

Chapter 9: New York City Fuel Gas Code

Editor's note: this chapter has been amended by [L.L. 2021/126, 11/7/2021, eff. 11/7/2022](#). For related unconsolidated provisions, see Appendix A at L.L. 2021/126.

Article 901: Enactment and Update of the New York City Fuel Gas Code

§ 28-901.1 Update.

No later than the third year after the effective date of this section 28-901.1 and every third year thereafter, the commissioner shall submit to the city council proposed amendments that he or she determines should be made to this code to bring it up to date with the latest edition of the International Fuel Gas Code or otherwise modify the provisions thereof. In addition, prior to the submission of such proposal to the city council, such proposal shall be submitted to an advisory committee established by the commissioner pursuant to this title for review and comment.

§ 28-901.2 Enactment of the New York city fuel gas code.

The New York city fuel gas code based on the 2003 edition of the International Fuel Gas Code published by the International Code Council, with changes that reflect the unique character of the city and amendments that bring it up to date with the 2009 edition of such International Fuel Gas Code, is hereby adopted to read as follows:

Chapter 1: Administration

Section FGC 101: General

101.1 Title.

This code shall be known and may be cited as the "New York City Fuel Gas Code," "NYCFG" or "FGC". All section numbers in this code shall be deemed to be preceded by the designation "FGC".

101.2 Scope.

This code shall apply to the installation of fuel-gas piping systems, fuel-gas appliances and related accessories in accordance with Sections 101.2.2 through 101.2.5.

101.2.1 [Reserved.]

101.2.2 Piping systems.

These regulations cover piping systems for natural gas. High pressure natural gas installations at pressures of 15 psig (103 kPa gauge) or above shall also comply with the requirements of Appendix G of this code. Coverage shall extend to the outlet of the appliance shutoff valves. Piping system requirements shall include design, materials, components, fabrication, assembly, installation, testing, inspection, operation and maintenance.

101.2.3 Gas utilization appliances.

Requirements for gas appliances and related accessories shall include installation, combustion and ventilation air and venting and connections to piping systems.

101.2.4 Systems and equipment outside the scope.

This code shall not apply to the following:

1. Portable LP-gas appliances and equipment of all types that are not connected to a fixed fuel piping system.
2. Oxygen-fuel gas cutting and welding systems.
3. Industrial gas applications using gases such as acetylene and acetylenic compounds, hydrogen, ammonia, carbon monoxide, oxygen and nitrogen.
4. Petroleum refineries, pipeline compressor or pumping stations, loading terminals, compounding plants, refinery tank farms and natural gas processing plants.
5. Integrated chemical plants or portions of such plants where flammable or combustible liquids or gases are produced by, or used in, chemical reactions.
6. LP-gas installations at utility gas plants.
7. Liquefied natural gas (LNG) installations.
8. Fuel gas piping in public utility power plants and atomic energy plants.
9. Components within proprietary items of equipment, apparatus or instruments such as gas-generating sets, compressors and calorimeters.
10. LP-gas equipment for vaporization, gas mixing and gas manufacturing.
11. Temporary LP-gas piping for buildings under construction or renovation that is not to become part of the permanent piping system.
12. Installation of LP-gas systems for railroad switch heating.
13. Installation of hydrogen gas, LP-gas and compressed natural gas (CNG) systems on vehicles.
14. Except as provided in Section 401.1.1 and Appendices E and G, gas piping, meters, gas pressure regulators and other appurtenances used by the serving gas supplier in the distribution of gas, other than undiluted LP-gas.
15. Building design and construction, except as specified herein.
16. Piping systems for mixtures of gas and air within the flammable range with an operating pressure greater than 10 psig (69 kPa gauge).
17. Portable fuel cell appliances that are neither connected to a fixed piping system nor interconnected to a power grid.

101.2.5 Other fuels.

The requirements for the design, installation, maintenance, alteration and inspection of mechanical systems operating with fuels other than fuel gas shall be regulated by the *New York City Mechanical Code*.

101.3 [Reserved.]

101.4 Intent.

The purpose of this code is to provide minimum standards to safeguard life or limb, health, property, public welfare and the environment by regulating and controlling the design, construction, installation, quality of materials, location, operation and maintenance or use of fuel gas systems.

101.5 Severability.

If a section, subsection, sentence, clause or phrase of this code is, for any reason, held to be unconstitutional, such decision shall not affect the validity of the remaining portions of this code.

Section FGC 102: Applicability

102.1 General.

Where there is a conflict between a general requirement and a specific requirement, the specific requirement shall govern. Where, in a specific case, different sections of this code specify different materials, methods of construction or other requirements, the most restrictive shall govern.

