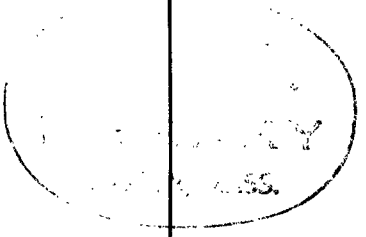
NFPA No.

211

CHIMNEYS FIREPLACES VENTING SYSTEMS 1968



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Official NFPA Definitions

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

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Units of Measurements

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

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Standard for

Chimneys, Fireplaces, and Venting Systems

NFPA No. 211 — 1968

This edition of NFPA No. 211, adopted by the Association on May 23, 1968, supersedes the edition of 1966. Revisions, additions and deletions from the 1966 edition included in this edition are: 50, new 701.A, 702.B.2.b, 802.A, new 802.B, C and D, 803, 807.B, new 905.C, 906.A, Table 1, Appendix A, Appendix B and new Appendix D. Several editorial changes were also made.

The 1966 edition of NFPA No. 211 was approved as a USA Standard by the United States of America Standards Institute on July 19, 1967. This 1968 edition is being resubmitted to USASI for approval.

Origin and Development of No. 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

Committee on Chimneys and Heating Equipment

H. E. Kuhlman, *Chairman,*
Oklahoma Inspection Bureau, P. O. Box 559, Oklahoma City, Okla. 73101
Warren M. Apgar, *Secretary,*
American Insurance Assn., 85 John St., New York, N. Y. 10038

John Beilein, Maryland Fire Underwriters Rating Bureau.
C. E. Blome, Gas Appliance Manufacturers Assn.
Lt. William Carpenter, Fire Marshals Assn. of North America.
Ralph Cramer, AGA Laboratories.
Kendall H. Flint, Gas Vent Institute.
Clifton P. Geisert, Western Actuarial Bureau.
Robert C. Haufler, Liberty Mutual Insurance Co.
Hugh Higgins, National Oil Fuel Institute.
David S. Martin, Underwriters' Laboratories of Canada.
Ernest R. Menold, Sheet Metal & Air Conditioning Contractors' National Assn.
Dean Olds, Institute of Appliance Manufacturers.
Anthony R. O'Neill, The Travelers Insurance Cos.
Joseph F. Schulz, Incinerator Institute of America.
Ross A. W. Switzer, Dominion Fire Commissioner, Canada.
R. H. Zelinske, Underwriters' Laboratories, Inc.

Alternates.

Miro Dvirka, Incinerator Institute of America. (Alternate to Joseph F. Schulz.)
J. J. Fannon, Maryland Fire Underwriters Rating Bureau. (Alternate to John Beilein.)
M. J. Reed, National Oil Fuel Institute. (Alternate to Hugh Higgins.)
W. R. Sarno, American Gas Association. (Alternate to Ralph Cramer.)
J. H. Witte, Underwriters' Laboratories, Inc. (Alternate to R. H. Zelinske.)

SCOPE: To prepare fire protection standards on chimneys, fireplaces, heating appliance venting systems, incinerators, and similar heat producing or heat removal devices, including clearances between heat sources and combustible materials.

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 was previously covered in NFPA No. 212. This latter standard was withdrawn in 1964.

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Standard for

Chimneys, Fireplaces, and Venting Systems

NFPA No. 211 — 1968

10. GENERAL.

101. Introduction.

All fuel-burning appliances, including fireplaces, produce products of combustion (waste gases) when in use. These waste gases must be safely and completely expelled to the outside atmosphere.

The safe removal of these waste gases, the fire-safe construction and installation of chimneys, fireplaces, and venting systems for domestic, commercial, and industrial appliances are the primary concern of this Standard.

102. Scope and Purpose.

This edition of NFPA Standard No. 211 represents basic standards for chimneys, fireplaces, and venting systems, their safe installation and use. The Standard applies to residential as well as commercial, and industrial applications. Definitions relating to chimneys, fireplaces, and venting systems are contained in the Glossary of Terms, NFPA No. 97M, 1968.

20. SELECTION OF CHIMNEY, GAS VENT OR VENTING SYSTEM

Selection is dependent on the appliance connected thereto and the fuel used by the appliance. This standard gives minimum construction and installation requirements for chimneys and venting systems suitable for use with appliances classified as residential type, low, medium and high heat appliances. Appendix A covers the selection of a chimney for various appliances. Appendix B covers the selection of a venting system for certain appliances listed as suitable for use with such systems. This standard also gives minimum requirements for the construction and installation of fireplaces.

30. DRAFT.

301. A chimney, gas vent or venting system shall be capable of producing a draft at the appliance not less than that required for safe operation of the appliance connected thereto. An exhauster (draft booster) may be used except with incinerators to increase low draft. When an exhauster (draft booster) is used, provision

shall be made to automatically shut off the fuel supply to the appliance in the event of failure of the exhauster.

302. An appliance equipped with a forced or induced draft system which may result in positive pressure in the venting system shall be connected to a pressure-tight venting system.

303. Natural draft chimneys or gas vents shall not terminate at an elevation less than 5 ft. above the flue collar or highest connected draft hood outlet except as provided in 906.

40. TERMINATION (HEIGHT).

Chimneys, vents, and venting systems shall terminate above the roof level in accordance with the requirements of this Standard, except as provided in 702.A.2, 903.E. and 906. See also Appendix D.

50. FACTORY-BUILT CHIMNEYS.

Factory-built chimneys shall be listed and shall be installed in accordance with the conditions of the listing and the manufacturer's instructions.

