Factory-built package, multiple produced. Primarily used in family living environment. May or may not be coin-operated for public use. Usually the smallest unit physically and in function output.

b. Type 2. Factory-built package, multiple produced. Used in business with direct intercourse of the function with the public. May or may not be operated by public or hired attendant. May or may not be coin-operated. Not designed for use in individual family living environment. May be small, medium, or large in relative size.

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

Combustion. Combustion, as used herein, refers to the rapid oxidation of fuel accompanied by the production of heat or heat and light.

Combustion Products. Effluents resulting from the combustion of a fuel including the inerts, but excluding excess air.

Corbel. Units of masonry projecting from or stepping upward and outward from the face of a wall or chimney in courses to form a support or ledge for a beam, rafter or other member.

Damper. A valve or plate for controlling draft or the flow of gases including air.

Damper, Automatically Operated. A damper operated by an automatic control.

Damper, Flue Gas. A damper located on the downstream side of the combustion chamber of a fuel-burning appliance, usually in a flue passage of the appliance or in the chimney or vent connector.

Damper, Manually Operated. An adjustable damper manually set and locked in the desired position.

Direct Vent Appliance (Sealed Combustion System Appliance). A system consisting of an appliance, combustion air and flue gas connections between the appliance and the outside atmosphere, and a vent cap supplied by the manufacturer, and constructed so that all air for combustion is obtained from the outside atmosphere and all flue gases are discharged to the outside atmosphere.

Draft. The pressure differential which causes the flow of air or gases through a chimney, gas vent or venting system.

a. Mechanical Draft. Draft produced by a fan or an air or steam jet. When a fan is located so as to push the flue gases through the chimney or vent, the draft is forced. When the fan is located so as to pull the flue gases through the chimney or vent, the draft is induced.

b. Natural Draft. Draft produced by the difference in the weight of a column of flue gases within a chimney or vent and a corresponding column of air of equal dimension outside the chimney or vent.

Draft Hood. A device built into a gas appliance, or made a part of a chimney connector or vent connector from a gas appliance, which is designed to (1) permit the ready escape of flue gases in the event of zero draft, a back draft, or stoppage beyond the draft hood; (2) permit the ready escape of the back pressure from a back draft so it does not enter the gas appliance; and (3) neutralize possible effects of excess draft upon the operation of the appliance.

Draft Regulator, Barometric. A device built into a fuel-burning appliance or made a part of a chimney connector or vent connector, which functions to reduce excessive draft through an appliance to a desired value by admitting ambient air into the appliance chimney, chimney connector, vent or vent connector.

Factory-Built Appliance. A manufactured appliance furnished by the manufacturer as a single assembly or as a package set of subassemblies or parts, and including all the essential components necessary for it to function normally when installed as intended.

Fan. An assembly comprising blades or runners and housings or casings, and being either a blower or exhauster.

Fireplace. A hearth, fire chamber, or similarly prepared place and a chimney.

a. Factory-Built Fireplace. A fireplace composed of listed factory-built components assembled in accordance with the terms of listing to form the completed fireplace.

b. Masonry Fireplace. A hearth and fire chamber of solid masonry units such as bricks, stones, listed masonry units, or reinforced concrete, provided with a suitable chimney.

Fireplace Accessories. Accessories intended for field installation into or attachment to existing masonry fireplaces. This includes such items as heat exhangers, door assemblies, tubular grates and blowers.

Fireplace Insert. A factory-built field-installed product consisting of a firebox assembly designed to be in-

stalled within or partially within the fire chamber of a fireplace which uses the fireplace flue to vent the products of combustion.

Fireplace Stove. A freestanding, chimney-connected, solid fuel burning heater having its fire chamber open to the room.

Flame Spread Rating. The flame spread rating of materials as determined by the *Method of Test of Surface Burning Characteristics of Building Materials*, NFPA 255, ASTM E84, Underwriters Laboratories Inc. UL 723. Such materials are listed in the Underwriters Laboratories Inc. Building Materials List under "Hazard Classification (Fire)."

Floor Protector. Noncombustible surfacing applied to the floor area underneath and extending in front, to the sides and to the rear of a heat producing appliance.

Flue. The general term for a passage through which flue gases pass from the combustion chamber to the outer air.

a. Appliance Flue. The flue passage within an appliance.

b. Chimney Flue. The passage in a chimney for conveying the flue gases to the outside atmosphere.

c. Dilution Flue. A passage designed to effect the dilution of flue gases with air before discharge from an appliance.

Flue Collar. That portion of an appliance designed for attachment of a chimney or vent connector or a draft hood.

Flue Gases. Combustion products from fuel-burning appliances plus excess air.

Furnace, Central Warm-Air. A self-contained indirect-fired or electrically heated appliance designed to supply heated air through ducts to spaces remote from or adjacent to the appliance location.

a. Forced-Air-Type Central Furnace. A central furnace equipped with a blower which provides the primary means for circulation of air.

1. Attic-Type Central Furnace. A forced-air type furnace designed specifically for installation in an attic or in a space with low headroom, normally occupied.

2. Downflow-Type Central Furnace. A forced-air type furnace designed with airflow essentially in a vertical path, discharging air at or near the bottom of the furnace.

3. Horizontal-Type Central Furnace. A forced-air type furnace designed with airflow through the furnace essentially in a horizontal path.

4. Upflow-Type Central Furnace. A forced-air type furnace designed with airflow essentially in a vertical path, discharging air at or near the top of the furnace.

b. Gravity-Type Central Furnace. A central furnace depending primarily on circulation of air by gravity.

c. Gravity-Type Central Furnace with Integral Fan. A central furnace equipped with a fan as an integral part of its construction and operable on gravity systems only. The fan is used only to overcome the internal resistance to airflow.

d. Gravity-Type Central Furnace with Booster Fan. A central furnace equipped with a booster fan which does not materially restrict free circulation of air by gravity flow when such a fan is not in operation.

Furnace, Combination — Fuel. A single furnace unit designed to burn more than one type of fuel (gas, oil or solid), either separately or simultaneously, using either separate or common combustion chambers and flues.

Furnace, Duct. A central furnace designed for installation in a duct of an air distribution system to supply warm air for heating and which depends for air circulation on a blower not furnished as part of the furnace.

Furnace, Floor. A self-contained indirect-fired or electrically heated furnace designed to be suspended from the floor of the space to be heated. A fuel-burning floor furnace is designed to take air for combustion from outside the space being heated and is provided with means for observing flame and lighting the appliance from such space.

a. Gravity-Type Floor Furnace. A floor furnace depending primarily upon circulation of air by gravity. This classification shall also include floor furnaces equipped with booster-type fans which do not materially restrict free circulation of air by gravity flow when such fans are not in operation.

b. Fan-Type Floor Furnace. A floor furnace equipped with a blower which provides the primary means for circulation of air.

Furnace, Supplementary. A furnace designed to burn one type of fuel (gas, oil or solid) that is intended for supplementing a central warm-air furnace burning another type of fuel (gas, oil or solid) by means of a common warm-air supply plenum.

Gas Vent. A passageway, vertical or nearly so, composed of listed factory-built components assembled in accordance with the terms of listing for conveying flue gases from gas appliances or their vent connectors to the outside atmosphere.

a. Type B Gas Vent. A gas vent for venting gas appliances with draft hoods and other gas appliances listed for use with Type B Gas Vents.

b. Type BW Gas Vent. A gas vent for venting listed gas-fired vented wall furnaces.

Header. With reference to chimneys, a beam set at right angles to floor or roof joists to provide support and framing around the opening.

Hearth. The floor area within the fire chamber of a fireplace or a fireplace stove.

Hearth Extension. The noncombustible surfacing applied to the floor area extending in front of and at the sides of the hearth opening of a fireplace or a fireplace stove; also as applied to the floor area beneath a fireplace

stove or beneath an elevated overhanging fireplace hearth.

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 air passing through the exchanger, or in which heat from electric resistors is transferred to the air.

Heat-Producing Appliance. An appliance which produces heat by utilizing electric energy or by burning fuel.

Heat Reclaimer (Chimney Connector Type). A heat exchanger intended to be installed in a chimney connector between a heating appliance and the chimney to transfer heat from the flue gases through metal to air or water.

Incinerator. An appliance or combustion chamber for the reduction by burning of rubbish, garbage, and other wastes. (For description of types of wastes see NFPA 82.)

a. Residential-Type Incinerators. An incinerator for the burning of ordinary combustible waste material and garbage (Type 2 Waste) incidental to residential occupancy and having a firebox or charging compartment of not over 5 cu ft (0.142 m^3) in capacity. Residential-type incinerators may be self-contained, factory-made units not requiring field construction, or may be of a built-in type designed to be encased in masonry or installed in a masonry wall or chimney.

b. Commercial-Industrial Type Incinerator (Class III, IV, VI, and VII). An incinerator having a charging capacity in excess of 5 cu ft (0.142 m^3) suitable for a variety of wastes as shown below.

Incinerator Class	Waste Types
Class III	Type O, Type 1, or Type 2
Class IV	Type 3
Class V	Types 0-4 (Municipal Incinerators)
Class VI	Type 4
Class VII	Types 5 & 6

c. Chute-Fed Incinerators (Class IIA). An incinerator designed specifically to be fed refuse from one or more floors above the incinerator directly into the incinerator by a separate chute constructed with a positive means to avoid penetration by smoke or fumes and connected directly over the primary combustion chamber. The incinerator is built with a primary and secondary combustion chamber and a settling chamber. It may include a flue-gas washer or scrubber. A separate chimney serves to convey the combustion gases to the outdoors. This class of incinerator is suitable for Type 1 and Type 2 wastes. They are generally used in residential and institutional buildings, including apartments, clubs, dormitories, churches, schools, and other occupancies where Type 1 and Type 2 wastes are to be incinerated.

d. Flue-Fed Incinerators (Class II). An incinerator which is served by a single chimney flue that serves also as the charging chute. Refuse is fed directly to the incinerator through this chimney flue from one or more floors above the incinerator. This class of incinerator is suitable for waste materials and garbage incidental to residential occupancy in single and multifamily buildings, Type 1 and Type 2 wastes. This class of incinerator is generally used in residential and institutional buildings, including apartments, clubs, dormitories, churches, schools, and other occupancies where Type 1 and Type 2 wastes are to be incinerated.

Labeled. Equipment or materials to which has been attached a label, symbol or other identifying mark of an organization acceptable to the "authority having jurisdiction" and concerned with product evaluation, that maintains periodic inspection of production of labeled equipment or materials and by whose labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner.

Lintel. As referring to masonry fireplaces, is that horizontal noncombustible member, usually of masonry or steel, spanning the opening of a masonry fireplace to support the load above.

Listed. Equipment or materials included in a list published by an organization acceptable to the "authority having jurisdiction" and concerned with product evaluation, that maintains periodic inspection of production of listed equipment or materials and whose listing states either that the equipment or material meets appropriate standards or has been tested and found suitable for use in a specified manner.

NOTE: The means for identifying listed equipment may vary for each organization concerned with product evaluation, some of which do not recognize equipment as listed unless it is also labeled. The "authority having jurisdiction" should utilize the system employed by the listing organization to identify a listed product.

Mantel. A shelf or facing ornament above a fireplace opening.