102.2 Existing installations.

Except as otherwise provided for in this chapter or elsewhere in this code, a provision in this code shall not require the removal, alteration or abandonment of, nor prevent the continued utilization and maintenance of, existing installations lawfully in existence on the effective date of this code.

102.2.1 Existing buildings.

Additions, alterations, renovations or repairs related to building or structural issues shall be governed by Chapter 1 of Title 28 of the *Administrative Code*, the *New York City Building Code* and the *1968 Building Code*, as applicable.

102.3 Maintenance.

Installations, both existing and new, and parts thereof shall be maintained in proper operating condition in accordance with the original design and in a safe condition. Devices or safeguards that are required by this code shall be maintained in compliance with the applicable provisions under which they were installed.

102.3.1 Owner responsibility.

The owner or the owner's designated agent shall be responsible for maintenance of installations. To determine compliance with this provision, the commissioner shall have the authority to require an existing installation to be inspected.

102.4 Additions, alterations or repairs.

Additions, alterations, renovations or repairs to installations shall conform to that required for new installations without requiring the existing installation to comply with all of the requirements of this code. Additions, alterations or repairs shall not cause an existing installation to become unsafe, hazardous or overloaded.

102.4.1 Minor additions, alterations, renovations and repairs.

Minor additions, alterations, renovations and repairs to existing installations shall meet the provisions for new construction, unless such work is done in the same manner and arrangement as was in the existing system, is not hazardous and is approved.

102.4.2 Special provisions for prior code buildings.

In addition to the requirements of Sections 102.4 and 102.4.1, the provisions of Sections 102.4.1.1 through 102.4.1.4 shall apply to prior code buildings.

102.4.2.1 Fuel gas piping in fire-resistance-rated assemblies.

For prior code buildings, the replacement of existing fuel gas piping in the same locations shall not be subject to Section 404.1, item 5, when approved by the commissioner.

102.4.2.2 Guards and access to roofs and elevated structures.

The provisions of Section 306.6 relating to guards and Section 306.5 relating to permanent means of access shall not apply where the equipment or appliances replace existing equipment or appliances in the same location.

102.4.2.3 Seismic supports.

For prior code buildings, the determination as to whether seismic requirements apply to an alteration shall be made in accordance with the *1968 Building Code* and interpretations by the department relating to such determinations. Any applicable seismic loads and requirements shall be permitted to be determined in accordance with Chapter 16 of the *New York City Building Code* or the *1968 Building Code* and Reference Standard RS 9-6 of such code.

102.4.2.4 Wind resistance.

For prior code buildings, equipment, appliances and supports that are exposed to wind shall be designed and installed to resist the wind pressures determined in accordance with Chapter 16 of the *New York City Building Code*.

102.5 Change in occupancy.

Refer to Chapter 1 of Title 28 of the *Administrative Code*.

102.6 [Reserved.]

102.7 [Reserved.]

102.8 Referenced standards.

The standards referenced in this code shall be those that are listed in Chapter 8 and in the rules of the department and such standards shall be considered part of the requirements of this code to the prescribed extent of each such reference. Where differences occur between provisions of this code and the referenced standards, the provisions of this code shall apply. Refer to Article 103 of Chapter 1 of Title 28 of the *Administrative Code* for additional provisions relating to referenced standards.

102.8.1 Editions of referenced standards.

References to standards in this code shall be to the editions of those standards provided for in Chapter 8 of this code, or as otherwise provided by rule.

102.9 Requirements not covered by code.

Requirements necessary for the strength, stability or proper operation of an existing or proposed installation, or for the public safety, health and general welfare, not specifically covered by this code, shall be determined by the commissioner.

102.10 Application of references.

Reference to chapter section numbers, or to provisions not specifically identified by number, shall be construed to refer to such chapter, section or provision of this code.

Section FGC 103: Department of Buildings

103.1 Enforcement agency.

Refer to the New York City Charter and Chapter 1 of Title 28 of the *Administrative Code*.

103.2 [Reserved.]

103.3 [Reserved.]

103.4 [Reserved.]

Section FGC 104: Duties and Powers of the Commissioner Of Buildings

104.1 General.

The commissioner shall have the authority to render interpretations of this code and to adopt rules, policies, and procedures in order to clarify and implement its provisions. Such interpretations, policies, procedures, and rules shall be in compliance with the intent and purpose of this code. See the New York City Charter and Chapter 1 of Title 28 of the *Administrative Code* for additional provisions relating to the authority of the Commissioner of Buildings.

