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CHIMNEYS, FIREPLACES, VENTS AND SOLID FUEL BURNING APPLIANCES 1980

NATIONAL FIRE PROTECTION ASSOCIATION, INC.
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Standard for

Chimneys, Fireplaces, Vents and Solid Fuel Burning Appliances

NFPA 211-1980

1980 Edition of NFPA 211

This 1980 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, and was adopted by the National Fire Protection Association, Inc. on November 18, 1980, at its Fall Meeting in San Diego, California. It was released for publication by the Standards Council on December 10, 1980.

It has been approved by the American National Standards Institute.

A major change included in this 1980 edition is the expanded scope encompassing solid fuel burning appliances. This change is reflected throughout this revision including a new chapter which deals specifically with solid fuel burning appliances.

Revisions include the incorporation in the text of the chimney and vent selection charts formerly in Appendices, the clarification of clearances to combustibles, and the rewriting of Chapter 7, Fireplaces.

References to insulating material employing asbestos fiber have been deleted and recognition provided for commonly found masonry materials relative to reduction in clearances to combustibles; the connection of solid fuel burning appliances to a flue serving an appliance burning other fuels has been restricted; and, as discussed above, a new chapter (Chapter 8) has been added concerning solid fuel burning appliances.

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 arresters which had been covered in NFPA 213 but was withdrawn in 1969.

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NOTE: Membership on a Committee shall not in and of itself constitute an endorsement of the Association or of any document developed by the Committee on which the member serves.

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Standard for

Chimneys, Fireplaces, Vents and Solid Fuel Burning Appliances

NFPA 211-1980

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.

Approved. Means "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.

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."

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.

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.

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.

Noncombustible Material. Material which will not ignite and burn, such materials consisting entirely of steel, iron, brick, tile, concrete, slate, asbestos, glass or plasters, or combination thereof.

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.

Shall. Indicates a mandatory requirement.

1-3.1 Other definitions relating to chimneys, fireplaces, and venting systems are contained in the Glossary of Terms Relating to NFPA 97M, *Chimneys, Vents, and Heat-Producing Appliances.*

Table 1-2(a)
Chimney Selection Chart

Chimney Type (Construction Requirements)				
1. Factory Built-Residential-Type and Building Heating Appliance (Section 2-3)	1. Factory Built-Residential-type and Building Heating Appliance (Section 2-3)	1. Factory Built-1400 Degree Fahrenheit (Section 2-3)	1. Factory Built-Medium Heat Appliance (Section 2-3)	
2. Masonry, Residential Type, (Chapter 3 and Section 3-2)	2. Masonry, Low Heat Type, (Chapter 3 and Section 3-3)	2. Masonry, Low Heat Type, (Chapter 3 and Section 3-3)	2. Masonry, Medium Heat Type, Chapter 3 and Section 3-4)	1. Masonry, High Heat Type, (Chapter 3 and Section 3-5)
	3. Metal, Low Heat Type, (Chapter 4 and Section 4-2)	3. Metal, Low Heat Type, (Chapter 4 and Section 4-2)	3. Metal, Medium Heat Type, (Chapter 4 and Section 4-3)	2. Metal, High Heat Type, (Chapter 4 and Section 4-4)
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[1]

Column I	Column II	Column III	Column IV	Column V
A. Residential-type appliances, such as: 1. Ranges. 2. Warm air furnaces 3. Water heaters. 4. Hot water heating boilers.	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 m³)	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.	All appliances shown in Columns I, II and III, and appliances such as: 1. Alabaster gypsum. 4. Annealing furnaces (glass or metal). 3. Charcoal furnaces.	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.