60. MASONRY CHIMNEYS.

601. General Requirements.

A. Support. Masonry chimneys shall be supported on properly designed foundations of masonry or reinforced concrete. Noncombustible material having a fire resistance rating of not less than 3 hours may be used to support masonry chimneys where such supports are independent of the floor construction and the load transferred to the ground.

B. Corbeling. No masonry chimneys shall be corbeled from a wall more than 6 inches, nor shall a chimney be corbeled from a wall which is less than 12 inches in thickness unless it projects equally on each side of the wall provided that in the second story of 2-story dwellings corbeling of chimneys on the exterior of the enclosing walls may equal the wall thickness. Corbeling shall not exceed one inch projection for each course of brick projected.

C. Change in size or shape at roof not permitted. No change in the size or shape of a chimney flue where the chimney passes through the roof, shall be made within a distance of 6 inches above or below the roof joists or rafters.

D. 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. Adequate clearance between cleanout doors and combustible material shall be provided.

E. Firestopping. All spaces between chimneys and floors and ceilings through which chimneys may pass shall be firestopped with noncombustible material. The firestopping of spaces between chimneys and wood joists, beams, or headers shall be to a depth of one inch only placed on strips of metal or metal lath laid across the spaces between combustible material and the chimney.

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

602. Masonry Chimneys for Residential Type Appliances (See Appendix A).

A. Construction.

1. Masonry chimneys shall be constructed of solid masonry units or reinforced concrete with walls not less than 4 inches thick or rubble stone masonry not less than 12 inches thick.

2. Masonry chimneys for residential type appliances shall be lined with approved fire clay tile flue liners not less than 5/8 of an inch thick, or with other approved liner of material that will resist corrosion softening or cracking from flue gases at temperatures up to 1800°F.

3. Fire clay tile flue liners shall be installed ahead of the construction of the chimney as it is carried up, carefully bedded one on the other in Type A, Type B or fire clay mortar with close fitting joints left smooth on the inside.

NOTE: Specifications on Type A and B mortar are given in the National Building Code published by the American Insurance Association, 85 John St., New York, N. Y. 10038.

4. Liners 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.

5. Flue liners shall start from a point not less than 8 inches below the intake. They shall extend, as nearly vertically as possible, for the entire height of the chimney.

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 inches.

7. Where more than two flues are located in the same chimney, masonry wythes (partitions) at least 4 inches 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.

B. Termination (height). Masonry chimneys for residential type appliances shall extend at least 3 feet above the highest point where they pass through the roof of a building and at least 2 feet higher than any portion of a building within 10 feet. See Appendix D.

C. Clearance from combustible material.

1. All wood beams, joists and studs shall be trimmed away from chimneys. Headers, beams, joists and studs shall be not less than 2 inches from the outside face of a chimney or from masonry enclosing a flue. Ends of wood girders may be supported on a corbeled shelf of a masonry chimney provided there is not less than 8 inches of solid masonry between the ends and the flue liner.

2. No combustible lathing, furring or plaster grounds shall be placed against a chimney at any point more than 1½ inches from the corner of the chimney, but this shall not prevent plastering directly on the masonry or on metal lath and metal furring, nor shall it prevent placing chimneys for residential type appliances entirely on the exterior of a building against the sheathing.

603. Masonry Chimneys for Low Heat Appliances.

A. Construction.

1. Masonry chimneys shall be constructed of solid masonry units or reinforced concrete with walls not less than 8 inches thick, except that rubble stone masonry shall be not less than 12 inches thick.

2. Masonry chimneys for low heat appliances shall be lined with approved fire clay tile flue liners not less than ⅝ of an inch thick, or with other approved liner of material that will resist corrosion softening or cracking from flue gases at temperatures up to 1800°F.

3. Fire clay tile flue liners shall be installed ahead of the construction of the chimney as it is carried up, carefully bedded one on the other in Type A, Type B or fire clay mortar with close fitting joints left smooth on the inside.

NOTE: Specifications on Type A and B mortar are given in the National Building Code published by the American Insurance Association, 85 John St., New York, N. Y. 10038.

4. Flue liners shall start from a point not less than 8 inches below the intake. They shall extend, as nearly vertically as possible, for the entire height of the chimney.

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 inches.

6. Where more than two flues are located in the same chimney, masonry wythes (partitions) at least 4 inches 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.

B. Termination (height). Masonry chimneys for low-heat appliances shall extend at least 3 feet above the highest point where they pass through the roof of a building and at least 2 feet higher than any portion of a building within 10 feet. See Appendix D.

C. Clearance from combustible material.

1. All wood beams, joists and studs shall be trimmed away from chimneys. Headers, beams, joists and studs shall be not less than 2 inches from the outside face of a chimney or from masonry enclosing a flue.

2. No combustible lathing, furring or plaster grounds shall be placed against a chimney at any point more than 1½ inches from the corner of the chimney, but this shall not prevent plastering directly on the masonry or on metal lath and metal furring, nor shall it prevent placing chimneys for low heat appliances entirely on the exterior of a building against the sheathing.

604. Masonry Chimneys for Medium Heat Appliances.

A. Construction. Masonry chimneys for medium heat appliances shall be constructed of solid masonry units or of reinforced concrete not less than 8 inches thick, except that stone masonry shall be not less than 12 inches thick; and in addition, shall be lined with not less than 4½ inches of fire brick laid on the 4½ inch bed in fire clay mortar, starting not less than 2 feet below the chimney connector entrance and extending for a distance of at least 25 feet above the chimney connector entrance. Chimneys extending 25 feet or less above the chimney connector shall be lined to the top.

B. Termination (height). Masonry chimneys for medium heat appliances shall extend not less than 10 feet higher than any portion of any building within 25 feet.