Manufacturer. The company or organization which evidences its responsibility by affixing its name or nationally registered trademark or trade name to the appliance concerned.

Noncombustible Material. A material which, in the form in which it is used and under the conditions anticipated, will not ignite, burn, support combustion, or release flammable vapors when subjected to fire or heat. Materials reported as noncombustible, when tested in accordance with the *Standard Method of Test for Noncombustibility of Elementary Materials*, ASTM E 136, shall be considered noncombustible materials.

Qualified Agency. Any individual, firm, corporation or company which either in person or through a representative is engaged in and is responsible for the connection venting, installation, repair and servicing of heat producing appliances, who is experienced in such work, familiar with all precautions required, and has complied with all the requirements of the authority having jurisdiction.

Range. An appliance intended primarily for cooking, including roasting, baking or broiling or any combination of these functions.

Range, Built-In Residential Type. A range designed to be recessed into, placed upon, or attached to counters, cabinets, walls or partitions.

Range, Bungalow (Utility Type). A range having an additional section for gas, liquid, or solid fuel which is designed for space heating and heating a solid top section but not for oven heating.

Range, Room Heater Type. A range having a separate room heater section.

Range, Residential Type. A range primarily for residential cooking purposes.

Range, Restaurant Type. A range of the type designed for use primarily in restaurant and hotel kitchens.

Roof Jack. A factory-made assembly for conveying flue gases through a roof and which includes a flue-gas passageway, insulating means, flashing, and cap.

Room Heater. A self-contained, freestanding air-heating appliance intended for installation in the space being heated and not intended for duct connection.

a. Room Heater, Circulating. A room heater with an outer jacket surrounding the heat exchanger arranged with openings at top and bottom so that air circulates between the heat exchanger and the outer jacket. Room heaters which have openings in an outer jacket to permit some direct radiation from the heat exchanger are classified as radiant type.

b. Room Heater, Fireplace Stove, Combination. A chimney-connected, solid fuel burning room heater which is designed to be operated with the fire chamber either open or closed.

c. Room Heater, Radiant. A room heater designed to transfer heat primarily by direct radiation.

d. Room Heater, Solid Fuel. A chimney-connected, solid fuel burning room heater which is designed to be operated with the fire chamber closed.

Room Large in Comparison with the Size of the Appliance. A room having a volume equal to at least 12 times the total volume of a 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 compartment and burner vestibule, when used. When the actual ceiling height of a room is greater than 8 ft (2.44 m), the volume of the room is to be figured on the basis of a ceiling height of 8 ft (2.44 m).

Sealed Combustion System Appliance (Direct Vent Appliance). A system consisting of an appliance, combustion air and flue gas connections between the appliance and the outside atmosphere, and a vent cap supplied by the manufacturer, and constructed so that all air for combustion is obtained from the outside atmosphere and all flue gases are discharged to the outside atmosphere.

Shall. Indicates a mandatory requirement.

Smoke Developed Rating. The smoke developed rating of materials as determined by the *Method of Test of Surface Burning Characteristics of Building Materials*, NFPA 255, ASTM E84, Underwriters Laboratories Inc. Standard UL 723.

Smoke Test. A procedure for ascertaining the tightness of a chimney and for detecting any cracks in a masonry chimney flue or deterioration or breaks in the integrity of a factory-built or metal chimney flue. The procedure involves igniting a smoke bomb or building a smoky fire in a fireplace or solid fuel burning appliance, covering the chimney termination and checking for smoke escapage through the chimney walls.

Solid Fuel. Wood, coal and other similar organic materials and any combination of them.

Solid Fuel Burning Appliance. A chimney-connected device that burns solid fuel designed for purposes of heating, cooking or both.

Spark Arrestors. Screening material or a screening device attached to a chimney termination to prevent the passage of sparks and brands to the outside atmosphere.

Splay. See "Wash."

Steel Fireplace Unit. A unit consisting of a steel firebox, and an air chamber adjacent to the sides and rear of the firebox, used to construct a masonry fireplace. The unit usually has ducts to circulate air to and heated air from the air chamber to the living space.

Thimble. A fixed or removable ring, tube or lining usually located in the hole where the chimney connector or vent connector passes through a wall or enters a chimney or vent.

Trimmer. With reference to chimneys, the longer floor or roof framing member around a rectangular opening into which the end of a header is joined.

Type B Vent. See "Gas Vent."

Type BW Vent. See "Gas Vent."

Type L Vent. A passageway, vertical or nearly so, composed of listed factory-built components assembled in accordance with the terms of listing for conveying flue gases from oil and gas appliances or their vent connectors to the outside atmosphere.

Unit Heater. A self-contained heating appliance, which may or may not include an integral fan for circulating air, which may be of the floor-mounted or suspended type, intended for the heating of the space in which it is installed. A unit heater may be an indirect-fired fuel burning appliance or may utilize steam, hot water or electricity.

Vent. See "Gas Vent" and "Type L Vent."

Venting. Removal of combustion products as well as noxious or toxic fumes to the outer air.

Venting System (Flue Gases). A continuous open passageway from the flue collar or draft hood of a fuel-burning appliance to the outside atmosphere for the purpose of removing flue gases.

NOTE: A venting system for exhausting flue gases usually is composed of a gas vent, Type L vent or a chimney and vent or chimney connector(s) if used, assembled to form the open passageway.

Venting System, Type L. See "Type L Vent."

Vent Cap. A protective covering or housing attached to the vent termination intended for preventing the entry of rain, snow, animals, etc., and for preventing downdrafts.

Vent Connector. The pipe which connects a fuel-burning appliance to a gas vent or Type L vent.

NOTE: Since a vent is a vertical or nearly vertical passageway composed of listed factory-built components it follows that any pipe or manifold used to connect an appliance(s) to such vertical vent is a vent connector. However if the vertical vent is connected directly to an appliance draft hood or flue collar, a vent connector is not involved.

Vent Gases. Products of combustion from fuel-burning appliances plus excess air, plus any dilution air in the venting system above a draft hood or draft regulator.

Vented Appliance. An indirect-fired appliance provided with a flue collar to accommodate a venting system for conveying flue gases to the outer air.

Wall Furnace. A self-contained, vented appliance complete with grills or equivalent, designed for incorporation in or permanent attachment to the structure of a building, mobile home or recreational vehicle, and furnishing heated air directly into the space to be heated through openings in the casing. Such appliances shall not be provided with duct extensions beyond the vertical and horizontal limits of the casing proper, except that boots not to exceed 10 in. (254 mm) beyond the horizontal of the casing for extension through walls of nominal thickness may be permitted. When provided, such boots shall be supplied by the manufacturer as an integral part of the appliance. This definition excludes floor furnaces, unit heaters and central furnaces.

a. Gravity-Type Wall Furnace. A wall furnace depending on circulation of air by gravity.

b. Fan-Type Wall Furnace. A wall furnace equipped with a fan for the circulation of air.

Wall Protector (Shield). Noncombustible surfacing applied to a wall area for the purpose of reducing the clearance between the wall and a heat producing appliance.

Wash. A slight slope or beveled edge of the top surface of a chimney designed to shed water away from the flue liner.

Water Heater. An indirect-fired fuel-burning or electrically heated appliance for heating water to a temperature not more than 200°F (93°C), having an input not greater than 200,000 Btu or 58.6 kw per hour and a water containing capacity not exceeding 120 US gal (454 L).

Wythe. With reference to masonry chimneys, a course, thickness or a continuous vertical section of masonry separating flues in a chimney.

1-4 Dimensions. As used to describe building construction components, all minimum dimensions specified in this standard are actual unless otherwise stated. Nominal dimensions are permitted to vary from their stated dimensions by no more than ½ in. (12.7 mm).

1-5 Draft.

1-5.1 A chimney or vent shall be capable of producing a draft at the appliance not less than that required for safe operation of the appliance(s) connected thereto in accordance with Chapter 26, Chimney, Gas Vent, and Fireplace Systems, of the 1979 Equipment Volume of the ASHRAE *Handbook*.

1-5.2 A mechanical draft system of either forced or induced draft design may be used to increase draft or capacity. When a mechanical draft system is installed, provision shall be made to prevent the flow of fuel to automatically fired appliance(s) when that system is not operating.

1-5.3 Chimneys serving incinerators, or other process equipment where the combustion process cannot be completely stopped by fuel shutoff alone, shall be sized for natural draft conditions. When air pollution control devices, or other devices, in the chimney system require a mechanical draft system, the chimney system shall be so arranged that upon a power failure the natural draft chimney alone can satisfactorily remove the products of combustion until the conbustible material is completely consumed.

1-5.4 Forced draft systems and all portions of induced draft systems under positive pressure during operation shall be designed and installed so as to be gastight or as to prevent leakage of combustion products into a building.

1-6 Termination (Height).

1-6.1 Chimneys and vents shall terminate above the roof level in accordance with the requirements of this standard. [*See Figures 3-3(a) and (b).*]

Exception: As provided in 4-2.1 Exception, Section 6-3, and Section 6-6.

1-6.2 Natural draft chimneys and vents shall not terminate at an elevation less than 5 ft (1.53 m) above the flue collar or highest connected draft hood outlet.

Exception: As provided in Section 6-6.

1-7 Enclosure. Interior residential chimneys shall be enclosed where they extend through closets, storage areas or habitable spaces where the surface of the chimney could be contacted by persons or combustible materials. The space between the chimney and the enclosure shall be at least the minimum air space clearance specified in this standard (Table 3-2) or the clearance specified in the manufacturer's instructions for listed chimneys.