Types of Appliances to be Used with Each Type Chimney[1]

Column I	Column II	Column III	Column IV	Column V
5. Low pressure steam heating boilers.	C. Steam boilers operating at not over 1000°F (538°C) flue gas temperature; pressing machine boilers.	2. Annealing baths for hard glass (fats, paraffin, salts, or metals).	4. Cold stirring furnaces.	5. Brass furnaces.
6. Incinerators.		3. Bake ovens (in bakeries).	5. Feed driers (direct fire heated).	6. Carbon point furnaces.
7. Floor furnaces.		4. Candy furnaces.	6. Fertiler dryers (direct fire heated).	7. Cement brick and tile kilns.
8. Wall furnaces.		5. Core ovens.	7. Galvanizing furnaces.	8. Ceramic kilns.
9. Room heaters.		6. Feed drying ovens.	8. Gas producers.	9. Coal and water gas retorts.
10. Fireplace stoves.		7. Forge furnaces (solid fuel).	9. Hardening furnaces (cherry to pale red).	10. Cupolas.
11. Fireplace stove-room heater.		8. Gypsum kilns.	10. Incinerators, commercial and industrial.	11. Earthenware kilns.
B. Fireplaces:		9. Hardening furnaces (below dark red).	11. Lehrs and glory.	12. Glass blow furnaces.
1. Factory-built		10. Lead melting furnaces.	12. Lime kilns.	13. Glass furnaces (smelting).
2. Masonry.		11. Nickel plate (drying) furnaces.	13. Linseed oil boiling.	14. Glass kilns.
3. Freestanding (see Fireplace stove).		12. Paraffin furnaces.	14. Porcelain biscuit kilns.	15. Open hearth furnaces.
		13. Restaurant-type cooking appliances using solid or liquid fuel.	15. Pulp driers (direct fire heated).	16. Ore roasting furnaces.
		14. Sulphur furnaces.	16. Steam boilers operating at over 1000°F (538°C) flue gas temperature.	17. Porcelain baking and glazing kilns.
		15. Tripoli kilns (clay, coke and gypsum).	17. Water-glass kilns.	18 Pot-arches.
		16. Wood drying furnaces.	18. Wood-distilling furnaces.	19. Puddling furnaces.
		17. Zinc amalgamating furnaces.	19. Wood-gas retorts.	20. Regenerative furnaces.
				21. Reverberatory furnaces.
				22. Vitreous enameling ovens (ferrous metals).

[1]For appliance types not listed in Columns I through V, the appropriate chimney shall be selected on the basis of the appliance outlet flue 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, brezeway 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.

Chapter 2 Draft, Termination, Factory-built Chimney Units and Liners

2-1 Draft.

2-1.1 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*.

2-1.2 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.

2-1.3 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 combustible material is completely consumed.

2-1.4 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.

2-2 Termination (height).

2-2.1 Chimneys and vents shall terminate above the roof level in accordance with the requirements of this standard. (*See also Appendix B.*)

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

2-2.2 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.

2-3 Factory-built Chimneys and Chimney Units.

2-3.1 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.

2-3.2 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.

2-3.3 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.

2-4 Flue Lining.

2-4.1 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.

2-4.2 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).

2-5 Protection Against Entry of Birds.

2-5.1 Chimney or vent caps for gas- or oil-fired appliances shall be designed to prevent the entry of birds.

2-5.1.1 Screens attached to chimney and vent caps to prevent the entry of birds shall not adversely affect chimney or vent draft.

Chapter 3 Masonry Chimneys

3-1 General Requirements.

3-1.1 Support. Masonry chimneys shall be supported on properly designed foundations of masonry or reinforced portland or retractory cement conerete, 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.

3-1.2.1 Masonry chimneys shall not be corbeled from a wall more than 6 in. (152 mm).

3-1.2.2 Masonry chimneys shall not be corbeled from a wall which is less than 12 in. (305 mm) in thickness.

Exception: When it projects egually on each side of the wall provided that in the second story of two-story dwellings corbeling of chimneys on the exterior of the enclosing walls shall not exceed the wall thickness.

3-1.2.3 Corbeling shall not exeeed 1-in. (25.4 mm) projection for each course of brick projected.

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 provided in chimneys shall be equipped with ferrous metal doors and frames arranged to remain tightly closed when not in use.