C. Clearance from combustible material. Masonry chimneys for medium heat appliances shall have a clearance of 2 inches from buildings and structures.

605. Masonry Chimneys for High Heat Appliances.

A. Construction. Masonry chimneys for high heat appliances shall be constructed with double walls of solid masonry units or of reinforced concrete each not less than 8 inches in thickness, with an air space of not less than 2 inches between them. The inside of the interior walls shall be of fire brick not less than 4½ inches in thickness laid on the 4½-inch bed in fire clay mortar.

B. Termination (height). Masonry chimneys for high heat appliances shall extend not less than 20 feet higher than any portion of any building within 50 feet.

C. 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, 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.

606. Masonry Chimneys for Incinerators.

A. Residential. Masonry chimneys for residential type incinerators shall be constructed in accordance with the requirements for Chimneys for Residential Type Appliances, 602.

B. Flue-fed incinerators (apartment house type).

1. Construction.

a. The flue of flue-fed incinerators shall serve the incinerator only and be used for no other purpose.

b. The flue liner shall be straight and plumb and shall be smooth on the inside.

c. The size of incinerator flues shall be in accordance with the following:

Where not more than one service opening is provided, the size of flue shall be not less than 14 by 14 inches or 196 square inches, inside measurements, except that in one family dwellings the size shall be not less than 12 by 12 inches or 144 square inches.

Where two to six service openings are provided, the size of flue shall be not less than 18 by 18 inches or 324 square inches, inside measurements.

Where seven or more service openings are provided, the size of flue shall be not less than 22 by 22 inches or 484 square inches, inside measurements.

d. A masonry chimney serving an incinerator with a combustion chamber having a horizontal combined hearth and grate area of 7 square feet or less shall have walls of clay or shale brickwork not less than 4 inches thick with a lining of 4½ inches of fire brick for a distance of not less than 10 feet above the roof of the combustion chamber; beyond this point chimney walls shall consist of not less than 8 inches of clay or shale brickwork with a standard fire clay tile flue liner not less than ⅝ inch in thickness extending from the top of the fire brick lining to the top of the chimney.

e. A masonry chimney serving an incinerator with a combustion chamber having a horizontal combined hearth and grate area exceeding 7 square feet shall have walls of clay or shale brickwork not less than 4 inches thick with a lining of 4½ inches of fire brick for a distance of not less than 40 feet above the roof of the combustion chamber; beyond this point, chimney walls shall consist of not less than 8 inches of clay or shale brickwork with a standard fire clay tile flue liner not less than ⅝ inch in thickness extending from the top of the fire brick lining to the top of the chimney.

f. Other constructions may be used if equivalent to the constructions outlined in the preceding paragraphs, in structural strength, insulating value and ability to withstand thermal expansion and flame impingement.

g. Fire brick shall be laid in high temperature cement or fire clay mortar.

h. A flue that is divided into two channels, one for feeding refuse and the other for the discharge of combustion gases, shall be constructed as specified in this section.

i. Masonry chimneys for flue-fed incinerators shall be supported on properly designed foundations of masonry or reinforced concrete. Noncombustible material having a fire resistance rating of not less than 3 hours may be used to support masonry chimneys where such supports are independent of the floor construction and the load is transferred to the ground. They shall be so constructed as not to place excessive stress upon the roof of the combustion chamber. Masonry chimneys may be supported on incinerator walls.

j. All flues shall terminate in a substantially constructed spark arrester with openings not greater than ¾ inch, or be provided with other suitable means for avoiding discharge of fly particles. Expansion chambers used as a secondary combustion chamber shall

be constructed equivalent to that of the incinerator combustion chamber. Those used only for settling shall be of construction equivalent to that of the upper portion of incinerator.

2. **Termination (height).** Masonry chimneys of flue-fed incinerators shall extend at least 4 feet above sloping roofs measured from the highest point at which the chimney passes through the roof and at least 8 feet above flat roofs. In either case, the chimney shall extend at least 2 feet higher than any portion of a building within 20 feet.

3. **Clearances.**

a. A clearance of not less than 2 inches shall be provided between the exterior surface of chimneys for flue-fed apartment house type incinerators and combustible material.

b. Combustible lathing, furring or plaster grounds shall not be placed against a chimney at any point more than 1½ inches from the corner of the chimney; but this shall not prevent plastering directly on the masonry or on metal lath and metal furring; nor shall it prevent placing chimneys entirely on the exterior of a building against the sheathing.

C. Commercial and industrial type incinerators.

1. **Construction.**

a. Masonry chimneys of commercial and industrial type incinerators, except as provided in the following paragraphs b. and c., shall be not less than 8 inches of clay or shale brickwork or reinforced concrete lined with fire brick not less than 4½ inches thick for the full height of the chimney.

b. Subject to approval by the authority having jurisdiction, commercial and industrial type incinerators may be connected to chimneys constructed of 8 inches of clay or shale brickwork or reinforced concrete lined with fire clay flue liner, where the incinerator is specially constructed to produce low flue gas temperatures.

c. Other constructions may be used if equivalent to the construction outlined in the preceding paragraphs, in structural strength, insulating value and ability to withstand thermal expansion and flame impingement.

d. Fire brick and other refractory lining shall be laid in high temperature cement or fire clay mortar.

e. Masonry chimneys for commercial and industrial incinerators shall be supported on properly designed foundations of

masonry or reinforced concrete. Noncombustible material having a fire resistance rating of not less than 3 hours may be used to support masonry chimneys where such supports are independent of the floor construction and the load is transferred to the ground. They shall be so constructed as not to place excessive stress upon the roof of the combustion chamber. Masonry chimneys may be supported on incinerator walls.

f. Incinerators used for the burning of rubbish or other readily combustible solid waste material shall include effective means for arresting sparks and fly particles, such as an expansion chamber, baffle walls, or other effective arrangement, or the flues of such incinerators shall be provided with an approved spark arrester having openings not greater than ¾ inch.