Table 1-2(a) Chimney Selection Chart
SEE TEXT FOR REQUIREMENTS

Column I	Column II	Column III	Column IV	Column V
Chimney Type (For Installation and Construction Requirements see Chapters 2, 3, and 4 as referenced below.)				
1. Factory Built — Residential Type and Building Heating Appliance (See Section 2-3)	1. Factory Built — Residential Type and Building Heating Appliance (See Section 2-3)	1. Factory Built — 1400 Degree Fahrenheit (See Section 2-3)	1. Factory Built — Medium Heat Appliance (See Section 2-3)	
2. Masonry, Residential Type (See Chapter 3)	2. Masonry, Low Heat Type (See Chapter 3)	2. Masonry, Low Heat Type (See Chapter 3)	2. Masonry, Medium Heat Type (See Chapter 3)	2. Masonry, High Heat Type (See Chapter 3)
	3. Metal, Low Heat Type (See Chapter 4, Section 4-2 and Note 1 below)	3. Metal, Low Heat Type (See Chapter 4, Section 4-2 and Note 1 below)	3. Metal, Medium Heat Type (See Chapter 4, Section 4-3 and Note 1 below)	3. Metal, High Heat Type (See Chapter 4, Section 4-4 and Note 1 below)
Maximum Continuous Appliance Outlet Flue Gas Temperature				
1000°F (538°C)	**1000°F (538°C)**	**1400°F (760°C)**	**1800°F (982°C)**	**Over 1800°F (982°C)**
Types of Appliances to Be Used with Each Type Chimney (See Note 2 below.)				
Residential type gas, liquid, and solid fuel burning appliances such as: 1. Dual fuel furnaces 2. Fireplace inserts 3. Fireplace stoves 4. Fireplace stove-room heater 5. Floor furnaces 6. Free-standing fireplaces 7. Hot water heating boilers 8. Low pressure steam heating boilers 9. Masonry fireplaces 10. Ranges 11. Residential incinerators 12. Room heaters 13. Stoves 14. Wall furnaces 15. Warm air furnaces 16. Water heaters	A. All appliances shown in Column I B. Nonresidential type building heating appliances for heating a total volume of space exceeding 25,000 cu ft (708 m) C. Steam boilers operating at not over 1000°F (538°C) flue gas temperature; pressing machine boilers	All appliances shown in Columns I and II and appliances such as: 1. Class A ovens or furnaces operating at temperatures below 1400°F (760°C) as defined in NFPA 86A 2. Annealing baths for hard glass (fats, paraffin, salts, or metals) 3. Bake ovens (in bakeries) 4. Candy furnaces 5. Core ovens 6. Feed drying ovens 7. Forge furnaces 8. Gypsum kilns 9. Hardening furnaces (below dark red) 10. Lead melting furnaces 11. Nickel plate (drying) furnaces 12. Paraffin furnaces 13. Restaurant-type cooking appliances using solid or liquid fuel 14. Sulfur furnaces 15. Tripoli kilns (clay, coke and gypsum) 16. Wood drying furnaces 17. Zinc amalgamating furnaces	All appliances shown in Columns I, II and III, and appliances such as: 1. Alabaster gypsum 2. Annealing furnaces (glass or metal) 3. Charcoal furnaces 4. Cold stirring furnaces 5. Feed driers (direct fire heated) 6. Fertilizer driers (direct fire heated) 7. Galvanizing furnaces 8. Gas producers 9. Hardening furnaces (cherry to pale red) 10. Incinerators — commercial and industrial 11. Lehrs and glory 12. Lime kilns 13. Linseed oil boiling 14. Porcelain biscuit kilns 15. Pulp driers (direct fire heated) 16. Steam boilers operating at over 1000°F (538°C) flue gas temperature 17. Water-glass kilns 18. Wood-distilling furnaces 19. Wood-gas retorts	All appliances shown in Columns I, II, III, and IV and appliances such as: 1. Bessemer retorts 2. Billet and Bloom furnaces 3. Blast furnaces 4. Bone calcining furnaces 5. Brass furnaces 6. Carbon point furnaces 7. Cement brick and tile kilns 8. Ceramic kilns 9. Coal and water gas retorts 10. Cupolas 11. Earthenware kilns 12. Glass blow furnaces 13. Glass furnaces (smelting) 14. Glass kilns 15. Open hearth furnaces 16. Ore roasting furnaces 17. Porcelain baking and glazing kilns 18. Pot-arches 19. Puddling furnaces 20. Regenerative furnaces 21. Reverberator furnaces 22. Vitreous enameling ovens (ferrous metals)
Column I	**Column II**	**Column III**	**Column IV**	**Column V**

NOTE 1: Single-wall metal chimneys or unlisted metal chimneys shall not be used inside one- and two-family dwellings. See Chapter 4.

NOTE 2: For appliance types not listed in Columns I through V, the appropriate chimney shall be selected on the basis of the appliance gas temperature when appliance is fired at its normal maximum input, and type of surroundings.

Table 1-2(b)
Vent Selective Chart
Type of Vent

Type B — Gas	Type BW — Gas	Type L — Oil	Metal Pipe
Column I	**Column II**	**Column III**	**Column IV**
All listed gas appliances with draft hoods such as: 1. Central furnaces. 2. Duct furnaces. 3. Floor furnaces. 4. Heating boilers. 5. Ranges. 6. Built-in ovens. 7. Vented wall furnaces listed for use with Type B vents. 8. Room heaters. 9. Water heaters. 10. Horizontal furnaces. 11. Unit heaters.	1. Vented wall furnaces listed for use with Type BW vents only.	1. Low temperature flue gas appliances listed for use with Type L vents. 2. Gas appliances shown in Column I.	1. Incinerators used outdoors, such as in open sheds, breezeways or carports as provided in 4-5.1. 2. Gas appliances shown in Column I. 3. Listed residential and low heat gas appliances without draft hoods and unlisted residential and low heat gas appliances with or without draft hoods.

1-8 Flue Lining.

1-8.1 Castable or plastic refractories used to line chimneys or connectors shall be the equivalent in resistance to heat and erosion by flue gases to that of the firebrick which would otherwise be specified.

1-8.2 Lining made of castable or plastic refractories shall be secured to the supporting walls by anchors made of corrosion resistant steel capable of supporting the refractory load at 1500°F (816°C).

1-9 Caps and Spark Arrestors for Chimneys and Vents.

1-9.1 Chimney or vent caps, when required for the termination of chimneys or vents, shall be designed to prevent the entry of rain, snow and animals — including birds.

1-9.2 Screening material attached to chimney or vent caps to prevent the entry of animals and insects shall not adversely affect the chimney or vent draft.

1-9.3 Spark arrestors, when required by the authority having jurisdiction for chimneys attached to solid fuel burning equipment, shall meet the following requirements:

(a) The net-free area of the arrestor shall be not less than 4 times the net-free area of the outlet of the chimney flue it serves.

(b) The arrestor screen shall have heat and corrosion resistance equivalent to 19 gage (.041 in.) galvanized steel or 24 gage (.024 in.) stainless steel.

(c) Openings shall not permit the passage of spheres having a diameter larger than ½ in. (12.7 mm) nor block the passage of spheres having a diameter of less than ⅜ in. (9.5 mm).

(d) The spark screen shall be accessible for cleaning and the screen or chimney cap shall be removable to allow for cleaning of the chimney flue.

1-9.4 When part of a listed chimney termination system, spark arrestors shall be constructed and installed in accordance with the listing.

1-10 Inspection and Maintenance. Chimneys shall be inspected and cleaned, if necessary, at least once a year or more frequently as required to ensure adequate draft, clearance, soundness, and freedom from combustible deposits.

Chapter 2 Factory-Built Chimneys and Chimney Units

2-1 Type and Installation.

2-1.1 Factory-built chimneys and chimney units shall be listed, and shall be installed in accordance with the temperature conditions of the listing and the manufacturer's instructions. Flue gas temperatures in the chimney shall not exceed the limits employed during listing tests.

2-1.2 Factory-built chimneys which pass through floors of buildings requiring the protection of vertical openings shall be enclosed with approved walls having a fire resistance rating of not less than 1 hr when such chimneys are located in a building less than 4 stories in height, and not less than 2 hrs when such chimneys are located in a building 4 stories or more in height.

2-2 Use. Factory-built chimneys may be used for exhaust systems and ducting from hoods, industrial ovens, furnaces and process equipment of any temperature classification [*see Table 1-2(a)*] provided that the system is engineered so that gas temperatures and pressures do not exceed the applicable limit for the type of chimney.

Chapter 3 Masonry Chimneys

3-1 General Requirements.

3-1.1 Support. Masonry chimneys shall be supported on properly designed foundations of masonry or rein-

forced portland or refractory cement concrete, or on noncombustible material having a fire resistance rating of not less than 3 hrs provided such supports are independent of the building construction and the load is transferred to the ground.

3-1.2 Corbeling. Individual and maximum projections of corbels in masonry chimneys shall comply with the requirements of this section [see Figures 3-1.2(a), (b), (c), and (d)].

Exception: Corbeling limitations may be varied for engineered reinforced brick masonry construction.

3-1.2.1 Individual corbels occurring at any point within a masonry chimney shall not exceed one-half the individual masonry unit height nor one-third the thickness.

3-1.2.2 Masonry chimney support may be formed by corbeling from a wall that is not less than 12 in. (305 mm) in thickness to form a maximum total projection of not more than one-half the wall thickness.

Exception: When the corbeling projects equally on each side of the wall, the masonry chimney support may be formed by corbeling from a wall that is not less than 8 in. (203 mm) in thickness to form a maximum total projection on each side of the wall that is not more than one-half the wall thickness.

3-1.2.3 Corbeling to change direction of a masonry chimney shall have a maximum offset such that the centerline of the upper flue does not fall beyond the center of the lower flue wall.

3-1.2.4 Corbeling to increase the chimney wall thickness shall have a maximum total projection that does not exceed the thickness of the chimney wall.

3-1.2.5 Corbeled or solid masonry shall be provided in masonry chimneys to support the entire perimeter of flue liners.

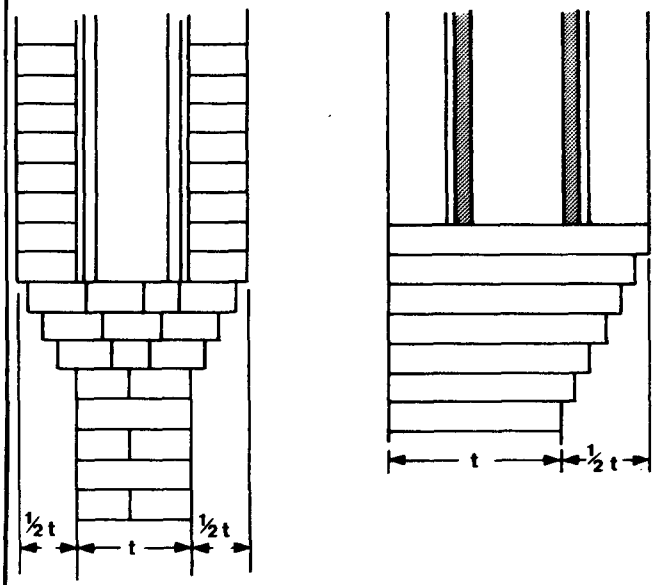
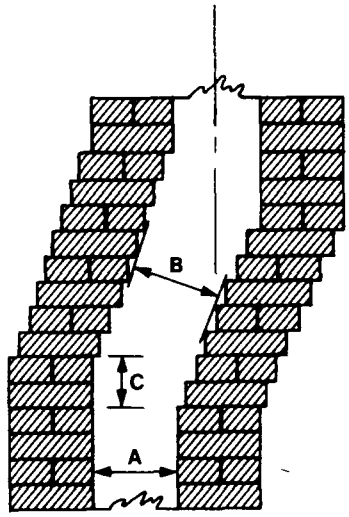


Figure 3-1.2(a) Corbels for Supporting Chimneys

Exception: Where a flue is constructed of two flue liners without a separation, three sides of each flue liner must be entirely supported on corbeled masonry.

3-1.2.6 Corbels shall be made with solid units and, where corbels are on walls of hollow masonry units, there shall be not less than three courses of solid masonry units below the corbels.



Recommended Chimney Offset Construction — Centerline of Upper Flue Does Not Fall Beyond Center of Lower Flue Wall. Chimney Size "A" and Offset Size "B" Are Equal Because Offset Is Started Two Brick Courses "C" Higher on One Wall than on the Other.