3-1.5 Firestopping. All spaces between chimneys and floors and ceilings through which chimneys pass 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 material to a depth of no more than 1 in. (25.4 mm).

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

3-2 Masonry Chimneys for Residential-type Appliances. [See Table 1-2(a).]

3-2.1 Construction.

3-2.1.1 Masonry chimneys for residential-type appliances shall be constructed of solid masonry units 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 or rubble stone masonry not less than 12 in. (305 mm) thick. Masonry shall be laid with full, push-filled, cross and bed, mortar joints.

3-2.1.2 Masonry chimneys for residential-type appliances shall be lined with fire-clay flue lining (ASTM C315) or the equivalent not less than $\frac{5}{8}$ in. (16 mm) thick, or with liner of other approved material that will resist corrosion, softening or cracking from flue gases at temperatures up to 1800°F (982°C).

3-2.1.3 Fire-clay flue liner 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.

3-2.1.4 Lining shall be separate from the chimney wall and the space between the liner and masonry shall not be filled; only enough mortar shall be used to make a good joint and hold the liners in position.

3-2.1.5 Flue lining shall start from a point not less than 8 in. (203 mm) below the lowest chimney connector entrance. The lining shall extend, as nearly vertically as possible, for the entire height of the chimney.

3-2.1.6 Where two adjoining flues in the same chimney are separated only by flue liners, the joints of the adjacent flue liners shall be staggered at least 7 in. (178 mm).

3-2.1.7 Where more than two flues are located in the same chimney, masonry wythes (partitions) shall be constructed of solid masonry units 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 bonded.

3-2.2 Termination (height). Masonry chimneys for residential-type 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 Appendix B.*)

3-2.3 Clearance from Combustible Material.

3-2.3.1 The clearance between masonry chimneys and combustible material shall be not less than 2 in. (50.8 mm) for interior chimneys and not less than ½ in. (12.7 mm) for exterior chimneys.

Exception No. 1: The clearance between masonry chimneys and combustible flooring or trim shall be at least ½ in (12.7 mm).

Exception No. 2: Ends of wood girders may be supported on a corbeled shelf of a masonry chimney provided there is not less than 8 in. (203 mm) of solid masonry between the ends and the flue liner.

3-2.3.2 Combustible lathing, furring, or plaster grounds shall not be placed against a chimney at any point more than 1½ in. (38 mm) from the corner of the chimney.

Exception No. 1: This requirement shall not prevent plastering directly on the masonry or on metal lath and metal furring.

Exception No. 2: This requirement shall not prevent placing chimneys for residential-type appliances entirely on the exterior of a building against the sheathing.

3-3 Masonry Chimneys for Low Heat Appliances.

3-3.1 Construction.

3-3.1.1 Masonry chimneys for low heat appliances shall be constructed of solid masonry units or reinforced portland or refractory cement concrete with walls not less than 8 in. (203 mm) thick or rubble stone masonry not less than 12 in. (305 mm) thick. Masonry shall be laid with full, push-filled, cross and bed, mortar joints.

3-3.1.2 Masonry chimneys for low heat appliances shall be lined with fire-clay flue lining (ASTM C315), or the equivalent, not less than ⅝ in. (16 mm) thick, or with liner of other approved material that will resist erosion, softening or cracking from flue gases at temperatures up to 1800°F (982°C).

3-3.1.3 Fire-clay flue liners shall be installed ahead of the construction of the chimney as it is caried 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.

3-3.1.4 Flue liners shall start from a point not less than 8 in. (203 mm) below the lowest chimney connector entrance. The lining shall extend, as nearly vertically as possible, for the entire height of the chimney.

3-3.1.5 Where two adjoining flues in the same chimney are separated only by flue liners, the joints of the adjacent flue liners shall be staggered at least 7 in. (178 mm).