2. Termination (height). Masonry chimneys for commercial and industrial type incinerators shall extend at least 4 feet above sloping roofs measured from the highest point at which the chimney passes through the roof and at least 8 feet above flat roofs. In either case, the chimney shall extend at least 2 feet above any ridge, parapet, cornice, penthouse or other obstruction within 20 feet.

3. Clearances. A clearance of not less than 4 inches shall be provided between the exterior surface of masonry chimneys for commercial and industrial type incinerators and combustible material.

70. METAL CHIMNEYS (Smokestacks).

701. General Requirements.

A. Single wall metal chimneys shall not be used inside 1- and 2-family dwellings.

B. Metal chimneys shall be of adequate thickness based on good engineering practice, properly riveted or welded, and securely supported except that in no case shall sheet copper be lighter than No. 24 B & S gage or galvanized iron lighter than No. 20 galvanized sheet gage number.

NOTE: When selecting the gage of metal chimneys consideration should be given to factors such as location, maintenance, use, etc., as well as engineering design factors. As a guide the following are gages of uncoated sheet steel for given cross-sectional areas:

Mfrs. Std. Gage No.	Area (Sq. In.)
16	Up to 154
14	154 to 201
12	201 to 254
10	Larger than 254

C. Metal chimneys shall not be carried up inside of ventilating ducts unless 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.

D. Metal chimneys 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.

702. Metal Chimneys for Residential Type or Low Heat Appliances.

A. Termination (height).

1. Metal chimneys for residential type or low heat appliances except as provided in 702.A.2, shall extend at least 3 feet above the highest point where they pass through the roof of a building and at least 2 feet higher than any portion of a building within 10 feet. See Appendix D.

2. 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 feet from an adjacent building or building opening and at least 10 feet 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.

B. Clearances.

1. Exterior.

a. Exterior metal chimneys used only for residential type or low heat appliances as defined in Appendix A shall have a clearance of not less than 6 inches from a wall of wood frame construction and from any combustible material.

b. Exterior metal chimneys over 18 inches in diameter shall have a clearance of not less than 4 inches, and those 18 inches or less in diameter a clearance of not less than 2 inches from a building wall of other than wood frame construction.

c. No portion of an exterior metal chimney shall be nearer than 24 inches to any door or window or to any walk way, unless insulated or shielded in an approved manner to avoid burning a person who might touch the chimney.

2. Interior.

a. Where a metal chimney extends through any story above that in which the appliances connected to the chimney are located, it shall be enclosed in such upper stories with walls of noncombustible construction having a fire resistance rating of not less than one hour.

b. 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 inches.

c. The enclosing walls shall be without openings, except doorways equipped with approved self-closing fire doors at various floor levels for inspection purposes.

d. Where a metal chimney used for residential type or low heat appliances as defined in Appendix 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 inches from a wall of wood frame construction and from any combustible material. Such interior metal chimneys over 18 inches in diameter shall have a clearance of not less than 4 inches, and those 18 inches or less in diameter a clearance of not less than 2 inches from a building wall of other than wood frame construction.

e. Where a metal chimney serving only residential type or low heat appliances as defined in Appendix A passes through a roof constructed of combustible material, it shall be guarded by a ventilating thimble of galvanized iron or approved corrosion resistant metal, extending not less than 9 inches below and 9 inches above the roof construction, and of a size to provide not less than 6 inches clearance on all sides of the chimney; or the combustible material in the roof construction shall be cut away so as to provide not less than 18 inches clearance on all sides of the chimney, with any material used to close up such opening entirely noncombustible.

703. Metal Chimneys for Medium Heat Appliances.

A. Termination (height). Metal chimneys for medium heat appliances shall extend not less than 10 feet higher than any portion of any building within 25 feet.

B. Clearances.

1. Exterior.

a. Exterior metal chimneys used for medium heat appliances as defined in Appendix A shall have a clearance of not less than 24 inches from a wall of wood frame construction and from any combustible material.

b. Exterior metal chimneys over 18 inches in diameter shall have a clearance of not less than 4 inches, and those 18 inches or less in diameter a clearance of not less than 2 inches from a building wall of other than wood frame construction.

c. No portion of an exterior metal chimney shall be nearer than 24 inches to any door or window or to any walkway, unless insulated or shielded in an approved manner to avoid burning a person who might touch the chimney.

2. Interior.

a. Where a metal chimney extends through any story of a building above that in which the appliances connected to the chimney are located, it shall be enclosed in such upper stories with walls which are continuous of noncombustible construction having a fire resistance rating of not less than one hour.

b. The enclosure shall provide a space on all sides of the chimney sufficient to permit inspection and repair.

c. The enclosing walls shall be without openings, except doorways equipped with approved self-closing fire doors at various floor levels for inspection purposes.

d. Where a metal chimney serving a medium heat appliance as defined in Appendix A passes through a roof constructed of combustible material, it shall be guarded by a ventilating thimble of galvanized iron or approved corrosion resistant metal, extending not less than 9 inches below and 9 inches above the roof construction, and of a size to provide not less than 18 inches clearance on all sides of the chimney.

e. Where a metal chimney used for medium heat appliances as defined in Appendix 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 inches from a wall of wood frame construction and from any combustible material. Such interior metal chimneys over 18 inches in diameter shall have a clearance of not less than 4 inches, and those 18 inches or less in diameter a clearance of not less than 2 inches from a building wall of other than wood frame construction.