Figure 3-1.2(b) Corbels to Change Chimney Direction

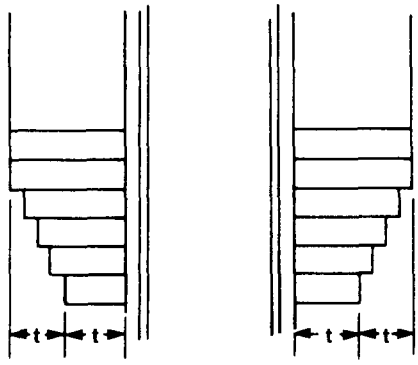


Figure 3-1.2(c) Corbels to Increase Chimney Wall Thickness

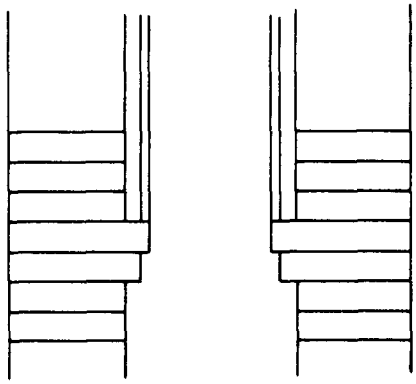


Figure 3-1.2(d) Corbels to Support Flue Lining

3-1.3 Change in Size or Shape at Roof Not Permitted. A change in the size or shape of a chimney flue where the chimney passes through the roof shall not be made within a distance of 6 in. (152 mm) above or below the roof joists or rafters.

3-1.4 Cleanout Openings. Cleanout openings or a means for cleaning shall be provided in all chimney flues. Cleanout openings shall be equipped with ferrous metal pre-cast cement, or other approved noncombustible doors and frames arranged to remain tightly closed and secured when not in use.

3-1.5 Firestopping. All spaces between chimneys and floors and ceilings through which chimneys pass shall remain fully open but shall be firestopped with noncombustible material. The firestopping of spaces between chimneys and wood joists, beams, or headers shall be galvanized steel not less than .019 in. (.483 mm) (26 gage) in thickness or noncombustible sheet material not more than ½ in. (12.7 mm) thick.

3-1.6 Smoke Test. Masonry chimneys shall be proved tight by a smoke test after erection and before being put into use.

3-1.7 Structural Design. Chimneys shall be designed, anchored, supported and reinforced as required in this standard. Chimneys shall not support any structural load other than their own weight unless designed to act as a supporting member. Chimney design shall consider seismic and wind loading.

Masonry chimneys are permitted to be constructed as part of the masonry or reinforced concrete walls of buildings.

3-1.8 Inspection and Maintenance. Chimneys shall be inspected and cleaned if necessary at least once a year or more frequently as required to ensure adequate draft, clearance, soundness and freedom from combustible deposits.

3-1.9 Thimbles.

3-1.9.1 Thimbles for chimneys or vent connectors shall be of fire clay (ASTM C315), galvanized steel of minimum thickness of 24 gage, or material of equivalent durability. Thimbles shall be installed without damage to the liner. The thimble shall extend through the wall to, but not beyond, the inner face of the liner and shall be firmly cemented to masonry.

3-1.9.2 Thimbles shall be located to provide adequate pitch or rise of chimney or vent connectors and, where the ceiling above the appliance is constructed of combustible material, the location of the thimble shall provide minimum clearance required for the connector as specified in Section 5-5.

3-1.9.3 Installation of thimbles through walls or partitions constructed of combustible materials shall conform with the requirements of Section 5-7.

3-1.10 Relining.

3-1.10.1 When masonry chimneys are relined, the liner shall be listed or of approved material that will resist corrosion, softening, or cracking from flue gases at temperatures appropriate to the class of chimney service. Listed liner systems shall be installed in accordance with the listing. Approved materials shall be installed in accordance with Section 3-2.

Table 3-2 Construction, Termination and Clearances for Masonry Chimneys
SEE TEXT FOR REQUIREMENTS

Column	I	II	III	IV	V	VI	VII	VIII	IX	X
Appliance Type	Chimney Wall Thickness		Chimney Liner (See Note 1)			Start of Flue Liner Below Lowest Connector	Termination		Minimum Air Space Clearances	
	Brick or Concrete in. (mm)	Rubble Stone in. (mm)	Type	Thickness in. (mm)	Mortar	in. (mm)	Highest Point ft (m)	Nearby Structures ft (m)	Interior Chimney in. (mm)	Exterior Chimney in. (mm)
Residential	4(102)	12(305)	Fire Clay	⅝(16)	Medium Duty	8(203)	3(0.91)	2(0.61) within 10 ft	2(51)	1(25)
Low Heat	8(203)	12(305)	Fire Clay	⅝(16)	Medium Duty	8(203)	3(0.91)	2(0./61) within 10 ft	2(51)	2(51)
Medium Heat	8(203)	12(305)	Fire Brick	4.5(114)	Medium Duty	24(610)	10(3.05)	10(3.05) within 25 ft	4(102)	4(102)
High Heat	See Note 2		Fire Brick	4.5(114)	High Duty	To Base of Chimney	20(6.1)	20(6.1) within 50 ft	See Note 3	
Column	I	II	III	IV	V	VI	VII	VIII	IX	X

Notes to Table 3-2

Note 1: When masonry chimneys are lined with a listed chimney liner system, the system shall be installed in accordance with the listing.

Note 2: Masonry chimneys for high heat appliances shall be constructed with double walls of solid masonry units or reinforced portland or refractory cement concrete, each wall to be not less than 8 in. (203 mm) thick with an air space of not less than 2 in. (51 mm) between them.

Note 3: Masonry chimneys for high heat appliances shall have sufficient clearance from buildings and structures to avoid overheating combustible material, to permit inspection and maintenance operations on the chimney and to avoid the danger of burns to persons. Clearance shall be based on good engineering practice and acceptable to the authority having jurisdiction.

3-1.10.2 The relined chimney shall meet the requirements of the class of chimney service.

3-2 Construction of Masonry Chimneys. Masonry chimneys shall be constructed as outlined in Table 3-2 and detailed below.

3-2.1 Masonry chimneys shall be constructed of solid masonry or solid waterproofed modular concrete blocks in nominal thicknesses not less than that specified in Table 3-2, Column I, or of reinforced portland or refractory cement concrete in actual thicknesses not less than that specified in Table 3-2, Column I, or of rubble stone masonry in actual thicknesses not less than that specified in Table 3-2, Column II. Masonry shall be laid with full, push-filled, head and bed, mortar joints.

Exception No. 1: Reinforced masonry chimneys for residential-type appliances may be constructed of hollow masonry units not less than 6 in. (153 mm) nominal, in thickness, with cells fully filled with mortar.

Exception No. 2: Masonry chimneys for high heat appliances shall be constructed with double walls of solid masonry or reinforced portland or refractory cement concrete, each wall to be not less than 8 in. (203 mm) thick with an air space of not less than 2 in. (51 mm) between them.

3-2.2 Masonry chimneys shall be lined with fire clay flue lining (ASTM C315 or equivalent) or fire brick (ASTM C64 or equivalent) as specified in Table 3-2, Column III in thicknesses not less than that specified in Table 3-2, Column IV.

Exception: Masonry chimneys for residential appliances, low heat appliances, and residential incinerators may be lined with a listed system or other approved material that will resist corrosion, softening, or cracking from flue gases at temperatures up to 1800°F (982°C).

3-2.3 Fire clay flue liners shall be installed ahead of the construction of the chimney as it is carried up, carefully bedded one on the other in refractory mortar (ASTM C105, medium duty) or the equivalent, with close-fitting joints left smooth on the inside.

3-2.4 Fire brick flue liners shall be installed laid in full width refractory mortar as specified in Table 3-2, Column V, or the equivalent.

3-2.5 Flue lining for residential and low heat chimneys shall be separated from the chimney wall by at least a ½ in. (12.7 mm) air space. The air space shall not be filled and only enough mortar shall be used to make a good joint and hold the liners in position.

Exception: When masonry chimneys are lined with a listed chimney liner system, the system shall be installed in accordance with the listing.

3-2.6 The flue lining shall start from a point below the lowest chimney connector entrance of not less than the distance specified in Table 3-2, Column VI. The lining shall extend for the entire height of the chimney to a level not less than 2 in. (51 mm) above the splay or wash. The lining shall be carried up as nearly vertically as possible, with a maximum slope no greater than 30 degrees from the vertical.

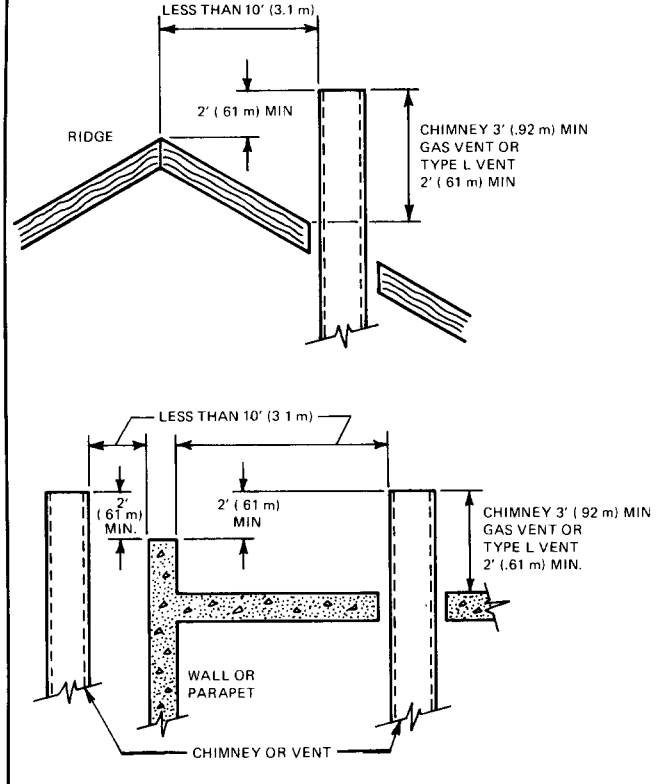
Exception: Flue lining for chimneys for high heat appliances and commercial and industrial incinerators shall extend to the base of the chimney.

3-2.7 When more than one flue is contained in a chimney, a separation shall be provided between adjacent flues. The separation shall be constructed of solid masonry wythes (partitions) not less than 4 in. (102 mm), nominal, in thickness or of reinforced portland or refractory cement concrete not less than 4 in. (102 mm), actual, in thickness and the partitions shall be bonded to the chimney walls.

Exception No. 1: Where two flues are used to vent a single fireplace or appliance, this separation is not required.

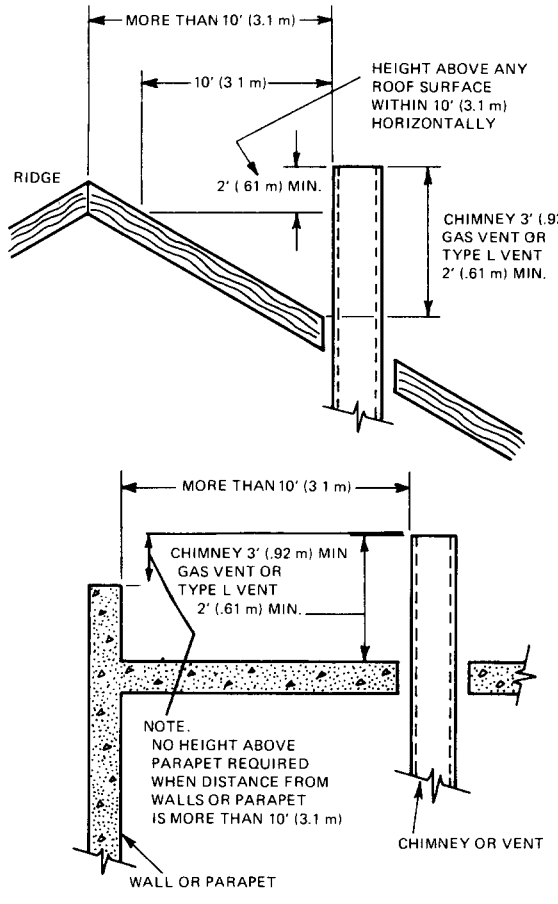
Exception No. 2: Multiple flues in one chimney are not permitted for medium heat appliances, high heat appliances, or commercial and industrial incinerators.