Section FGC 105: Permits

105.1 General.

Permits shall comply with this section, with Article 105 of Chapter 1 of Title 28 of the *Administrative Code*, and with requirements found elsewhere in this code.

105.2 Required.

Any owner or authorized agent who intends to construct, add to, alter, repair, move, demolish, or change the occupancy of a building or structure, or to erect, install, add to, alter, repair, remove, convert or replace any gas, mechanical or plumbing system, the installation of which is regulated by this code, or to cause any such work to be done, shall first make application for construction document approval in accordance with Chapter 1 of Title 28 of the *Administrative Code* and this chapter and obtain the required permit.

105.3 Work exempt from permit.

Exemptions from permit requirements of this code as authorized in Chapter 1 of Title 28 of the *Administrative Code* and the rules of the department shall not be deemed to grant authorization for any work to be done in any manner in violation of the provisions of this code or any other laws or rules.

105.4 Validity of permit.

The issuance or granting of a permit shall not be construed to be a permit for, or an approval of, any violation of any of the provisions of this code or of any other law. Permits presuming to give authority to violate or cancel the provisions of this code or other law shall not be valid. The issuance of a permit based on construction documents and other

data shall not prevent the commissioner from requiring the correction of errors in the construction documents and other data. The commissioner is also authorized to prevent occupancy or use of a structure where in violation of this code or of any other law.

105.5 Other permits.

In addition to any permits required by the provisions of this code, permits for sidewalk and street openings shall be obtained from the Department of Transportation.

Section FGC 106: Construction Documents

106.1 General.

Construction documents shall comply with Article 104 of Chapter 1 of Title 28 of the *Administrative Code* and other applicable provisions of this code and its referenced standards. Such construction documents shall be coordinated with architectural, structural and means of egress plans.

106.2 Required documents.

The applicant shall submit all of the documents specified in Sections 106.3 through 106.8 as appropriate to the nature and extent of the work proposed. Construction documents shall indicate the heating, ventilation, refrigeration, and other mechanical work to be performed, so drawn as to conform to the architectural and structural aspects of the building and to show in detail compliance with this code.

106.2.1 Composite plans.

Composite plans showing compliance of architectural, structural, and mechanical parts of a building may be submitted provided that a clear understanding of each part is not impaired.

106.3 Lot diagram.

The lot diagram shall be provided where applicable to the work proposed, including but not limited to the installation of exterior or rooftop equipment.

106.4 Building classification statement.

Where applicable to the proposed work, the statement shall identify:

1. The occupancy group or groups that apply to parts of the building in accordance with Section 302 of the *New York City Building Code*;
2. The occupancy group of the main use or dominant occupancy of the building;
3. The construction class of the building in accordance with Section 602 of the *New York City Building Code*;
4. The structural occupancy/risk category in accordance with Table 1604.5 of the *New York City Building Code*;
5. The height of the building as defined in Section 502.1 of the *New York City Building Code*;
6. The applicable measurements to the highest and lowest level of fire department access; and
7. Whether the building is inside or outside of the fire districts.

106.5 Fuel-gas-burning appliance and fuel-gas piping plans.

Construction documents for fuel-gas-burning appliances and fuel-gas piping shall contain plans that include the following data and information:

1. Riser diagrams showing the story heights, the gas risers, and related appliances.
2. Diagrammatic floor plans showing the size, location, material for all gas distribution piping and related appliances.
3. Floor plans or partial floor plans showing the location, layout, size, and listing information for all fuel-gas burning appliances, gas vents, and chimneys, with the riser numbers coordinated with other plans and diagrams. The floor plans shall indicate locations of meters, shutoff valves, including the outside gas cut-off required by Appendix E, Section E6. The plans shall also indicate the method or means of providing air to the appliance space, including duct and opening sizes.
4. Plans indicating the location and type of any relevant smoke and heat detectors, alarm and fire-extinguishing systems.
5. Seismic protection and restraint details for piping and appliances as required by Chapter 16 of the *New York City Building Code*.
6. Details indicating the location, size and materials for all breechings; the thickness and type of insulation materials; and the clearances from combustible walls, partitions and ceiling; and the fire-resistive ratings of rooms and spaces containing the appliances.
7. Details describing the type, material, listing information, height, and termination distances to adjacent properties and structures for chimneys and gas vents.
8. Details showing structural supports for fuel-gas-burning equipment where required.
9. In areas of special flood hazards, construction documents shall comply with Appendix G of the *New York City Building Code*.

106.6 Heating systems.

Construction documents for heating systems shall include the temperature to be maintained in every room and the output capacity in BTU per hour (W) of the central heating source.