704. Metal Chimneys for High Heat Appliances.

A. Construction. Metal chimneys used for high heat appliances

as defined in Appendix A shall be lined with not less than 4½ inches of fire brick laid in fire clay mortar extending not less than 25 feet above the chimney connector entrance. Chimneys extending 25 feet or less above the chimney connector shall be lined to the top.

B. Termination (height). Metal chimneys for high heat appliances shall extend not less than 20 feet higher than any portion of any building within 50 feet.

C. Clearance from combustible material. Metal chimneys for high heat appliances shall have sufficient clearance from buildings and structures to avoid overheating combustible material, to permit inspection, 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.

705. Metal Chimneys for Incinerators.

A. Residential type incinerators. Metal pipe not less than No. 20 galvanized sheet gage number or other equivalent noncombustible corrosion resistant material may be used for residential type incinerators installed in locations such as sheds, breezeways or carports provided the metal pipe is exposed and readily examinable for its full length and clearances not less than 18 inches are maintained from combustible material. The metal pipe shall extend at least 3 feet above the highest point where it passes through the roof and at least 2 feet higher than any portion of the building within 10 feet. Where the metal pipe passes through a roof constructed of combustible material, clearances shall conform to the requirements for interior metal chimneys for Residential or Low Heat Appliances, 702.B.2.e.

B. Commercial and industrial type incinerators.

1. Construction.

a. Metal chimneys of commercial and industrial type incinerators, shall be lined with firebrick not less than 4½ inches thick for the full height of the chimney.

b. Firebrick shall be laid in high temperature cement or fire clay mortar.

c. Subject to approval by the authority having jurisdiction, commercial and industrial type incinerators may be connected to a metal chimney without firebrick flue liner provided the incinerator is specially constructed to produce low flue gas temperatures.

2. **Termination (height).** Metal chimneys of commercial and industrial type incinerators shall extend at least 4 feet above sloping roofs measured from the highest point at which the metal chimney passes through the roof and at least 8 feet above flat roofs. In either case, the chimney shall extend at least 2 feet higher than any portion of a building within 20 feet.

3. **Clearance.** A clearance of not less than 4 inches shall be provided between the exterior surface of metal chimneys for commercial and industrial type incinerators and combustible material.

80. CHIMNEY CONNECTOR AND VENT CONNECTORS.

801. 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.

802. Materials.

A. Connectors shall be made of noncombustible corrosion resistant material such as steel or refractory masonry capable of withstanding the flue gas temperatures produced by the appliances and of sufficient thickness to withstand physical damage. Connectors for appliances installed in attics shall be of Type B or Type L vent material for listed gas appliances with draft hoods or of Type L vent material for oil appliances listed as suitable for Type L vents. For other appliances allowed in attics, a chimney shall be attached directly to the appliance.

When selecting the gage of metal for single wall metal pipe connectors of residential type and low heat appliances not installed in attics, consideration should be given to factors such as location, maintenance, use, etc., as well as engineering design factors. As a guide the following are gages of galvanized steel for given diameter connectors, except as provided in Paragraphs B, C and D below.

Galvanized Sheet Gage No.	Diameter of Connector, Inches
24	10 or less
22	10 to 12
20	14 to 16
16	16

B. Metal connectors for medium heat appliances and commercial and industrial incinerators shall be constructed of steel not lighter than that designated for metal chimneys in 701.B. In addition, they shall be lined with fire brick not less than 2¼ inches thick, when they are more than 12 inches but not in excess of 18

inches in diameter or greatest dimension, and with fire brick not less than 4½ inches thick when they are over 18 inches in diameter or greatest dimension. Fire brick shall be laid in high temperature cement or fire-clay mortar.

Chimney connectors for appliances specially constructed to produce low flue gas temperatures, and chimney connectors not over 10 inches in diameter and not over 8 feet long, may be of flue tile properly supported and insulated, or of other suitable construction without fire brick lining where located entirely within the appliance room.

C. Metal connectors for high heat appliances shall be constructed of steel not lighter than that designated for metal chimneys in 701.B.

In addition, they shall be lined with fire brick not less than 4½ inches thick, laid in high temperature cement or fire-clay mortar.

D. Masonry connectors or breechings shall be made of refractory material equivalent in resistance to heat and corrosion to high-duty regular type (ASTM Classification C 27-60) fire-clay brick 4½ inches thick.

E. Connectors used for gas appliances having draft hoods and for listed conversion-burner-equipped appliances having draft hoods may be constructed of materials having resistance to corrosion and heat not less than that of No. 28 gage galvanized steel, or they may be of Type B or Type L vent material.

F. Connectors made of Type L vent material may be used with gas, oil and solid fuel-burning residential-type appliances including residential-type incinerators.

803. Length.

A connector shall be as short and straight as possible. The appliance shall be located as close as practicable to the chimney, gas vent, or venting system. The horizontal run of an uninsulated connector to a natural draft chimney, or vent, serving a single liquid or solid fuel burning appliance, shall not be more than 75 percent of the height of the vertical portion of the chimney or vent above the connector, unless part of an engineered venting system.