3-3 Termination (Height). Masonry chimneys shall extend above the highest point where they pass through the roof of a building by at least the distance specified in Table 3-2, Column VII and above any portion of any structure by a least the distance specified in Table 3-2, Column VIII, measured horizontally from the vertical chimney line. [*See Figures 3-3(a) and (b)*].



Termination less than 10 feet (3.1 m) from ridge, wall or parapet.

Figure 3-3(a)



Termination more than 10 feet (3.1 m) from ridge, wall or parapet

Figure 3-3(b)

3-4 Clearance from Combustible Material. The minimum air space clearance between interior masonry chimneys (which have any portion of the chimney located within the exterior wall of the building) and combustible materials shall be at least the distance specified in Table 3-2, Column IX. The minimum air space clearance between exterior masonry chimneys (which have the chimney completely outside the exterior wall of the building, excluding the soffit or cornice area) and combustible material shall be at least the distance specified in Table 3-2, Column X. The air space shall not be filled; however, this shall not eliminate the requirements for firestopping in 3-1.5.

Exception No. 1: For residential and low heat chimneys, noncombustible trim may be used to prevent entry of debris into the air space.

Exception No. 2: Masonry chimneys for high heat appliances shall have sufficient clearance from buildings and structures to avoid overheating combustible material, to permit inspection and maintenance operations on the chimney and to avoid danger of burns to persons. Clearances shall be based upon good engineering practice and acceptable to the authority having jurisdiction.

3-5 Masonry Chimneys for Incinerators. In addition to the requirements in Sections 3-1 through 3-4, masonry chimneys for incinerators shall meet the following requirements.

3-5.1 Chute-fed incinerators shall meet the requirements of NFPA 82, *Standard on Incinerators, Waste and Linen Handling Systems and Equipment.*

3-5.2 Masonry chimneys for commercial and industrial incinerators shall be supported on properly designed foundations of masonry or reinforced portland or refractory cement or on noncombustible material having a fire resistance rating of not less than 3 hours provided such supports are independent of the building construction and the load is transferred to the ground.

Exception: Chimneys may be supported on incinerator walls if the incinerator foundation and walls are built to support the load thus imposed. They shall be so constructed as not to place excessive stress upon the roof of the combustion chamber.

3-5.3 The terminus of the chimney for commercial and industrial incinerators shall be equipped with an approved spark arrestor if the incinerator does not include effective means for arresting sparks and fly ash. (See NFPA 82, *Standard on Incinerators, Waste and Linen Handling Systems and Equipment.*)

Chapter 4 Metal Chimneys (Smokestacks)

4-1 General Requirements.

4-1.1 Single-wall metal chimneys or unlisted metal chimneys shall not be used inside one- and two-family dwellings.

4-1.2 Metal chimneys shall be constructed of steel or cast iron. Sheet steel shall have a thickness not less than that indicated in Table 4-1.2.

Table 4-1.2 Minimum Thickness of Sheet Steel Chimneys

Mfgr. Std. Gage No.	Min. Thickness in. (mm)	Area in² (m²)	Equiv. Round Diam. in. (mm)
16	0.053 (1.35)	up to 154 (.0994)	up to 14 (356)
14	0.067 (1.70)	155 to 201 (.0999 to .1296)	over 14 to 16 (356 to 406)
12	0.093 (2.36)	202 to 254 (.1303 to .1638)	over 16 to 18 (406 to 457)
10	0.123 (3.12)	Larger than 254 (.1638)	over 18 (457)

NOTE: Regardless of minimums in this table, the thickness of sheet metal shall be adequate to meet the requirements of 4-1.3.

4-1.3 Metal chimneys shall be properly riveted, welded or bolted, securely supported and constructed in accor-

dance with good engineering practice as necessary for the following:

(a) Strength to resist stresses due to steady or gusting wind loads.

(b) Adequate anchoring, bracing, and inherent strength to withstand seismic and wind-induced vibrational stresses.

(c) Proper material thickness for durability considering fuel analysis, gas temperature, and exposure.

(d) Security against leakage of flue gases under positive pressure.

(e) Allowance for thermal expansion of breeching and vertical sections.

4-1.4 Metal chimneys shall not be used inside of ventilating ducts.

Exception: When such ducts are constructed and installed as required by this standard for chimneys, and the ventilating ducts are used solely for exhaust of air from the room or space in which the appliance served by the metal chimney is located.

4-1.5 Metal chimneys shall have sufficient clearance from buildings and structures to avoid heating combustible material to a temperature in excess of 90°F (50°C) 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.

4-1.6 Metal chimneys shall be supported on properly designed foundations of masonry or reinforced portland or refractory cement concrete or on noncombustible material having a fire resistance rating of not less than 3 hrs provided such supports are independent of the building construction and the load is transferred to the ground. A metal chimney may be supported also at intervals by the building structure, in which case expansion joints shall be provided at each support level. All joints shall be liquidtight or of a design such that liquid will drain to the interior of the chimney.

4-1.7 Metal chimneys serving residential-type or low heat appliances and producing flue gases having a temperature below 350°F (165.5°C) at the entrance to the chimney at full load or partial load shall be lined with acid and condensate resistant metal or refractory material, or constructed of suitable stainless steel, or otherwise protected so as to minimize or prevent condensation and corrosion damage.

4-2 Metal Chimneys for Residential-type or Low Heat Appliances.

4-2.1 Termination (Height). Metal chimneys for residential-type or low heat appliances shall extend at least 3 ft (.92 m) above the highest point where they pass through the roof of a building and at least 2 ft (.61 m) higher than any portion of a building within 10 ft (3.1 m). [*See Figures 3-3(a) and (b).*]

Exception: The outlet of a metal chimney for residential-type and low heat appliances equipped with an exhauster may terminate at a location not less than 3 ft (.92 m) from an adjacent building or building opening and at least 10 ft (3.1 m) above grade or walkways.

In any case, the outlet shall be so arranged that the flue gases are not directed so as to jeopardize people, overheat combustible structures, or enter building openings in the vicinity of the outlet.

4-2.2 Clearances.

4-2.2.1 Exterior.

4-2.2.1.1 Exterior metal chimneys used only for residential-type or low heat appliances as defined in Table 1-2(a) shall have a clearance of not less than 6 in. (152.4 mm) from a wall of wood frame construction and from any combustible material.

4-2.2.1.2 Exterior 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.

4-2.2.1.3 Exterior 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.

4-2.2.1.4 A metal chimney erected on the exterior of a building shall not be installed nearer than 24 in. (610 mm) to any door or window or to any walkway.

Exception: The distance may be less than 24 in. (610 mm) when the chimney is insulated in an approved manner to avoid danger of burns to persons.

4-2.2.2 Interior.

4-2.2.2.1 Where a metal chimney extends through any story of a building above that in which the appliances connected to the chimney are installed, it shall be enclosed in such upper stories, within a continuous enclosure constructed of noncombustible materials (*see Section 1-3*). The enclosure shall comply with the following:

(a) The enclosure shall extend from the ceiling of the appliance room to or through the roof so as to maintain the integrity of the fire separations required by the applicable building code provisions.

(b) The enclosure walls shall have a fire resistance rating of not less than 1 hr if the building is less than 4 stories in height.

(c) The enclosure walls shall have a fire resistance rating of not less than 2 hrs if the building is 4 stories or more in height.

(d) The enclosure shall provide a space on all sides of the chimney sufficient to permit inspection and repair but in no case shall it be less than 12 in. (305 mm).

(e) The enclosing walls shall be without openings.

Exception: Doorways equipped with approved self-closing fire doors may be installed at various floor levels for inspection purposes.

4-2.2.2.2 Where a metal chimney serving only residential-type or low 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 18 in. (457 mm) from a wall of wood frame construction and from any combustible material.

4-2.2.2.3 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.

4-2.2.2.4 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.

4-2.2.2.5 Where a metal chimney serving only residential-type or low heat appliances as defined in Table 1-2(a) passes through a roof constructed of combustible material, it shall be guarded by a ventilating thimble of galvanized steel or approved corrosion resistant metal, extending not less than 9 in. (229 mm) below and 9 in. (229 mm) above the roof construction, and of a size to provide not less than 6 in. (152 mm) clearance on all sides of the chimney.

Exception: In lieu of the above requirement, the combustible material in the roof construction may be cut away so as to provide not less than 18 in. (457 mm) clearance on all sides of the chimney, with any material used to close up such opening entirely noncombustible.

4-3 Metal Chimneys for Medium Heat Appliances.

4-3.1 Construction. Metal chimneys serving medium heat appliances as defined in Table 1-2(a) shall be lined with medium-duty fire brick (ASTM C64, Type F) or the equivalent laid in fireclay mortar (ASTM C105, medium duty), or the equivalent.

4-3.1.1 The lining shall be at least 2½ in. (64 mm) thick for chimneys having a diameter or greatest cross-section dimension of 18 in. (457 mm) or less.

4-3.1.2 The lining shall have a thickness of not less than 4½ in. (114 mm) laid on a full width bed for chimneys having a diameter or greatest cross-section dimension greater than 18 in. (457 mm).

4-3.1.3 The lining shall start 2 ft (.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.

4-3.2 Termination (Height). Metal chimneys for medium heat appliances shall extend not less than 10 ft (3.1 m) higher than any portion of any building within 25 ft (7.6 m).

4-3.3 Clearances.

4-3.3.1 Exterior.

4-3.3.1.1 Exterior metal chimneys used for medium heat appliances as defined in Table 1-2(a) shall have a clearance of not less than 24 in. (610 mm) from a wall of wood frame construction and from any combustible material.

4-3.3.1.2 Exterior 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.

4-3.3.1.3 Exterior 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.

4-3.3.1.4 A metal chimney erected on the exterior of a building shall not be installed nearer than 24 in. (610 mm) to any door or window or to any walkway.

Exception: The distance may be less than 24 in. (610 mm) when the chimney is insulated or shielded in an approved manner to avoid danger of burns to persons.

4-3.3.2 Interior.

4-3.3.2.1 Where a metal chimney extends through any story of a building above that in which the appliances connected to the chimney are installed, it shall be enclosed in such upper stories, within a continuous enclosure constructed of noncombustible materials (*see Section 1-3*). The enclosure shall comply with the following:

(a) The enclosure shall extend from the ceiling of the appliance room to or through the roof so as to maintain the integrity of the fire separations required by the applicable building code provisions.

(b) The enclosure walls shall have a fire resistance rating of not less than 1 hr if the building is less than 4 stories in height.

(c) The enclosure walls shall have a fire resistance rating of not less than 2 hrs if the building is 4 stories or more in height.

(d) The enclosing walls shall provide a space on all sides of the chimney to permit inspection and repair, but in no case shall it be less than 12 in. (305 mm).