106.7 Boilers.

Construction documents for boiler installations shall indicate the output capacity in BTU per hour (W), the operating weight of each boiler, the pressure setting of the relief valves, and such other data and information as required by this code.

106.8 Energy efficiency.

Construction documents shall include compliance documentation as required by the *New York City Energy Conservation Code*.

Section FGC 107: Inspections and Testing

107.1 General.

Except as otherwise specified, inspections required by this code or by the department during the progress of work may be performed on behalf of the owner by approved agencies or, if applicable, by special inspectors. However, in the interest of public safety, the commissioner may direct that any of such inspections be performed by the department. All inspections shall be performed at the sole cost and expense of the owner. Refer to Article 116 of Chapter 1 of Title 28 of the *Administrative Code* for additional provisions relating to inspections. In addition to any inspections otherwise required by this code or applicable rules, the following inspections shall be required:

107.2 Required inspections and testing.

In addition to any inspections otherwise required by this code or applicable rules, the following inspections shall be required:

1. Progress inspections:

1.1. Underground inspection shall be made after trenches or ditches are excavated and bedded, piping is installed and before backfill is put in place. When excavated soil contains rocks, broken concrete, frozen chunks and other rubble that would damage or break the piping or cause corrosive action, clean backfill shall be on the job site.

1.2. Rough-in inspection shall be made after the roof, framing, fireblocking and bracing are in place and components to be concealed are complete, and prior to the installation of wall or ceiling membranes.

1.3. Inspections required by the *New York City Energy Conservation Code* shall be made in accordance with rules of the department, as applicable.

2. Special inspections. Special inspections shall be performed in accordance with this code and Chapter 17 of the *New York City Building Code*.

3. Final inspection. Refer to Article 116 of Chapter 1 of Title 28 of the *Administrative Code*.

4. **Issuance of certificate of compliance.** Upon satisfactory inspection of service equipment and the satisfaction of all the requirements for sign-off, the department shall issue a certificate of compliance as applicable for the following service equipment:

- 4.1. Fuel-gas-burning equipment,
- 4.2. Heating systems, and
- 4.3. Boilers.

107.2.1 Approved inspection agencies.

Refer to Articles 114 and 115 of Chapter 1 of Title 28 of the *Administrative Code*.

107.2.2 Inspection of prefabricated construction assemblies.

Prior to the approval of a prefabricated construction assembly having concealed work and the issuance of a permit, the department shall require the submittal of an evaluation report by an approved agency on each prefabricated construction assembly, indicating the complete details of the installation, including a description of the system and its components, the basis upon which the system is being evaluated, test results and similar information and other data as necessary for the commissioner to determine conformance to this code.

107.2.2.1 Test and inspection records.

Required test and inspection records shall be available to the commissioner at all times during the fabrication of the installation and the erection of the building; or such records as the commissioner designates shall be filed.

107.2.3 Exposure of work.

It shall be the duty of the permit holder to cause the work to remain accessible and exposed for inspection purposes. Neither the commissioner nor the city shall be liable for expense entailed in the removal or replacement of any material required to allow inspection.

107.3 Testing.

Installations shall be tested as required in this code and in accordance with Sections 107.3.1 through 107.3.3. Tests shall be made by the permit holder and witnessed by the department or an approved agency.

107.3.1 New, altered, extended or repaired installations.

New installations and parts of existing installations that have been altered, extended, renovated or repaired, shall be tested as prescribed herein to disclose leaks and defects.

107.3.2 Apparatus, instruments, material and labor for tests.

Apparatus, instruments, material and labor required for testing an installation or part thereof shall be furnished by the permit holder.

107.3.3 Reinspection and testing.

Where any work or installation does not pass an initial test or inspection, the necessary corrections shall be made so as to achieve compliance with this code. The work or installation shall then be resubmitted to the department for inspection and testing.

107.4 Sign-off of completed work.

Refer to Article 116 of Chapter 1 of Title 28 of the *Administrative Code*.

107.5 Temporary connection.

The commissioner shall have the authority to allow the temporary connection of an installation to the sources of energy for the purpose of testing the installation or for use under a temporary certificate of occupancy.

Section FGC 108: Violations

108.1 General.

Refer to Chapters 2 and 3 of Title 28 of the *Administrative Code*.

108.2 Authority to disconnect service utilities.

The commissioner shall have the authority to require disconnection of utility service to the building, structure or system regulated by the technical codes in case of emergency where necessary to eliminate an immediate hazard to life or property. The commissioner shall notify the serving utility, and wherever possible, the owner and occupant of the building, structure or service system of the decision to disconnect prior to taking such action. If not notified prior to disconnection, the owner or occupant of the building, structure or service system shall be notified in writing, as soon as practicable thereafter.