The horizontal run of an insulated connector to a natural draft chimney, or vent, serving a single gas 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, unless part of an engi-

Continued on page 211-20

TABLE 1

Chimney Connector and Vent Connector Clearances from Combustible Materials

Description of Appliance	Minimum Clearance, Inches (See Note 1)
RESIDENTIAL TYPE APPLIANCES	
Column 1, Appendix A	
Single-Wall Metal Pipe Connectors	
Gas Appliances Without Draft Hoods	18
Electric, Gas, and Oil Incinerators	18
Oil and Solid-Fuel Appliances	18
Unlisted Gas Appliances With Draft Hoods	9
Boilers and Furnaces Equipped With Listed Gas Burners and With Draft Hoods	9
Oil Appliances Listed as Suitable For Use With Type L Venting Systems, but only when connected to chimneys.	9
Listed Gas Appliances With Draft Hoods. See Note 3.	6
Type L Venting System Piping Connectors	
Gas Appliances Without Draft Hoods	9
Electric, Gas, and Oil Incinerators	9
Oil and Solid-Fuel Appliances	9
Unlisted Gas Appliances With Draft Hoods	6
Boilers and Furnaces Equipped With Listed Gas Burners and With Draft Hoods	6
Oil Appliances Listed As Suitable For Use With Type L Venting Systems	(See Note 2)
Listed Gas Appliances With Draft Hoods	(See Note 3)
Column 1, Appendix B	
Type B Gas Vent Piping Connectors	
Listed Gas Appliances With Draft Hoods	(See Note 3)
COMMERCIAL-INDUSTRIAL TYPE APPLIANCES	
Low-Heat Appliances	
Column 2. Appendix A	
Single-Wall Metal Pipe Connectors	
Gas, Oil, and Solid-Fuel Boilers, Furnaces, and Water Heaters	18
Ranges, Restaurant Type	18
Oil Unit Heaters	18
Unlisted Gas Unit Heaters	18
Listed Gas Unit Heaters With Draft Hoods	6
Other Low-Heat Industrial Appliances	18
Medium-Heat Appliances	
Column 3. Appendix A	
Single-Wall Metal Pipe Connectors	
All Gas, Oil, and Solid-Fuel Appliances	36

Table 1 continued

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 venting system piping is used, the clearance may be in accordance with the venting system listing.

NOTE 3: If listed Type B or Type L venting system piping is used, the clearance may be in accordance with the venting system listing.

The clearances from connectors to combustible materials may be reduced if the combustible material is protected in accordance with Table 2.

TABLE 2.

Clearances, Inches, With Specified Forms of Protection.*

Type of Protection. Applied to the combustible material and covering all surfaces within the distance specified as the required clearance with no protection. (See Fig. 1). Thicknesses are minimum.	Where the required Clearance with no protection is: 36 inches	18 inches	9 inches	6 inches
(a) ¼ in. asbestos millboard spaced out 1 in.†	30	12	6	3
(b) 28 gage sheet metal on ¼ in. asbestos millboard	24	12	4	2
(c) 28 gage sheet metal spaced out 1 in.†	18	9	4	2
(d) 28 gage sheet metal on ⅛ in. asbestos millboard spaced out 1 in.†	18	9	4	2
(e) ¼ in. asbestos millboard on 1 in. mineral wool bats reinforced with wire mesh or equivalent	18	6	4	2
(f) 22 gage sheet metal on 1 in. mineral wool bats reinforced with wire or equivalent	12	3	2	2

*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 requirements for accessibility.

†Spacers shall be of noncombustible material.

neered venting system. 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.

804. Size.

The connector, for its entire length, shall be not smaller than the flue collar of the appliance unless otherwise recommended by the appliance, chimney, or vent manufacturer.

805. Clearance.

Clearances from combustible material shall be in accordance with Table 1.

806. 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.

807. Installation.

A. 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. 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.

B. No chimney connector or vent connector shall pass through any floor or ceiling, nor through a fire wall or fire partition.

C. Connectors for listed residential and low heat gas appliances with draft hoods except incinerators may pass through walls or partitions constructed of combustible material if:

1. Made of listed Type B or Type L material and installed with not less than listed clearances to combustible material.

2. Made of single wall metal pipe and guarded by a ventilated metal thimble not less than 4 inches larger in diameter than the vent connector.

D. Connectors of low heat appliances except listed residential and low heat gas appliances with draft hoods (Appendix B, Column 1) shall not pass through walls or partitions constructed of

combustible material unless they are guarded at the point of passage by:

1. Metal ventilated thimbles not less than 12 inches larger in diameter than the connector;

2. Metal or burned fire clay thimbles built in brickwork or other approved fireproofing materials extending not less than 8 inches beyond all sides of the thimble.

E. 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 insulating material.

F. No connector of any medium or high heat appliance classified in Appendix A, shall pass through any wall or partition constructed of combustible material.

G. Connectors shall maintain a pitch or rise of at least ¼ inch to the foot (horizontal length of pipe) from the appliance to the chimney.

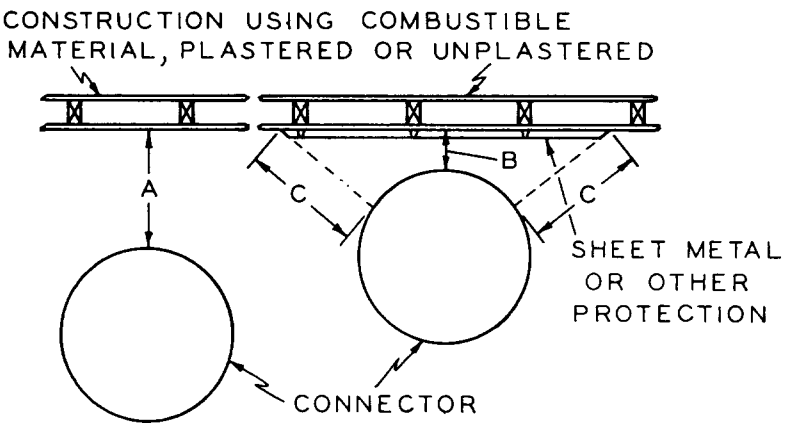

Figure 1.

