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Standard for

CHIMNEYS, FLUES AND VENTS

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National Fire Protection Association

International

The National Fire Protection Association was organized in 1896 to promote the science and improve the methods of fire protection. Its membership includes national and regional societies and associations (list on outside back cover) and over eighteen thousand individuals, corporations, and organizations. Anyone interested may become a member; the annual dues are $15.00. Full membership information is available on request.

This is one of a large number of publications on fire safety issued by the Association. All NFPA standards and recommended practices, including this text, are prepared by the technical committees of the NFPA and adopted at an Annual Meeting of the Association. They are intended to prescribe reasonable measures for minimizing losses of life and property by fire.

This text and most other NFPA standards and recommended practices are published in the **National Fire Codes,** a compilation of NFPA's official technical material, issued in seven clothbound volumes. Full information on the availability of these Codes and other NFPA publications can be secured from the Association.

Official NFPA Definitions

SHALL is intended to indicate requirements.

SHOULD is intended to indicate recommendations, or that which is advised but not required.

APPROVED refers to approval by the authority having jurisdiction.

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Chimneys, Flues and Vents

NFPA No. 211 — 1961

This revised edition of NFPA Standard No. 211, adopted by the Association on May 18, 1961, supersedes the edition of 1957. The only revision made in 1961 was the addition of Paragraph 72 on Type L venting systems.

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 then 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 recom-

mendation 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.

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Standard for
CHIMNEYS, FLUES AND VENTS.

NFPA No. 211 — 1961

CHIMNEYS — GENERAL REQUIREMENTS.

1. Height.

(a) 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 the building within 10 feet.

(b) Chimneys for medium heat appliances shall extend not less than 10 feet higher than any portion of any building within 25 feet.

(c) Chimneys for high heat appliances shall extend not less than 20 feet higher than any portion of any building within 50 feet.

(d) Chimneys of flue-fed incinerators shall be of the height specified in section 52.(k).

(e) Chimneys of commercial and industrial type incinerators shall be of the height specified in section 53.(g).

2. Clearance from combustible material.

(a) All wood beams, joists and studs shall be trimmed away from chimneys and fireplaces. 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. 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.

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

(c) No woodwork shall be placed within 4 inches of the back face of a fireplace; nor shall combustible lathing, furring or plaster grounds 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.

(d) The clearance between woodwork and a factory-built fireplace approved as a result of tests by a nationally recognized testing laboratory* need not comply with paragraph (c) of this section provided the factory-built fireplace is installed in accordance with the conditions of approval.

(e) 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.

(f) All spaces between chimneys and wood joists, beams or headers shall be firestopped by placing noncombustible material to a depth of one inch at the bottom of such spaces.

(g) All spaces back of combustible mantels shall be filled with noncombustible material.

3. Smoke test.

Chimneys shall be proved tight by a smoke test after erection and before being put into use.

MASONRY CHIMNEYS — GENERAL REQUIREMENTS.

11. Support.

Masonry chimneys shall be supported on properly designed foundations of masonry or reinforced concrete or other noncombustible material having a fire resistance rating of not less than 3 hours.

12. Corbeling.

No chimney 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.

13. Change in size or shape at roof not permitted.

No change in the size or shape of a chimney, where the chimney passes through the roof, shall be made within a distance of 6 inches above or below the roof joists or rafters.

*Underwriters' Laboratories, Inc., is such a laboratory.

MASONRY CHIMNEYS FOR LOW HEAT APPLIANCES.

(The preceding General Requirements also apply.)

21. Appliances classed as low heat appliances.

Low heat appliances shall normally include appliances such as ranges, heating stoves, warm air heating furnaces, fireplaces, water heaters and hot water heating boilers, steam boilers operating at not over 50 pounds per square inch gauge pressure, steam boilers of not over 10 boiler horsepower regardless of operating pressure, domestic type incinerators, bakery ovens, candy furnaces, coffee roasters, core ovens, lead melting furnaces, rendering furnaces, stereotype furnaces, drying and curing appliances, and other furnaces classified as low heat appliances in accordance with nationally recognized good practice. Appliances otherwise classed as medium heat appliances may be considered as low heat appliances if not larger than 100 cubic feet in size.

22. Construction.

Masonry chimneys for low heat appliances shall be constructed of solid masonry units or of reinforced concrete. Chimneys in dwellings, chimneys for domestic type low heat appliances and chimneys for building heating equipment for heating a total volume of occupied space not to exceed 25,000 cubic feet shall have walls not less than 4 inches thick. In other buildings and for other low heat appliances the thickness of chimney walls shall be not less than 8 inches, except that rubble stone masonry shall be not less than 12 inches thick.