108.3 Connection after order to disconnect.

A person shall not make energy source connections to installations regulated by this code that have been disconnected or ordered to be disconnected by the commissioner, or the use of which has been ordered to be discontinued by the commissioner until the commissioner authorizes the reconnection and use of such installations. When an installation is maintained in violation of this code, and in violation of a notice issued pursuant to the provisions of this section, the commissioner shall institute appropriate action to prevent, restrain, correct or abate the violation.

Chapter 2: Definitions

Section FGC 201: General

201.1 Scope.

Unless otherwise expressly stated, the following words and terms shall, for the purposes of this code and standard, have the meanings indicated in this chapter.

201.2 Interchangeability.

Words used in the present tense include the future; words in the masculine gender include the feminine and neuter; the singular number includes the plural and the plural, the singular.

201.3 Terms defined in other codes.

Where terms are not defined in this code and are defined in the *New York City Electrical Code*, *New York City Building Code*, *New York City Fire Code*, *New York City Mechanical Code* or *New York City Plumbing Code*, such terms shall have meanings ascribed to them as in those codes.

201.4 Terms not defined.

Where terms are not defined through the methods authorized by this section, such terms shall have ordinarily accepted meanings such as the context implies.

Section FGC 202: General Definitions

1968 OR PRIOR CODE BUILDINGS OR STRUCTURES (PRIOR CODE BUILDINGS). See Section 28-101.5 of the *Administrative Code*.

ACCESS (TO). That which enables a device, appliance or equipment to be reached by ready access or by a means that first requires the removal or movement of a panel, door or similar obstruction (see also "Ready access").

ADMINISTRATIVE CODE. *The Administrative Code of the City of New York* .

AIR CONDITIONER, GAS-FIRED. A gas-burning, automatically operated appliance for supplying cooled and/or dehumidified air or chilled liquid.

AIR CONDITIONING. The treatment of air so as to control simultaneously the temperature, humidity, cleanness and distribution of the air to meet the requirements of a conditioned space.

AIR, EXHAUST. Air being removed from any space or piece of equipment or appliance and conveyed directly to the atmosphere by means of openings or ducts.

AIR-HANDLING UNIT. A blower or fan used for the purpose of distributing supply air to a room, space or area.

AIR, MAKEUP. Air that is provided to replace air being exhausted.

ALTERATION. Any construction, addition, change of use or occupancy, or renovation to a building or structure in existence. See Section 28-101.5 of the *Administrative Code*.

ANODELESS RISER. A transition assembly in which plastic piping is installed and terminated above ground outside of a building.

APPLIANCE. Any apparatus or device that utilizes gas as a fuel or raw material to produce light, heat, power, refrigeration or air conditioning.

APPLIANCE, AUTOMATICALLY CONTROLLED. Appliances equipped with an automatic burner ignition and safety shutoff device and other automatic devices which accomplish complete turn-on and shutoff of the gas to the main burner or burners, and graduate the gas supply to the burner or burners, but do not affect complete shutoff of the gas.

APPLIANCE, FAN-ASSISTED COMBUSTION. An appliance equipped with an integral mechanical means to either draw or force products of combustion through the combustion chamber or heat exchanger.

APPLIANCE TYPE.

Low-heat appliance (residential appliance). Any appliance in which the products of combustion at the point of entrance to the flue under normal operating conditions have a temperature of 1,000°F (538°C) or less.

Medium-heat appliance. Any appliance in which the products of combustion at the point of entrance to the flue under normal operating conditions have a temperature of more than 1,000°F (538°C), but not greater than 2,000°F (1093°C).

APPLIANCE, UNVENTED. An appliance designed or installed in such a manner that the products of combustion are not conveyed by a vent or chimney directly to the outdoor atmosphere.

APPLIANCE, VENTED. An appliance designed and installed in such a manner that all of the products of combustion are conveyed directly from the appliance to the outdoor atmosphere through an approved chimney or vent system.

APPROVED. In reference to construction documents, the determination by the department after full examination that submitted construction documents comply with this code and other applicable laws and rules. In reference to materials, the determination by the commissioner that material is acceptable for its intended use. See Section 28-101.5 of the *Administrative Code*.

APPROVED AGENCY. An established and recognized agency, or other qualified person, engaged in conducting tests or furnishing inspection services, when approved pursuant to department rules as qualified to perform or witness identified testing or inspection services. See Chapter 1 of Title 28 of the *Administrative Code*.

APPROVED INSPECTION AGENCY. An approved agency that is approved by the department as qualified to perform one or more of the inspections required by this code. See Chapter 1 of Title 28 of the *Administrative Code*.