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

B equals the reduced clearance permitted in accordance with Table 2.

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

H. 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. No device which will obstruct the free flow of flue gases shall be installed in a connector, chimney, or vent. This 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.

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

J. The entire length of a connector shall be readily accessible for inspection, cleaning, and replacement, unless listed materials are used and previous approval has been obtained from the authority having jurisdiction.

K. A vent connector shall not be connected to a chimney flue serving a fireplace unless the fireplace opening is sealed or the chimney flue which vents the fireplace is permanently sealed below the connection.

808. Interconnection.

A. Connectors shall not be connected to a chimney, vent, or venting system served by a power exhauster unless the connection is made on the negative pressure side of the exhauster.

B. Two or more fuel-burning appliances may be connected to a single chimney or vent provided sufficient draft is available for safe combustion in each appliance and removal of all the products of combustion safely to the outdoors. Gas and oil appliances so connected shall be equipped with primary safety controls.

809. Dampers.

A. 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.

B. Automatically operated dampers shall be of approved type designed to maintain a safe damper opening at all times and arranged to prevent the initiation or increase of firing unless the damper is opened to a safe position.

810. Draft Hoods.

For information concerning the use and installation of draft

hoods, refer to the Standard for Gas Appliances and Gas Piping, NFPA No. 54, 1964.

811. Draft Regulators.

A. Gas appliances connected to chimneys, other than those required by NFPA No. 54, to be installed with draft hoods, may be installed with draft regulators if in accordance with the appliance manufacturer's instructions.

B. For information concerning the use and installation of draft regulators with oil-burning appliances, refer to the Standard for Oil-Burning Equipment. NFPA No. 31, 1968.

C. 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.

D. 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.

90. VENTS AND VENTING SYSTEMS.

Appliance vents and venting systems may be one of the following types installed as required by this section.

901. Types and Uses (See Appendix B).

A. Type B gas vents shall be used to vent only listed gas appliances with draft hoods; except they shall not be used for venting:

1. Vented wall furnaces listed for use with Type BW gas vents only.

2. Incinerators.

3. Appliances which may be converted readily to the use of solid or liquid fuels.

4. Combination gas oil burning appliances.

5. Appliances listed for use with chimneys only.

B. 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.

C. Type L venting systems 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.

D. Single wall metal pipe may be used to vent gas appliances in accordance with the following:

1. The pipe shall be of sheet copper not lighter than No. 24 B & S gage or of galvanized iron not lighter than No. 20 galvanized sheet gage number.

2. 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.

3. 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.

902. Location.

Outside vents for gas appliances should not be used in cold climates unless adequately insulated.

903. Termination.

A. Except as provided in 903.E and in 906, all vents and venting systems shall terminate above the roof surface. See Appendix D.

1. Vents and venting systems installed with mechanical exhausters may be terminated not less than 12 inches above the highest point where they pass through the roof surface.

2. Vents and venting systems installed with listed caps shall terminate in accordance with the terms of the cap's listing.

3. Vents and venting systems installed without listed caps, or mechanical exhausters shall extend 2 feet above the highest point where they pass through the roof surface of a building and at least 2 feet higher than any portion of a building within 10 feet.

B. Natural-draft vents for gas appliances shall terminate at an elevation not less than 5 feet above the highest connected appliance outlet except as provided in 906. B.

C. Gas vents serving vented wall furnaces shall terminate at an elevation not less than 12 feet above the bottom of the furnace.

D. Vents and venting systems passing through roofs shall extend through roof flashing.

E. Powered vents and venting systems need not comply with 903A, B and C provided they comply with the following:

1. Approval shall be obtained from the authority having jurisdiction.

2. The outlet of an exhauster-equipped gas-venting system serving listed gas appliances equipped with draft hoods shall be not less than 9 inches from any building opening nor less than 2 feet from an adjacent building; and not less than 7 feet above grade or walkways.

3. The outlet of an exhauster-equipped Type L venting system serving listed oil fuel fired appliances shall be not less than 1 foot from any building opening nor less than 2 feet from an adjacent building; and not less than 7 feet above grade or walkways.

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

904. Marking of Gas Vents.

In those sections of the country where solid and liquid fuels are used extensively, gas-vent systems 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."

905. Installation.

A. Type B and Type BW gas vents and Type L venting systems shall be installed in full compliance with the terms of their listing.

B. Single wall metal pipe shall be installed as follows:

1. Single wall metal pipe shall be installed with minimum clearances from combustible material as follows:

a. Appliances without draft hoods, 18 inches.

b. Unlisted appliances equipped with draft hoods, 9 inches.

c. Boilers and furnaces equipped with listed conversion burners and with draft hoods, 9 inches.

d. Listed appliances with draft hoods except incinerators, 6 inches.

2. Where a single wall metal pipe passes through an exterior wall constructed of combustible material, except as provided in 905.B.2.d, it shall be guarded at the point of passage by a ventilating metal thimble not smaller than the following:

a. For listed gas burning appliances with draft hoods, except incinerators — 4 inches larger in diameter than the vent pipe, unless there is a run of not less than 6 feet of vent pipe in the open, between the draft hood outlet and the thimble, in which case the thimble may be 2 inches larger in diameter than the vent pipe.

b. For unlisted gas burning appliances with draft hoods — 6 inches larger in diameter than the vent pipe.

c. For incinerators and appliances without draft hoods — 12 inches larger in diameter than the vent pipe.

d. In lieu of thimble protection all combustible material in the wall shall be cut away from the vent pipe a sufficient distance to provide the clearance required by 905. B. 1 of this Section from such vent pipe to combustible material, with any material used to close up such opening entirely noncombustible.