3-3.1.6 Where more than two flues are located in the same chimney, masonry wythes (partitions) at least 4 in. (102 mm) wide and bonded into the masonry walls of the chimney shall be built at such points between adjacent flue linings that there are not more than two flues in any group of adjoining flues without such wythe separation.

3-3.2 Termination (height). Masonry chimneys for 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 Appendix B.*)

3-3.3 Clearance from Combustible Material.

3-3.3.1 All wood beams, joists and studs shall be trimmed away from chimneys. Headers, beams, joists and studs shall be not less than 2 in. (51 mm) from the outside face of a chimney or from masonry enclosing a flue.

3-3.3.2 Combustible lathing, furring, or plaster grounds shall not be placed against a chimney at any point more than 1½ in. (38 mm) from the corner of the chimney.

Exception No. 1: This requirement shall not prevent plastering directly on the masonry or on metal lath and metal furring.

Exception No. 2: This requirement shall not prevent placing chimneys for low heat appliances entirely on the exterior of a building against the sheathing.

3-4 Masonry Chimneys for Medium Heat Appliances.

3-4.1 Construction.

3-4.1.1 Masonry chimneys for medium heat appliances shall be constructed of solid masonry units or of reinforced portland or refractory cement concrete with walls not less than 8 in. (203 mm) thick or with stone masonry not less than 12 in. (305 mm) thick.

3-4.1.2 Masonry chimneys for medium heat appliances shall be lined with medium-duty fire brick (ASTM C64, Type F) or the equivalent, not less than 4½ in. (114 mm) thick laid on the 4½-in. (114-mm) bed in refractory mortar (ASTM C105, medium duty) or the equivalent.

3-4.1.3 The flue 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 (7.63 m) above the highest chimney connector entrance. Chimneys terminating 25 ft (7.63 m) or less above a chimney connector entrance shall be lined to the top.

3-4.2 Termination (height). Masonry 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 (7.63 m).

3-4.3 Clearance from Combustible Material. A clearance of not less than 4 in. (102 mm) shall be provided between the exterior surfaces of a masonry chimney for medium heat appliances and combustible material.

3-5 Masonry Chimneys for High Heat Appliances.

3-5.1 Construction.

3-5.1.1 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.

3-5.1.2 The inside of the interior wall of masonry chimneys for high heat appliances 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 the 4½-in. (114-mm) bed in refractory mortar (ASTM C105, high duty) or the equivalent.

3-5.1.3 The lining shall start at the base of the chimney and extend continuously to the top.

3-5.2 Termination (height). Masonry 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).

3-5.3 Clearance from Combustible Material. 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 on good engineering practice and acceptable to the authority having jurisdiction.

3-6 Masonry Chimneys for Incinerators.

3-6.1 Residential. Masonry chimneys for residential-type incinerators shall be constructed in accordance with the requirements for Masonry Chimneys for Residential-type Appliances, Section 3-2.

3-6.2 Chute-fed Incinerators. See NFPA 82, *Standard on Incinerators, Waste and Linen Handling Systems and Equipment.*

3-6.3 Commercial and Industrial-type Incinerators.

3-6.3.1 Construction.

3-6.3.1.1 Masonry chimneys for commercial and industrial incinerators shall be constructed of solid masonry units or reinforced portland or refractory cement concrete with walls not less than 8 in. (203 mm) thick.

3-6.3.1.2 Masonry chimneys for commercial and industrial incinerators shall be lined with medium-duty fire brick (ASTM C64, Type F) or the equivalent, not less than 4½ in. (114 mm) thick laid on the 4½-in. (114-mm) bed in refractory mortar (ASTM C105, medium duty) or the equivalent.

3-6.3.1.3 The lining shall start at the base of the chimney and extend continuously to the top.

3-6.3.1.4 Masonry chimneys for commercial and industrial incinerators 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.

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.

3-6.3.2 Termination (height).

3-6.3.2.1 Masonry chimneys for commercial and industrial incinerators shall extend not less than 10 ft (3.1 m) higher than any portion of any building within 25 ft (7.63 m).