APPROVED TESTING AGENCY. An approved agency that is approved by the department as qualified to test and evaluate the performance of one or more of the materials regulated in their use by this code. Such term shall include, when approved pursuant to department rules, a third-party testing or certification agency, evaluation agency, testing laboratory, testing service, licensed concrete testing laboratory or other entity concerned with product evaluation. See Chapter 1 of Title 28 of the *Administrative Code*.

ARCHITECT. A person licensed and registered to practice the profession of architecture under the *Education Law of the State of New York*.

ATMOSPHERIC PRESSURE. The pressure of the weight of air and water vapor on the surface of the earth, approximately 14.7 pounds per square inch (psi) (101 kPa absolute) at sea level.

AUTOMATIC IGNITION. Ignition of gas at the burner(s) when the gas controlling device is turned on, including reignition if the flames on the burner(s) have been extinguished by means other than by the closing of the gas controlling device.

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

BAROMETRIC DRAFT REGULATOR. A balanced damper device attached to a chimney, vent connector, breeching or flue gas manifold to protect combustion appliances by controlling chimney draft. A double-acting barometric draft regulator is one in which the balancing damper is free to move in either direction to protect combustion appliances from both excessive draft and backdraft.

BOILER, HIGH-PRESSURE. An appliance for supplying steam or hot water that, for a steam boiler, operates at a pressure of more than 15 psig (103 kPa gauge), and for a hot water boiler, operates at a pressure exceeding 160 psig (1034 kPa gauge) or at a temperature exceeding 250°F (121°C).

BOILER, LOW-PRESSURE. A self-contained appliance for supplying steam or hot water as follows:

Hot water heating boiler. A boiler in which no steam is generated, from which hot water is circulated for heating purposes and then returned to the boiler, and that operates at water pressures not exceeding 160 pounds per square inch gauge (psig) (1103 kPa gauge) and at water temperatures not exceeding 250°F (121°C) at or near the boiler outlet.

Hot water supply boiler. A boiler, completely filled with water, which furnishes hot water to be used externally to itself, and that operates at water pressures not exceeding 160 psig (1103 kPa gauge) and at water temperatures not exceeding 250°F (121°C) at or near the boiler outlet.

Steam heating boiler. A boiler in which steam is generated and that operates at a steam pressure not exceeding 15 psig (103 kPa gauge).

BRAZING. A metal-joining process wherein coalescence is produced by the use of a nonferrous filler metal having a melting point above 1,000°F (538°C), but lower than that of the base metal being joined. The filler material is distributed between the closely fitted surfaces of the joint by capillary action.

BROILER. A general term including salamanders, barbecues and other appliances cooking primarily by radiated heat, excepting toasters.

BTU. Abbreviation for British Thermal Unit, which is the quantity of heat required to raise the temperature of 1 pound (454 g) of water 1°F (0.56°C) (1 Btu = 1055 J).

BURNER. A device for the final conveyance of the gas, or a mixture of gas and air, to the combustion zone.

Induced-draft. A burner that depends on draft induced by a fan that is an integral part of the appliance and is located downstream from the burner.

Power. A burner in which gas, air or both are supplied at pressures exceeding, for gas, the line pressure, and for air, atmospheric pressure, with this added pressure being applied at the burner.

CHIMNEY. A primarily vertical structure containing one or more flues, for the purpose of carrying gaseous products of combustion and air from a fuel-burning appliance to the outside atmosphere.

Factory-built chimney. A listed and labeled chimney composed of factory-made components, assembled in the field in accordance with manufacturer's instructions and the conditions of the listing.

Masonry chimney. A field-constructed chimney composed of solid masonry units, bricks, stones or concrete.

Metal chimney. A field-constructed chimney of metal.

CHIMNEY CONNECTOR. A pipe that connects a fuel-burning appliance to a chimney.

CLEARANCE. The minimum distance through air measured between the heat-producing surface of the mechanical appliance, device or equipment and the surface of the combustible material or assembly.

CLOTHES DRYER. An appliance used to dry wet laundry by means of heated air. Dryer classifications are as follows:

Type 1. Factory-built package, multiple production. Primarily used in family living environment. Usually the smallest unit physically and in function output.

Type 2. Factory-built package, multiple production. Used in business with direct intercourse of the function with the public. Not designed for use in individual family living

environment.

COMBUSTION. In the context of this code, refers to the rapid oxidation of fuel accompanied by the production of heat or heat and light.

COMBUSTION AIR. Air necessary for complete combustion of a fuel, including theoretical air and excess air.

COMBUSTION CHAMBER. The portion of an appliance within which combustion occurs.