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 specified for passage through a combustible exterior wall by 905. B. 2, or with listed gas appliances that can be connected to Type B gas vents by a noncombustible non-ventilating thimble not less than 4 inches larger in diameter than the vent pipe and extending not less than 18 inches above and 6 inches below the roof with the annular space open at the bottom and closed only at the top.

C. Additional requirements for the installation of venting systems serving gas appliances appear in Part V, Venting of Appliances, of Standard for Gas Appliances and Gas Piping, NFPA No. 54.

906. Special Venting Arrangements.

A. **Sealed Combustion System Appliances.** Sealed combustion system appliances shall be listed and shall be installed in accordance with their listings and the manufacturer's instructions.

B. **Ventilating Hoods and Exhaust Systems.**

1. Ventilating hoods and exhaust systems serving commercial cooking appliances may be used to vent gas-burning appliances

installed in commercial applications. The connector from the appliance shall terminate under the hood 18 inches from any grease filter or screen installed in the hood.

NOTE: For information on ventilation of restaurant cooking equipment see the Standard for Ventilation of Restaurant Cooking Equipment, NFPA No. 96.

2. When automatically operated appliances, such as water heaters, are vented through natural-draft ventilating hoods, dampers other than fire dampers shall not be installed in the exhaust system. When the ventilating hood or exhaust system is equipped with power means of exhaust, the appliance control system shall be so interlocked as to permit appliance operation only when the power means of exhaust is in operation.

3. A ventilating hood shall be installed above an open-top broiler in a residence. The hood shall be made with tight joints of sheet copper not lighter than No. 24 B & S gage or galvanized sheet steel not lighter than No. 28 galvanized sheet gage with a clearance of not less than ¼ inch between the hood and the underside of combustible material or metal cabinets. The width and breadth of the hood shall be not less than that of the open-top broiler unit and the hood shall be centered over the unit.

4. The hood required by 906. B. 3 shall be exhausted directly through an outside wall to the outside or connected to a suitable chimney flue used for no other purpose. Connecting ducts shall be made of galvanized sheet metal not lighter than No. 28 gage. A clearance of not less than 6 inches shall be provided between the exhaust duct and unprotected combustible material. This clearance may be reduced if the combustible material is protected in accordance with Table 2.

C. Clothes Dryers.

1. All ducts expelling lint shall be provided with a lint collector, unless the dryer is so equipped.

2. For Type 1 gas-fired clothes dryer exhaust see the Standard for Gas Appliances and Gas Piping, NFPA No. 54.

3. Type 2 clothes dryers shall be exhausted to the outside air.

4. Provision for make-up air shall be provided for Type 2 clothes dryers, with a minimum free area of 1 square inch for each 1000 Btu per hour total input rating of the dryer(s) installed.

5. A clothes dryer exhaust shall not be connected into any vent connector, gas vent or chimney.

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.

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. 22 galvanized sheet gage.

8. Exhaust ducts for Type 2 clothes dryers shall have a clearance of at least 6 inches to combustible material except as provided in 9 below.

9. 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 2.

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

11. Multiple installations of 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.

100. FIREPLACES.

1001. Factory-Built Fireplaces.

Factory-built fireplaces shall be listed and shall be installed in accordance with the conditions of the listing. Hearth extensions shall be provided in accordance with 1003.F.

1002. Factory-Built Fireplace Stoves.

Factory-built fireplace stoves shall be listed and shall be installed in accordance with the conditions of the listing. Hearth extension shall be provided in accordance with 1003.F.

1003. Masonry Fireplaces.

A. Fireplaces shall be constructed of solid masonry or of reinforced concrete with back and sides of the thickness specified in this paragraph, except as provided in 1001. Where a lining of firebrick at least 2 inches thick or other approved lining is provided, the total thickness of back and sides, including the lining, shall be not less than 8 inches. Where no such lining is provided, the thickness of back and sides shall be not less than 12 inches.

B. Steel fireplace units incorporating a firebox liner of not less than ¼-inch thick steel and an air chamber may be installed with masonry to provide a total thickness at the back and sides of not less than 8 inches, not less than 4 inches of which shall be solid masonry.

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

D. Fireplace hearth extensions shall be provided of approved noncombustible material for all fireplaces. Where the fireplace opening is less than 6 sq. ft., the hearth extension shall extend at least 16 in. in front of, and at least 8 in. beyond each side of the fireplace opening. Where the fireplace opening is 6 sq. ft. or larger, the hearth extension shall extend at least 20 in. in front of, and at least 12 in. beyond each side of the fireplace opening. Where a fireplace is elevated above or overhangs a floor, the hearth extension shall also extend over the area under the fireplace.

E. Fireplaces constructed of masonry or reinforced concrete 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.

F. Hearth extensions of approved factory built fireplaces and fireplace stoves shall be not less than ⅜ in. thick of asbestos, concrete, hollow metal, stone, tile or other approved noncombustible material. Such hearth extensions may be placed on the sub or finish flooring whether the flooring is combustible or not. The hearth extension shall be readily distinguishable from the surrounding floor.

G. All wood beams, joists and studs shall be trimmed away from fireplaces. Headers supporting trimmer arches at fireplaces shall be not less than 20 inches from the face of the chimney breast. Trimmers shall be not less than 6 inches from the inside face of the nearest flue lining.

H. No woodwork shall be placed within 4 inches of the back face of a fireplace, but this shall not prevent plastering directly on the masonry or on metal lath and metal furring.

I. No woodwork shall be placed within 6 inches of a fireplace opening. Woodwork above and projecting more than 1½ inches from a fireplace opening shall not be placed less than 12 inches from the top of a fireplace opening.