23. Liners.

(a) Masonry chimneys for low heat appliances shall be lined with approved fire clay flue liners not less than $\frac{5}{8}$ of an inch thick, or with other approved liner of material that will resist without softening or cracking a temperature of 1800° Fahrenheit.

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

(c) In masonry chimneys with walls less than 8 inches thick 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.

(d) Flue liners shall start from a point not less than 8 inches below the intake, or, in the case of fireplaces, from the throat of the fireplace. They shall extend, as nearly vertically as possible, for the entire height of the chimney.

24. Two or more flues in one chimney.

(a) Where two flues adjoin each other in the same chimney with only flue lining separation between them, the joints of the adjacent flue linings shall be staggered at least 7 inches.

(b) Where more than two flues are located in the same chimney, masonry wythes 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.

25. Cleanout openings.

Where cleanout openings are provided in chimneys they shall be equipped with metal doors and frames arranged to remain tightly closed when not in use.

MASONRY CHIMNEYS FOR MEDIUM HEAT APPLIANCES.

(The preceding General Requirements also apply.)

31. Appliances classed as medium heat appliances.

Medium heat appliances shall normally include appliances such as annealing furnaces (glass or metal), charcoal furnaces, galvanizing furnaces, gas producers and steam boilers of over 10 boiler horsepower operating at over 50 pounds per square inch gauge pressure when such appliances are larger than 100 cubic feet in size, and other furnaces classified as medium heat appliances in accordance with nationally recognized good practice. Appliances otherwise classed as high heat appliances may be considered as medium heat appliances if not larger than 100 cubic feet in size.

32. 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 flue pipe entrance and extending for a distance of at least 25 feet above the flue pipe entrance.

MASONRY CHIMNEYS FOR HIGH HEAT APPLIANCES.

(The preceding General Requirements also apply.)

41. Appliances classed as high heat appliances.

High heat appliances shall normally* include appliances such as billet and bloom furnaces, blast furnaces, brass melters, cupolas, glass furnaces, open hearth furnaces, and ceramic kilns and vitreous enameling ovens (ferrous metals) when such appliances are larger than 100 cubic feet in size, and other furnaces classified as high heat appliances in accordance with nationally recognized good practice.

42. 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.

MASONRY CHIMNEYS FOR INCINERATORS.

51. Domestic type incinerators.

Masonry chimneys for domestic type incinerators shall be constructed in accordance with the requirements for Masonry Chimneys for Low Heat Appliances.

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

(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:

*Continuous operating equipment of counter current type may not require the type of flue indicated by general types of appliances.

1. 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.

2. 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.

3. 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 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 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 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 brick work with a standard fire clay flue liner 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**) Clearance between chimneys and combustible material shall be not less than specified in section 2.

(**i**) 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.

(**j**) Chimneys of flue-fed incinerators shall be supported on foundations of masonry or reinforced concrete or other noncombustible material having a fire resistance rating of not less than

3 hours. They shall be so constructed as not to place excessive stress upon the roof of the combustion chamber.

(k) 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.

(l) All flues shall terminate in a substantially constructed spark arrester with openings not greater than ½ 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 chimney and with clearances to combustible construction as specified by section 2. Expansion chambers shall be provided with substantial noncombustible supports. Every expansion chamber shall have a vent of cross-sectional area at least equal to that of the flue.

53. Commercial and industrial type incinerators.

(a) 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 or a metal chimney, 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, or to a metal chimney, 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) Clearances between chimneys and combustible material shall be not less than specified in section 2.

(f) Chimneys of commercial and industrial type incinerators shall be supported on foundations of masonry or reinforced con-

crete or other noncombustible material having a fire resistance rating of not less than 3 hours. They shall be so constructed as not to place excessive stress upon the roof of the combustion chamber.

(**g**) Chimneys of 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 higher than any portion of a building within 20 feet.

(**h**) Incinerators may be connected to industrial or similar chimneys serving heat-producing appliances provided the cross-sectional area of such chimney is adequate for the combined services and its construction is suitable for the chimney flue gas temperature.

(**i**) 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.

FIREPLACES.

61. 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 by the following paragraph (b). Where a lining of fire brick 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**) Factory-built fireplaces that are approved as a result of tests and listing by a nationally recognized testing laboratory* need not conform to the above paragraph (a) provided they are installed in accordance with the conditions of the approval.