COMBUSTION PRODUCTS. Constituents resulting from the combustion of a fuel with the oxygen of the air, including inert gases, but excluding excess air.

COMMISSIONER. The Commissioner of buildings of the City of New York or his or her duly authorized representative. See Section 28-101.5 of the *Administrative Code*.

CONCEALED LOCATION. A location that cannot be accessed without damaging permanent parts of the building structure or finished surface. Spaces above, below or behind readily removable panels or doors shall not be considered as concealed.

CONCEALED PIPING. Piping that is located in a concealed location (see "Concealed Location").

CONDENSATE. The liquid that condenses from a gas (including flue gas) caused by a reduction in temperature or increase in pressure.

CONNECTOR, APPLIANCE (Fuel). Rigid metallic pipe and fittings or a listed and labeled device that connects an appliance to the gas piping system.

CONNECTOR, CHIMNEY OR VENT. The pipe that connects an appliance to a chimney or vent.

CONSTRUCTION DOCUMENTS. Plans and specifications and other written, graphic and pictorial documents, prepared or assembled for describing the design, location, physical characteristics and other elements of the project necessary for obtaining a building permit. See Section 28-101.5 of the *Administrative Code*.

CONTROL. A manual or automatic device designed to regulate the gas, air, water or electrical supply to, or operation of, a mechanical system.

CONVERSION BURNER. A unit consisting of a burner and its controls for installation in an appliance originally utilizing another fuel.

COUNTER APPLIANCES. Appliances such as coffee brewers and coffee urns and any appurtenant water-heating appliance, food and dish warmers, hot plates, griddles, waffle makers and other appliances designed for installation on or in a counter.

CUBIC FOOT. The amount of gas that occupies 1 cubic foot (0.02832 m³) when at a temperature of 60°F (16°C), saturated with water vapor and under a pressure equivalent to that of 30 inches of mercury (101 kPa).

DAMPER. A manually or automatically controlled device to regulate draft or the rate of flow of air or combustion gases.

DECORATIVE APPLIANCE, VENTED. A vented appliance wherein the primary function lies in the aesthetic effect of the flames.

DECORATIVE APPLIANCES FOR INSTALLATION IN VENTED FIREPLACES. A vented appliance designed for installation within the fire chamber of a vented fireplace, wherein the primary function lies in the aesthetic effect of the flames.

DECORATIVE SHROUD. A partial non-combustible enclosure for aesthetic purposes that is installed at the termination of a venting system that surrounds or conceals the chimney or vent cap.

DEMAND. The maximum amount of gas input required per unit of time, usually expressed in cubic feet per hour (1 ft³ = 0.0283 m³), or Btu/h (1 Btu/h = 0.293 1 W).

DILUTION AIR. Air that is introduced into a draft hood and is mixed with the flue gases.

DIRECT-VENT APPLIANCES. Appliances that are constructed and installed so that all air for combustion is derived directly from the outside atmosphere and all flue gases are discharged directly to the outside atmosphere.

DRAFT. The pressure difference existing between the appliance or any component part and the atmosphere, that causes a continuous flow of air and products of combustion through the gas passages of the appliance to the atmosphere.

Mechanical or induced draft. The pressure difference created by the action of a fan, blower or ejector, that is located between the appliance and the chimney or vent termination.

Natural draft. The pressure difference created by a vent or chimney because of its height, and the temperature difference between the flue gases and the atmosphere.

DRAFT HOOD. A nonadjustable device built into an appliance, or made as part of the vent connector from an appliance, that is designed to (1) provide for ready escape of the flue gases from the appliance in the event of no draft, backdraft or stoppage beyond the draft hood, (2) prevent a backdraft from entering the appliance, and (3) neutralize the effect of stack action of the chimney or gas vent upon operation of the appliance.

DRAFT REGULATOR. A device that functions to maintain a desired draft in the appliance by automatically reducing the draft to the desired value.

DRIP. A nipple and cap placed at a lowpoint in a system of piping to collect condensate and from which the condensate is removable.

DRY GAS. A gas having a moisture and hydrocarbon dew point below any normal temperature to which the gas piping is exposed.

DUCT FURNACE. A warm-air furnace normally installed in an air distribution duct to supply warm air for heating. This definition shall apply only to a warm-air heating appliance that depends for air circulation on a blower not furnished as part of the furnace.

DUCT SYSTEM. A continuous passageway for the transmission air that, in addition to ducts, includes duct fittings, dampers, plenums, fans and accessory air-handling equipment and appliances.

DWELLING. A building or structure which is occupied in whole or in part as the home, residence or sleeping place of one or more families.