3-6.3.2.2 The terminus of the chimney flue for the incinerator shall be equipped with an approved spark arrester if the incinerator does not include effective means for arresting sparks and fly ash. (*See NFPA 82.*)

3-6.3.3 Clearances. A clearance of not less than 4 in. (102 mm) shall be provided between the exterior surface of masonry chimneys for commercial and industrial-type incinerators and combustible materials.

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 in^2/m^2	Equiv. Round Diam. in./mm
16	0.053 (1.35)	up to 154/.0994	up to 14/356
14	0.067 (1.70)	155/.0999 to 201/.1296	over 14/356 to 16/406
12	0.093 (2.36)	202/.1303 to 254/.1638	over 16/406 to 18/457
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 accordance 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 180°F (82.2°C) 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 factory-built chimney, if so listed, and 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 Appendix 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 the 4½-in. (114 mm) 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 Appendix 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 the 4½-in. (114-mm) 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 CIearance 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 180°F (82.2°C) and to permit inspection and maintenance operations on the chimney. They shall be located or shielded to avoid danger of burns to persons.

4-5 Metal Chimneys for Incinerators.

4-5.1 Residential-type Incinerators. Galvanized steel pipe not less than No. 20 galvanized-steel gage number or other equivalent noncombustible, fire- and corrosion-resistant material may be used for residential-type incinerators installed in locations such as open sheds, breezeways, or carports. The pipe shall comply with the following requirements.

4-5.1.1 The pipe shall be exposed and readily examinable for its full length.

4-5.1.2 Clearance not less than 18 in. (457 mm) shall be maintained from combustible material.

4-5.1.3 The pipe shall extend at least 3 ft (.92 m) above the highest point where it passes by or through a roof and at least 2 ft (.61 m) higher than any portion of a building within 10 ft (3.1 m).

4-5.1.4 If the pipe passes through a roof constructed of combustible material, it shall be guarded by a ventilating thimble of galvanized steel or approved corrosion-resistant, noncombustible material 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 pipe.

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

4-5.2 Commercial and Industrial-type Incinerators.

4-5.2.1 Construction.

4-5.2.1.1 Metal chimneys for commercial and industrial-type incinerators shall be lined with medium-duty fire brick (ASTM C64, Type F, or the equivalent), not less than 4 in. (114 mm) thick laid on

the 4½-in. (114-mm) bed in refractory mortar (ASTM C105, medium duty), or the equivalent.

4-5.2.1.2 The lining shall start at the base of the chimney and extend continuously to the top.

4-5.2.2 Termination (height).

4-5.2.2.1 Metal chimneys for commercial and industrial incinerators shall extend not less than 10 ft (3.1 m) higher than any portion of any building within 25 ft (7.6 m).

4-5.2.2.2 The terminus of the chimney flue for the incinerator shall be equipped with an approved spark arrester if the incinerator does not include effective means for arresting sparks and fly ash (*see NFPA 82*).

4-5.2.3 Clearance. Metal chimneys for commercial and industrial incinerators shall be installed to provide clearances as specified in 4-3.3 for metal chimneys for medium heat appliances.

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.

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.

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)

5-2.4 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	
Column I, Table 1-2(a)	
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)*
Column I, Table 1-2(b)	
Type B Gas Vent Piping Connectors	
Listed Gas Appliances With Draft Hoods	*(See Note 3)*
LOW HEAT APPLIANCES	
Columns II & III, Table 1-2(a)	
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	
Column IV, Table 1-2(a)	
Single-Wall Metal Pipe Connectors	
All Gas, Oil, and Solid-Fuel Appliances	36 (914)
HIGH HEAT APPLIANCES	
Column V, Table 1-2(a)	
Masonry or Metal Connectors	
All Gas, Oil, and Solid-Fuel Appliances	*(See Note 4)*

[Notes to Table 5-5(a) on following page]

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).