(e) The enclosing walls shall be without openings.

Exception: Doorways equipped with unproved self-closing 1½-hr fire doors may be installed at various floor levels for inspection purposes.

4-3.3.2.2 Where a metal chimney serving a medium heat appliance as defined in Table 1-2(a) passes through a roof constructed of combustible material, it shall be guarded by a ventilating thimble of galvanized steel or approved corrosion resistant metal, extending not less than 9 in. (229 mm) below and 9 in. (229 mm) above the roof construction, and of a size to provide not less than 18 in. (457 mm) clearance on all sides of the chimney.

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 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 fire brick (ASTM C64, Type A) or the equivalent, not less than 4½ in. (114 mm) thick laid on a full width bed in refractory mortar (ASTM C105, high duty) or the equivalent.

4-4.1.1 The lining shall start 2 ft (.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 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.

5-2.2.1.1 Connectors for listed gas appliances having draft hoods and for appliances listed for use with Type B gas vents shall be of Type B or Type L vent material.

5-2.2.1.2 Connectors for oil appliances shall be of Type L vent or factory-built chimney material.

5-2.2.1.3 Appliances other than those covered in 5-2.2.1.1 and 5-2.2.1.2 shall have the chimney directly connected to the appliance. Connectors shall not be allowed.

Exception: Listed factory-built chimney material may be used to connect an appliance to the chimney.

5-2.2.2 Appliances Not Installed in Attics.

5-2.2.2.1 Connectors for listed gas appliances and appliances equipped with a listed gas burner and draft hood shall be of Type B or Type L vent material or metal pipe having resistance to corrosion and heat not less than .016-in. (0.406-mm) (28 gage) galvanized steel.

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	0.023 (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 fire brick (ASTM C64, Type F) laid in fire-clay mortar (ASTM C105, medium duty), or the equivalent.

5-2.4.2.1 The lining shall be at least 2½ 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 4½ in. (114 mm) thick laid on the 4½-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 brick (ASTM C64, Type A) or the equivalent having a thickness of not less than 4½ in. (114 mm) laid on the 4½-in. (114-mm) bed in fire-clay mortar (ASTM C105, 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 fire brick (ASTM C64, Type A) not less than 4½ in. (114 mm) thick.

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

5-3.1 The horizontal run of an uninsulated 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: When part of an engineered venting system.

5-3.2 The horizontal run of an insulated connector to a natural draft chimney, or vent, serving a single gas or liquid fuel fired appliance shall be not more than 100 percent of the height of the vertical portion of the chimney or vent above the connector.

Exception: When part of an engineered venting system.

5-3.3 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 may 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)
RESIDENTIAL-TYPE APPLIANCES	
Single-Wall Metal Pipe Connectors	
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 *(See Note 3)*	6 (152)
Type L Vent Piping Connectors	
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	*(See Note 3)*
Type B Gas Vent Piping Connectors	
Listed Gas Appliances with Draft Hoods	*(See Note 3)*
LOW HEAT APPLIANCES	
Single-Wall Metal Pipe Connectors	
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)
MEDIUM HEAT APPLIANCES	
Single-Wall Metal Pipe Connectors	
All Gas, Oil, and Solid-Fuel Appliances	36 (914)
HIGH HEAT APPLIANCES	
Masonry or Metal Connectors	
All Gas, Oil, and Solid-Fuel Appliances	*(See Note 4)*

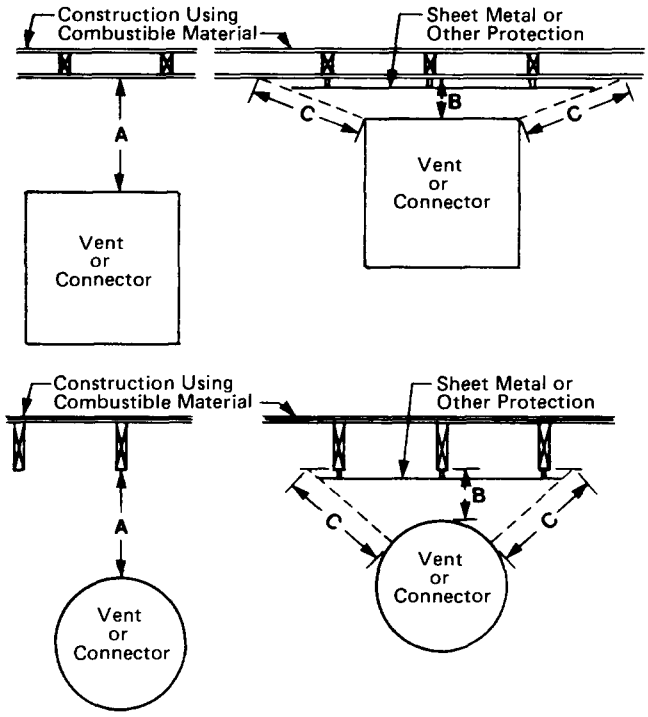
Notes to Table 5-5(a)

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 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.

Table 5-5(b)
Connector Clearances, Inches, With Specified Forms of Protection[1,2,3,4]

Type of Protection	Where the required clearance with no protection is:			
Applied to the combustible material and covering all surfaces within the distance specified as the required clearance with no protection. (*See Figure 5-5.*) Thicknesses are minimum.	36 in. (914 mm) (in./mm)	18 in. (457 mm) (in./mm)	9 in. (229 mm) (in./mm)	6 in. (152 mm) (in./mm)
(a) 0.013 in./0.330 mm (28 gage) sheet metal spaced out 1 in. (25.5 mm)	18/457	9/229	4/102	2/51
(b) 3½ in. (88.9 mm) thick masonry wall spaced out 1 in. (25.4 mm) and adequately tied to the wall being protected. (*See Note 4.*)	18/457	9/229	4/102	2/51
(c) 0.027 in./0.686 mm (22 gage) sheet metal on 1 in. (25.4 mm) mineral wool batts reinforced with wire or equivalent spaced out 1 in. (25.4 mm)	12/305	3/76	2/51	2/51

[1]Spacers and ties shall be of noncombustible material.

[2]All methods of protection require adequate ventilation between protective material and adjacent combustible walls and ceilings.

[3]Mineral wool batts (blanket or board) shall have a minimum density of 8 lb per ft³ (0.1289/cc) and a minimum melting point of 1500°F (816°C).

[4]If a single wall connector passes through the masonry wall there shall be at least ½ in. (12.7 mm) open ventilated airspace between the connector and the masonry.

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 upon 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.

5-6 Location. When the connector used for a gas appliance having a draft hood must be located in or pass through a 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 may 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] may 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 ap-

pliances, 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] may pass through walls or partitions constructed of combustible material if made of sections of a listed factory-built chimney and installed in accordance with the conditions of the listing and the manufacturer's instructions.

5-7.5 Connectors for residential-type and low heat appliances [Table 1-2(a), Columns I, II and III] may pass through walls or partitions constructed of combustible materials if all combustible material in the wall or partition is cut away from the connector a sufficient distance to provide the clearance required for such connector [Table 5-5(a)]. Any material used to close up such openings shall be noncombustible material.

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 ¼ in. (6.4 mm) to the foot (horizontal length of pipe) from the appliance to the chimney.

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

5-7.9 A device, other than a damper, which 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, 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, provided performance is in accordance with Section 1-5.

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.

Exception: When listed materials are used and previous approval has been obtained from the authority having jurisdiction.

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 may be connected to a masonry fireplace, 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.

5-8 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 may 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 listing. 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.

5-11 Draft Regulators.[1]

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*, may be installed with draft regulators if in accordance with the appliance manufacturer's instructions.

[1]For information concerning the use and installation of draft regulators with oil-burning appliances, refer to NFPA 31, *Standard for the Installation of Oil Burning Equipment*.

5-11.2 Solid fuel burning appliances may 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.

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 gas appliances listed for use with Type B gas vents.

Exception: 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 which 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.

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 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.

6-1.4 Single-wall metal pipe used to vent gas appliances shall conform to the following requirements.

6-1.4.1 Single-wall metal pipe shall not be used to vent incinerators.

Exception: For residential incinerators as provided for in 2-2.5.1 of NFPA 82, Standard on Incinerators, Waste and Linen Handling Systems and Equipment.

6-1.4.2 The pipe shall be of sheet copper with a thickness not less than 0.0201 in. (0.533 mm) (24 B & S gage) or galvanized steel with a thickness not less than 0.036 in. (0.914 mm) (20 gage).

6-1.4.3 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.

6-1.4.4 Single-wall metal pipe shall not originate in any unoccupied attic or concealed space and shall not pass through any attic, inside wall, concealed space nor through any floor or ceiling.

6-2 Location. Outside vents for appliances used in cold climates shall be insulated.

6-3 Termination.

6-3.1 All vents shall terminate above the roof surface. *[See Figures 3-3(a) and (b).]*

Exception: As provided in 6-3.5 and 6-6.

6-3.1.1 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.

6-3.1.2 Vents installed with listed caps shall terminate in accordance with the terms of the cap's listing.

6-3.1.3 Vents installed without listed caps or mechanical exhausters shall extend 2 ft (.61 m) above the highest point where they pass through the roof surface of a building and at least 2 ft (.61 m) higher than any portion of a building within 10 ft (3.1 m).

6-3.2 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 6-3.3 and 6-6.2.

6-3.3 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.

6-3.4 Vents passing through roofs shall extend through roof flashing.

6-3.5 Mechanical draft systems need not comply with 6-3.1 and 6-3.3 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 (.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 (.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 directed so 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 designed and installed so as to be gastight or so as to prevent leakage of combustion products into a building.

6-4 Marking of Gas Vents. In those sections of the country where solid and liquid fuels are used extensively, gas vents shall be plainly and permanently identified by a label reading: "This gas vent is for appliances which burn gas only. Do not connect to incinerators or solid or liquid fuel burning appliances."

6-5 Installation.[1]

6-5.1 Type B, Type BW, and Type L vents shall be installed in full compliance with the terms of their listing.

6-5.2 Vents which pass through floors of buildings requiring the protection of vertical openings shall be enclosed within an approved enclosure.

6-5.2.1 The enclosure walls shall have a fire resistance rating of not less than 1 hr when such vent is located in a building less than 4 stories in height.

6-5.2.2 The enclosure walls shall have a fire resistance rating of not less than 2 hrs when such vent is located in a building 4 stories or more in height.

6-5.3 Single-wall metal pipe shall be installed as follows:

6-5.3.1 Single-wall metal pipe shall be installed with minimum clearances from combustible material as follows:

(a) Gas appliances without draft hoods, 18 in. (457 mm).

(b) Unlisted gas appliances equipped with draft hoods, 9 in. (229 mm).

(c) Boilers and furnaces equipped with listed conversion gas burners and with draft hoods, 9 in. (229 mm).

(d) Listed gas appliances with draft hoods, 6 in. (152 mm).

Exception: Residential incinerators.

6-5.3.2 Where a single-wall metal pipe passes through an exterior wall constructed of combustible material, it shall be guarded at the point of passage by a ventilating metal thimble not smaller than the following:

Exception: In lieu of thimble protection, all combustible material in the wall shall be cut away from the pipe a sufficient distance to provide the clearance required by 6-5.3.1 from such pipe to combustible material, with any material used to close up such opening entirely noncombustible.