(**c**) 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

*Underwriters' Laboratories, Inc., is such a laboratory.

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.

(**d**) 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.

(**e**) Hearth extensions of approved factory-built fireplaces shall be not less than $\frac{3}{8}$ 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.

(**f**) Clearances between fireplaces of masonry or reinforced concrete and combustible material shall be not less than specified in section 2. Clearances between approved factory-built fireplaces and combustible material shall be not less than specified in the approval.

(**g**) Spaces between fireplaces and combustible material shall be firestopped as specified in section 2.

LABORATORY TESTED FACTORY-BUILT CHIMNEYS AND VENTING SYSTEMS

71. Factory-built chimneys that are approved as a result of tests and listing by a nationally recognized testing laboratory* shall be installed in accordance with the conditions of the approval.

72. Listed Type L low temperature venting systems may be used with fuel burning appliances listed as suitable for use with such systems.

METAL CHIMNEYS (SMOKESTACKS).

81. Construction.

(**a**) Metal chimneys shall be of adequate thickness, properly riveted or welded, and securely supported. Metal shall be galvanized or painted unless suitably corrosion resistant.

*Underwriters' Laboratories, Inc., is such a laboratory.

(b) Metal chimneys used for high heat appliances as defined in section 41 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 smoke pipe entrance.

82. Clearances for exterior metal chimneys.

Metal chimneys erected on the exterior of a building 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 using any nearby exit way, in accordance with the following:

(a) Exterior metal chimneys used only for low heat appliances as defined in section 21 burning gas shall have a clearance of not less than 6 inches from a wall of wood frame construction and from any combustible material.

(b) Exterior chimneys used for low heat appliances as defined in section 21 burning any fuel other than gas shall have a clearance of not less than 12 inches from a wall of wood frame construction and from any combustible material.

(c) Exterior chimneys used for medium heat appliances as defined in section 31 shall have a clearance of not less than 24 inches from a wall of wood frame construction and from any combustible material.

(d) 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.

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

83. Enclosure of interior metal chimneys.

(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.

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

84. Passage through roof.

(a) Where a metal chimney serving only low heat appliances as defined in section 21 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.

(b) Where a metal chimney serving a medium heat appliance as defined in section 31 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.

85. Location in ventilating ducts restricted.

Metal chimneys shall not be carried up inside of ventilating ducts unless such ducts are constructed as required by this standard for chimneys and are used solely for exhaust of air from the room or space in which the appliance served by the chimney is located.

GAS VENTS.

91. Types of vents which may be used.

Gas appliance vents that do not conform to the requirements of this standard for chimneys shall be of one of the following types installed as required by this section.

(a) Type B gas vents — Vent piping of noncombustible, corrosion resistant material approved as a result of tests and listing by a nationally recognized testing laboratory* for venting of gas appliances.

(b) Type BW gas vents — Vent piping of noncombustible, corrosion resistant material approved as a result of tests and listing by a nationally recognized testing laboratory* for venting recessed gas heaters.

*Underwriters' Laboratories, Inc., is such a laboratory.

(c) Type C gas vents — Vent piping of sheet copper of not less than No. 24 gauge or of galvanized iron of not less than No. 20 gauge or of other approved noncombustible corrosion resistant material.

(d) Vent piping may extend through any existing chimney whether the chimney is lined or not.

92. Height.

Gas vents shall extend at least 2 feet above the highest point where they pass through the roof of a building and at least 2 feet higher than any portion of the building within 10 feet, except that gas vents need not comply with this provision when equipped with an approved device which assures proper and effective venting as installed.

93. Use limits.

(a) Type B gas vents shall be used only with approved gas appliances which produce flue gas temperatures not in excess of 550° F. They shall not be used for venting:

(1) Incinerators;

(2) Appliances which may be converted readily to the use of solid or liquid fuel;

(3) Boilers and furnaces, other than attic furnaces, except where specific approval is obtained from the authority having jurisdiction for use of type B gas vents.

(b) Type BW gas vents shall be used only with approved recessed gas heaters.

(c) Type C gas vents 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. Such vents shall not pass through any attic or concealed space nor through any floor; but may be used to vent attic furnaces.

94. Marking of gas vents.

Gas vents which are not suitable for use with solid or liquid fuel burning appliances shall be plainly and permanently labeled:

"This flue is for appliances which burn gas only," unless permission to omit this marking is granted by the authority having jurisdiction.

95. Installation of type B and type BW gas vents.

Type B and type BW gas vents shall be installed in full compliance with the terms of their approval.