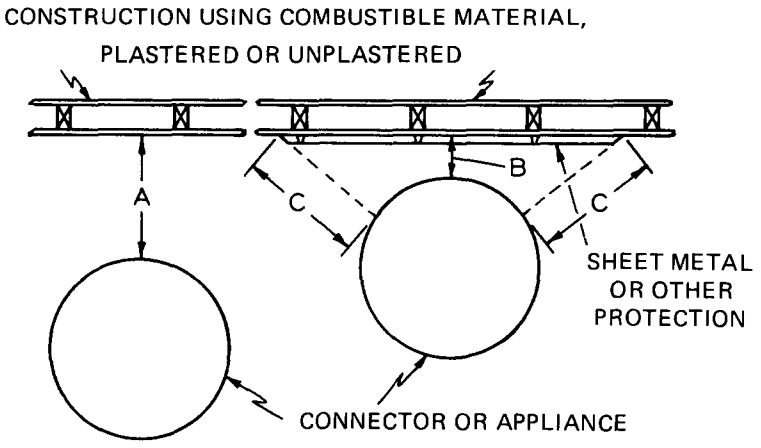

Figure 5-5

A equals the required clearance with no protection specified in Table 5-5(a).

B equals the reduced clearance permitted in accordance with Table 5-5(b).

The protection applied to the construction using combustible material shall extend far enough in each direction to make C equal to A.

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 of such materials to not over 180°F (82°C). 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.

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 ft^3 (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.

5-5.3 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-terperature 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 appliances, and installed with not less than listed clearances to combustible material, or

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

5-7.4 Connectors for residential-type appliances [Table 1-2(a), Column I] may pass through walls or partitions constructed of combustible material if made of listed factory-built chimney material 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 material if they are guarded at the point of passage by:

(a) Metal ventilated thimbles not less than 12 in. (305 mm) larger in diameter than the connector, or by

(b) Metal or burned fire clay thimbles built in brickwork or other approved fireproofing materials extending not less than 8 in. (203 mm) beyond all sides of the thimble.

5-7.6 In lieu of thimbles all combustible material in the wall or partition shall be cut away from the connector a sufficient distance to provide the clearance required from such connector. Any material used to close up such openings shall be noncombustible material.

5-7.7 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.

5-7.8 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.

5-7.9 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.

5-7.10 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 Secion 2-1.

5-7.11 Connectors shall be securely supported and joints fastened with sheet-metal screws, rivets, or other approved means.

5-7.12 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.

5-7.13 A connector serving another appliance shall not be connected to a chimney flue serving a fireplace.

Exception: When the fireplace opening is sealed or the chimney flue which vents the fireplace is permanently sealed below the connection.

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.

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.

[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*.

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 in 4-5.1.

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 Appendix 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 the mechanical draft system shall be located not less than 12 in. (305 mm) from any opening through which combustion products could enter the building nor less than 2 ft (.61 m) from an adjacent building, and not less than 7 ft (2.1m) 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.

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

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

6-6.2 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)*].

[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 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.

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 mm²) 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 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.

7-3.1.1 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).

7-3.1.2 Where the lining described in 7-2.1.1 is not provided, the thickness of back and sides shall be not less than 12 in. (305 mm).

7-3.1.3 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 Warm air ducts employed with steel fireplace units of the circulating air type shall be constructed of metal or masonry.

7-3.3 All wood beams, joists, studs and other combustible material shall be trimmed away from masonry fireplaces. Headers supporting trimmer arches at fireplaces shall be not less than 20 in. (508 mm) from the face of the chimney breast. Trimmers shall be not less than 6 in. (152 mm) from the inside face of the nearest flue lining.

7-3.4 Combustible material shall not be placed within 4 in. (102 mm) of the exterior surface of the rear wall of a masonry fireplace.

7-3.5 Woodwork and other combustible materials shall not be placed within 6 in. (152 mm) of a fireplace opening. Combustible materials 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 a 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.

7-5.1 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 heater having its fire chamber open to the room.

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

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.

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 installation.

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 adequate 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.