(a) For listed gas burning appliances with draft hoods 4 in. (102 mm) larger in diameter than the pipe.

Exception No. 1: Residential incinerators.

Exception No. 2: When there is a run of not less than 6 ft (1.8 m) of pipe in the open, between the draft hood outlet and the thimble, the thimble may be 2 in. (51 mm) larger in diameter than the pipe.

(b) For unlisted gas burning appliances with draft hoods 6 in. (152 mm) larger in diameter than the pipe.

(c) For gas appliances without draft hoods 12 in. (305 mm) larger in diameter than the pipe.

6-5.3.3 Where a single-wall metal pipe passes through a roof constructed of combustible material it shall be guarded at the point of passage as follows:

(a) As specified for passage through a combustible exterior wall by 6-5.3.2, or

(b) With listed gas appliances that can be connected to Type B gas vents, by a noncombustible, nonventilating thimble not less than 4 in. (102 mm) larger in diameter than the vent pipe and extending not less than 18 in. (457 mm) above and 6 in. (152 mm) below the roof with the annular space open at the bottom and closed only at the top.

6-6 Special Venting Arrangements.

6-6.1 Direct Vent Appliances (Sealed combustion system appliances).

6-6.1.1 Direct vent appliances (sealed combustion system appliances) shall be listed and shall be installed in accordance with their listing and the manufacturer's instructions.

6-6.1.2 The vent terminal of a direct vent appliance with an input of 50,000 Btu per hour or less shall be located not less than 9 in. (230 mm) from any opening through which vent gases could enter a building, and the vent terminal of such appliance having an input over 50,000 Btu per hour shall be located not less than 12 in. (305 mm) from the opening. The bottom of the vent terminal and the air intake shall be located at least 12 in. (305 mm) above grade.

6-6.2 Ventilating Hoods and Exhaust Systems.

6-6.2.1 When ventilating hoods and exhaust systems serving commercial cooking appliances are used to vent gas-burning appliances installed in commercial applications, the connector from the appliance shall terminate under the hood not less than 18 in. (457 mm) from any grease filter or screen installed in the hood.[1]

6-6.2.2 When automatically operated appliances, such as water heaters, are vented through natural draft ventilating hoods, dampers shall not be installed in the ventilating system.

6-6.2.3 When automatically operated appliances, such as water heaters, are vented through a ventilating hood or exhaust system equipped with a mechanical exhaust system, the appliance control system shall be interlocked so as to permit appliance operation only when the mechanical exhaust system is in operation [*see 6-3.5(c)*].

6-6.2.4 A ventilating hood shall be installed above an open-top broiler in a residence.

6-6.2.4.1 The hood shall be made with tight joints and shall be constructed of copper with a thickness not less than 0.0201 in. (0.533 mm) (24 B & S gage) or galvanized steel with a thickness not less than 0.016 in. (0.406 mm) (28 gage).

6-6.2.4.2 A clearance of not less than ¼ in. (6.4 mm) between the hood and the underside of combustible material or metal cabinets shall be provided.

[1]Additional requirements for the installation of venting systems serving gas appliances appear in NFPA 54, *National Fuel Gas Code*.

[1]For information on ventilation of restaurant cooking equipment see NFPA 96, *Standard for the Installation of Equipment for the Removal of Smoke and Grease-Laden Vapors from Commercial Cooking Equipment*.

6-6.2.4.3 The vertical clearance above the broiler to the underside of combustible material or metal cabinet protected by the hood shall be not less than 24 in. (610 mm).

6-6.2.4.4 The width and breadth of the hood shall be not less than that of the open-top broiler unit.

6-6.2.4.5 The hood shall be centered over the unit.

6-6.2.4.6 The hood shall be exhausted directly through an outside wall to the outside or connected to a suitable chimney flue used for no other purpose. The connecting duct shall conform to the following:

(a) Connecting ducts shall be made of galvanized steel not less than 0.016 in. (0.406 mm) (28 gage).

(b) A clearance of not less than 6 in. (152 mm) shall be provided between the exhaust duct and unprotected combustible material.

Exception: This clearance may be reduced if the combustible material is protected in accordance with Table 5-5(b).

6-6.3 Clothes Dryers.

6-6.3.1 All ducts expelling lint shall be provided with a lint collector.

Exception: When the dryer is so equipped.

6-6.3.2 For Type 1 gas-fired clothes dryer exhaust see NFPA 54, *National Fuel Gas Code*.

6-6.3.3 Type 2 clothes dryers shall be exhausted to the outside air.

6-6.3.4 Provision for make-up air shall be provided for Type 2 clothes dryers, with a minimum free area of 1 sq in. (645.2 mm^2) for each 1000 Btu per hour (1055kJ/hr) total input rating of the dryer(s) installed.

6-6.3.5 A clothes dryer exhaust shall not be connected into any chimney connector, vent connector, chimney or vent.

6-6.3.6 Ducts for exhausting clothes dryers shall not be put together with sheet-metal screws or other fastening means which extend into the duct and which would catch lint and reduce the efficiency of the exhaust.

6-6.3.7 Exhaust ducts for Type 2 clothes dryers shall be constructed of sheet metal or other noncombustible material. Such ducts shall be of adequate strength to meet the conditions of service with minimum thicknesses equivalent to No. 24 galvanized steel gage.

6-6.3.8 Exhaust ducts for Type 2 clothes dryers shall have a clearance of at least 6 in. (152 mm) to combustible material. If such duct passes through a wall, floor or partition constructed of combustible or limited combustible material, all such material in the wall, floor or partition shall be cut away from the duct, a sufficient distance to provide a clearance of at least 6 in. (152 mm) and the opening closed in accordance with 6-6.3.9.

Exception: Exhaust ducts for Type 2 clothes dryers may be installed with reduced clearances to combustible material provided the combustible material is protected as described in Table 5-5(b).

6-6.3.9 When ducts pass through walls, floors, or partitions, the space around the duct shall be sealed with noncombustible material.

6-6.3.10 Multiple installations of Type 1 and Type 2 clothes dryers shall be made in a manner to prevent adverse operation due to back pressures that might be created in the exhaust. Common exhaust vents which pass through floors of buildings requiring the protection of vertical openings shall be enclosed with approved walls having a fire resistance rating of not less than 1 hr when such chimneys are located in a building less than 4 stories in height, and not less than 2 hrs when such chimneys are located in a building 4 stories or more in height.

Chapter 7 Fireplaces

7-1 Definitions.

Fireplace. A hearth, fire chamber, or similarly prepared place and a chimney.

Factory-Built Fireplace. A fireplace composed of listed factory-built components assembled in accordance with the terms of listing to form the completed fireplace.

Masonry Fireplace. A hearth and fire chamber of solid masonry units such as bricks, stones, listed masonry units, or reinforced concrete, provided with a suitable chimney.

7-2 Factory-Built Fireplaces. Factory-built fireplaces shall be listed and shall be installed in accordance with the terms of listing. Hearth extensions shall be provided in accordance with the manufacturer's instructions or shall be of masonry on noncombustible construction in accordance with Section 7-4.

7-3 Masonry Fireplaces.

7-3.1 Construction.

7-3.1.1 Fireplaces shall be constructed of solid masonry units or of reinforced portland or refractory cement concrete. Masonry fireplaces shall be supported on properly designed foundations of masonry or reinforced portland or refractory cement concrete, or on other noncombustible constructions having a fire resistance rating of not less than 3 hrs provided such supports are adequate for the load.

7-3.1.2 Where a lining of low-duty fire brick (ASTM C64, Type G), or the equivalent, at least 2 in. (51 mm) thick laid in fire-clay mortar (ASTM C105, medium duty), or the equivalent, or other approved lining is provided, the total thickness of back and sides, including the lining, shall be not less than 8 in. (203 mm).

7-3.1.3 Where the lining described in 7-3.1.2 is not provided, the thickness of back and sides shall be not less than 12 in. (305 mm).

7-3.1.4 Where the masonry supporting a fireplace is designed to support vertical loads from the building and corbels are used to support beams or girders, corbeling shall be as described in 3-1.2 as recommended for masonry chimneys. The lintel spanning the fireplace shall be designed and constructed to safely support the additional concentrated load transferred by the member.

7-3.1.5 Masonry fireplaces shall be provided with chimneys designed and constructed in accordance with the requirements for Construction of Masonry Chimneys, Section 3-2, or where permitted by the individual listing, approved factory-built chimneys having approved adapters in accordance with the requirements for Factory-Built Chimneys, Chapter 2.

7-3.2 Steel Fireplace Units.

7-3.2.1 Steel fireplace units incorporating a firebox liner of not less than ¼-in. (6.4-mm) thick steel and an air chamber shall be installed with masonry to provide a total thickness at the back and sides of not less than 8 in. (203 mm), not less than 4 in. (102 mm) of which shall be solid masonry.

Exception: Listed firebox liners shall be installed in accordance with the terms of the listing.

7-3.2.2 Warm air ducts employed with steel fireplace units of the circulating air type shall be constructed of metal or masonry.

7-3.3 Clearance.

7-3.3.1 All wood beams, joists, studs and other combustible material shall have a clearance of not less than 2 in. (51 mm) from the front faces and sides of masonry fireplaces, and not less than 4 in. (102 mm) from the back faces of masonry fireplaces. Headers of combustible material supporting masonry trimmer arches or concrete hearth extensions shall be located not less than 20 in. (508 mm) from the face of the chimney breast.

7-3.3.2 Spaces between headers or trimmers of combustible material and masonry fireplaces shall be firestopped with noncombustible material. The material used for firestopping shall be galvanized steel not less than 0.19 in. (.483 mm) (26 gage) in thickness or noncombustible sheet material not more than ½ in. (12.7 mm) thick.

7-3.3.3 Woodwork, such as wood trim and mantels, and other combustible material shall not be placed within 6 in. (152 mm) of a fireplace opening. Combustible material above and projecting more than 1½ in. (38 mm) from a fireplace opening shall not be placed less than 12 in. (305 mm) from the top of the fireplace opening.

7-4 Hearth Extensions.

7-4.1 Masonry fireplaces shall have hearth extensions of brick, concrete, stone, tile or other approved noncombustible material properly supported and with no combustible material against the underside thereof. Wooden forms or centers used during the construction of hearth and hearth extension shall be removed when the construction is completed.

7-4.2 Where the fireplace opening is less than 6 sq ft (0.56 m²), the hearth extension shall extend at least 16 in. (406 mm) in front of the facing material and at least 8 in. (203 mm) beyond each side of the fireplace opening.

7-4.3 Where the fireplace opening is 6 sq ft (0.56 m²) or larger, the hearth extension shall extend at least 20 in. (508 mm) in front of the facing material, and at least 12 in. (305 mm) beyond each side of the fireplace opening.

7-4.4 Where a fireplace is elevated above or overhangs a floor, the hearth extension shall also extend over the area under the fireplace.

7-5 Accessories. Factory-built accessories for fireplaces include such devices as fireplace heater inserts, heat exchangers circulating air or water, etc. which may alter the combustion or heating characteristics of the fireplace. Such accessories shall be listed and shall be installed in accordance with the terms of their listing.

Exception: Unlisted accessories which are acceptable to the authority having jurisdiction may be installed as approved and in accordance with the manufacturer's installation instructions.

Chapter 8 Solid Fuel Burning Appliances

8-1 Definitions.

Fireplace Stove. A free-standing, chimney-connected, solid fuel burning stove which is designed to be operated with the fire chamber either open or closed.

Room Heater, Solid Fuel. A chimney-connected, solid fuel burning room heater which is designed to be operated with the fire chamber closed.

8-2 Appliances.

8-2.1 Solid fuel burning appliances shall be listed and installed in accordance with the terms of their listing.

Exception: Unlisted appliances which are approved by the authority having jurisdiction may be installed as specified in this chapter. Such installations shall also be in accordance with the manufacturer's installation instructions if such instructions specify the use of increased protection or greater clearances than specified in this chapter. This exception shall not apply to mobile home installations.

8-3 Location of Appliances.

8-3.1 Every appliance shall be located with respect to building construction and other equipment so as to permit access to the appliance. Sufficient clearance shall be maintained to permit cleaning of surfaces; the replacement of air filters, blowers, motors, controls and chimney connectors; the lubrication and servicing of moving

parts; and the adjustment and servicing of stokers if provided.

8-3.2 Solid fuel burning appliances shall not be installed in confined spaces. The space or room shall be of ample size to permit adaquate circulation of heated air.

Exception: Solid fuel burning appliances listed for installation in confined spaces such as alcoves shall be installed in accordance with the terms of the listing and the manufacturer's instructions.

8-3.3 Solid fuel burning appliances shall not be installed in any location where gasoline or any other flammable vapors or gases are likely to be present.

8-3.4 Solid fuel burning appliances shall not be installed in any residential garage.

8-4 Air for Combustion and Ventilation.

8-4.1 Solid fuel burning appliances shall be installed in a location in which the facilities for ventilation permit satisfactory combustion of fuel, proper chimney draft and maintenance of safe temperature under conditions of use. Appliances shall be located so as not to interfere with proper circulation of air within the heated space. Where buildings are so tight that normal infiltration does not provide the necessary air, outside air shall be introduced.

8-5 Chimney Connections and Usage.

8-5.1 All solid fuel burning appliances shall be connected to chimneys in accordance with Chapter 5. The chimney provided shall be in accordance with Table 1-2(a).

8-5.2 The clearance of chimney connectors to combustible material shall be as specified in Table 5-5(a).

8-5.3 Connectors and chimneys for solid fuel burning appliances shall be designed, located and installed to permit ready access for internal inspection and cleaning.

8-5.4 Connection to Masonry Fireplaces. A solid fuel burning appliance such as a stove or insert may use a masonry fireplace flue when the following conditions are met:

Exception: Listed fireplace accessories may use a masonry fireplace flue.

(1) There is a connector which extends from the appliance to the flue liner.

(2) The cross-sectional area of the flue is no more than 3 times the cross-sectional area of the flue collar of the appliance.

(3) If the appliance vents directly through the chimney wall above the smoke chamber, there shall be a noncombustible seal below the entry point of the connector.

(4) The installation shall be such that the chimney system can be inspected and cleaned.

(5) Means shall be provided to prevent dilution of combustion products in the chimney flue with air from the habitable space.

8-5.5 Another solid fuel burning appliance shall not be installed using an existing flue serving a factory-built fireplace unless the appliance is specifically listed for such installation.

8-6 Mounting.

8-6.1 Mounting for Residential-Type Appliances.

8-6.1.1 General Requirements.

8-6.1.1.1 Residential-type solid fuel burning appliances that are tested and listed by a recognized testing laboratory for installation on floors constructed of combustible materials shall be placed on floors in accordance with the requirements of the listing and the conditions of approval. Such appliances which are not listed by a recognized testing laboratory shall be provided with floor protection in accordance with the provisions of 8-6.1.2 or 8-6.1.3.

Exception: Residential-type solid fuel burning appliances are permitted to be placed without floor protection in any of the following manners:

(1) on concrete bases adequately supported on compacted soil, crushed rock, or gravel;

(2) on concrete slabs or masonry arches that do not have combustible materials attached to the underside;

(3) on approved assemblies constructed of only noncombustible materials, and having a fire resistance rating of not less than 2 hours, with floors constructed of noncombustible material;

(4) on properly stabilized ground that can support the load of the appliance.

8-6.1.1.2 Any floor assembly, slab or arch shall extend not less than 18 in. (457 mm) beyond the appliance on all sides.

8-6.1.1.3 In lieu of the requirements for floor protection specified herein, a floor protector listed by a recognized testing laboratory and installed in accordance with the installation instructions may be employed.

8-6.1.1.4 Concrete bases, concrete slabs, masonry arches and floor-ceiling assemblies and their supports shall be designed and constructed to support the appliances.

8-6.1.2 Room Heaters, Fireplace Stoves, Room Heater/Fireplace Combinations, Ranges.

8-6.1.2.1 Room heaters, fireplace stoves, room heater/fireplace stove combinations or ranges which are set on legs or pedestals that provide not less than 6 in. (152 mm) of ventilated open space beneath the fire chamber or base of the appliance are permitted to be placed on floors of combustible construction provided the floor under the appliance is protected with closely spaced solid masonry units not less than 2 in. (51 mm) in thickness. The top surface of the masonry shall be covered with sheet metal not less than 24 gage [0.023 in. (0.58 mm)]. The floor protection shall extend not less than 18 in. (457 mm) beyond the appliance on all sides.

8-6.1.2.2 Room heaters, fireplace stoves, room heater/fireplace stove combinations or ranges which are

set on legs or pedestals providing 2 to 6 in. (51 to 152 mm) of ventilated open space beneath the fire chamber or base of the appliance are permitted to 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 sheet metal not less than 24 gage [0.023 in. (0.58 mm)]. The floor protection shall extend not less than 18 in. (457 mm) beyond the appliance on all sides.

8-6.1.2.3 Room heaters, fireplace stoves, room heater/fireplace stove combinations or ranges with legs or pedestals that provide less than 2 in. (51 mm) of ventilated open space beneath the firechamber or base of the appliance shall not be placed on floors of combustible construction.

8-6.1.3 Furnaces, Boilers.

8-6.1.3.1 Furnaces or boilers with legs or pedestals providing not less than 6 in. (152 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 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 18 in. (457 mm) beyond the appliance on all sides.

8-6.1.3.2 Furnaces or boilers which are set on legs or pedestals providing 2 to 6 in. (51 to 152 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 18 in. (457 mm) beyond the appliance on all sides.

8-6.1.3.3 Furnaces or boilers with legs or pedestals that provide less than 2 in. (51 mm) of ventilated open space beneath the firechamber or base of the appliance shall not be placed on floors of combustible construction.

8-6.2 Mounting for Low-Heat Industrial-Type Appliances.

8-6.2.1 Low-heat industrial-type solid fuel burning appliances which have been tested and listed by a recognized testing laboratory for placement on floors constructed with a combustible material shall be placed on floors in accordance with the requirements of the listing and conditions of approval. Such appliances which are not listed by a recognized testing laboratory shall be provided with floor protection in accordance with the provisions of 8-6.2.3 or 8-6.2.4.

Exception: Low-heat industrial-type solid fuel burning appliances are permitted to be placed without floor protection in any of the following manners:

(1) on floors constructed of noncombustible materials and having a fire resistance rating of not less than 2 hrs. This construction shall extend not less than 18 in. (457 mm) beyond the appliance on all sides;

(2) on concrete bases adequately supported on compacted soil, crushed rock, or gravel;

(3) on properly stabilized ground that can support the load of the appliance.

8-6.2.2 Concrete bases, concrete slabs and floors shall be designed and constructed to support the appliances.

8-6.2.3 Low-heat industrial-type solid fuel burning appliances which are set on legs or pedestals that provide not less than 18 in. (457 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 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 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 18 in. (457 mm) beyond the appliance on all sides.

8-6.2.4 Low-heat industrial-type solid fuel burning appliances which are set on legs or pedestals that provide 6 to 18 in. (152 to 457 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 18 in. (457 mm) beyond the appliance on all sides.

8-6.2.5 Low-heat industrial-type solid fuel burning appliances with legs or pedestals that provide less than 6 in. (152 mm) of ventilated open space beneath the firechamber or base of the appliance shall not be placed on floors of combustible construction.

8-6.3 Mounting for Medium-Heat Industrial-Type Appliances.

8-6.3.1 Medium-heat industrial-type solid fuel burning appliances which have been tested and listed by a recognized testing laboratory for placement on floors constructed with a combustible material shall be placed on floors in accordance with the requirements of the listing

and conditions of approval. Such appliances which are not listed by a recognized testing laboratory shall be provided with floor protection in accordance with the provisions of 8-6.3.

Exception: Medium-heat industrial-type solid fuel burning appliances are permitted to be placed without floor protection in any of the following manners:

(1) on concrete bases adequately supported on compacted soil, crushed rock, or gravel;

(2) on floors constructed of noncombustible materials and having a fire resistance rating of not less than 2 hrs. This construction 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;

(3) on properly stabilized ground that can support the load of the appliance.

8-6.3.2 Concrete bases, concrete slabs and floors shall be designed and constructed to support the appliances.

8-6.3.3 Medium-heat industrial-type solid fuel burning appliances which are set on legs or pedestals that provide not less than 24 in. (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 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 5/16 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.

8-6.3.4 Medium-heat industrial-type solid fuel burning appliances which 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 5/16 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.

8-6.3.5 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.

8-6.4 Mounting of High-Heat Industrial-Type Appliances.

8-6.4.1 High-heat industrial-type solid fuel burning appliances shall be placed in one of the following manners:

(1) on concrete bases adequately supported on compacted soil, crushed rock, or gravel;

(2) on floors constructed of noncombustible materials and having a fire resistance rating of not less than 2 hrs. 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;

(3) on properly stabilized ground that can support the load of the appliance.

8-6.4.2 Concrete bases and floors shall be designed and constructed to support the appliances.

8-6.4.3 High-heat industrial-type solid fuel burning appliances shall not be placed on floors of combustible construction.

8-7 Clearances.

8-7.1 Solid fuel burning appliances shall be installed so that their use will not create a hazard to person or prop-

Table 8-7(a)
Standard Clearances for Solid Fuel Burning Appliances

For Reduced Clearances, see Table 8-7(b)
These clearances apply to appliances installed in rooms which 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[3] in./mm	From Sides[3] in./mm
Residential Appliances	6/152	48/1219	6/152[2]	6/152[2]
Steam Boilers — 15 psi Water Boilers — 250°F max. Water Boilers — 200°F max. All Water Walled or Jacketed.				
Furnaces				
Gravity and Forced Air[4]	18/457	48/1219	18/457	18/457
Room Heaters, Fireplace Stoves, Combinations	36/914	36/914	36/914	36/914
Ranges			Firing Side	Opp. Side
Lined Firechamber	30/762[1]	36/914	24/610	18/457
Unlined Firechamber	30/762[1]	36/914	36/914	18/457

[1]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 0.024 in. (0.610 mm) (24 gage) spaced out 1 in. (25.4 mm), the distance may be reduced to not less than 24 in. (610 mm).

[2]Adequate clearance for cleaning and maintenance shall be provided.

[3]Provisions for fuel storage shall be located at least 36 in. (914 mm) from any side of the appliance.

[4]For clearances from air ducts, see NFPA 90B.