DWELLING UNIT. A single unit consisting of one or more habitable rooms and occupied or arranged to be occupied as a unit separate from all other units within a dwelling.

ENGINEER. A person licensed and registered to practice the profession of engineering under the *Education Law of the State of New York*.

EQUIPMENT. Any apparatus or device that delivers gas as a fuel or raw material to an appliance or vents combustion products from an appliance, including but not limited to control devices, pressure regulators, valves, appliance appurtenances, gas connectors, or power exhausters used in connections to appliances.

EXTERIOR MASONRY CHIMNEYS. Masonry chimneys exposed to the outdoors on one or more sides below the roof line.

FIREPLACE. A fire chamber and hearth constructed of noncombustible material for use with solid fuels and provided with 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.

FIRING VALVE. A valve of the plug and barrel type designed for use with gas, and equipped with a lever handle for manual operation and a dial to indicate the percentage of opening.

FLAME SAFEGUARD. A device that will automatically shut off the fuel supply to a main burner or group of burners when the means of ignition of such burners becomes inoperative, and when flame failure occurs on the burner or group of burners.

FLOOR FURNACE. A completely self-contained furnace suspended from the floor of the space being heated, taking air for combustion from outside such space and with means for observing flames and lighting the appliance from such space.

Fan type. A floor furnace equipped with a fan which provides the primary means for circulating air.

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

FLUE. A passageway within a chimney or vent through which gaseous combustion products pass.

FLUE, APPLIANCE. The passage(s) within an appliance through which combustion products pass from the combustion chamber of the appliance to the draft hood inlet opening on an appliance equipped with a draft hood or to the outlet of the appliance on an appliance not equipped with a draft hood.

FLUE COLLAR. That portion of an appliance designed for the attachment of a draft hood, vent connector or venting system.

FLUE GASES. Products of combustion plus excess air in appliance flues or heat exchangers.

FLUE LINER (LINING). A system or material used to form the inside surface of a flue in a chimney or vent, for the purpose of protecting the surrounding structure from the effects of combustion products and for conveying combustion products without leakage into the atmosphere.

FUEL GAS. A natural gas, manufactured gas, liquefied petroleum gas or mixtures of these gases.

FUEL GAS UTILIZATION EQUIPMENT. See "Appliance."

FURNACE. A completely self-contained heating unit that is designed to supply heated air to spaces remote from or adjacent to the appliance location.

FURNACE, CENTRAL. A self-contained appliance for heating air by transfer of heat of combustion through metal to the air, and designed to supply heated air through ducts to spaces remote from or adjacent to the appliance location.

Downflow furnace. A furnace designed with airflow discharge vertically downward at or near the bottom of the furnace.

Forced-air furnace with cooling unit. A single-package unit, consisting of a gas-fired forced-air furnace of one of the types listed below combined with an electrically or fuel gas-powered summer air-conditioning system, contained in a common casing.

Forced-air type. A central furnace equipped with a fan or blower which provides the primary means for circulation of air.

Gravity furnace with booster fan. A furnace equipped with a booster fan that does not materially restrict free circulation of air by gravity flow when the fan is not in operation.

Gravity type. A central furnace depending primarily on circulation of air by gravity.

Horizontal forced-air type. A furnace with airflow through the appliance essentially in a horizontal path.

Multiple-position furnace. A furnace designed so that it can be installed with the airflow discharge in the upflow, horizontal or downflow direction.

Upflow furnace. A furnace designed with airflow discharge vertically upward at or near the top of the furnace. This classification includes "highboy" furnaces with the blower mounted below the heating element and "lowboy" furnaces with the blower mounted beside the heating element.

FURNACE, ENCLOSED. A specific heating, or heating and ventilating, furnace incorporating an integral total enclosure and using only outside air for combustion.

FURNACE PLENUM. An air compartment or chamber to which one or more ducts are connected and which forms part of an air distribution system.

GAS CONVENIENCE OUTLET. A permanently mounted, manually operated device that provides the means for connecting an appliance to, and disconnecting an appliance from, the supply piping. The device includes an integral, manually operated valve with a nondisplaceable valve member and is designed so that disconnection of an appliance only occurs when the manually operated valve is in the closed position.

GAS PIPING. An installation of pipe, valves or fittings installed on a premises or in a building and utilized to convey fuel gas.

GAS UTILIZATION EQUIPMENT. An appliance that utilizes gas as a fuel or raw material or both.

HAZARDOUS LOCATION. Any location considered to be a fire hazard for flammable vapors, dust, combustible fibers or other highly combustible substances. The location is not necessarily categorized in the *New York City Building Code* as a high-hazard group classification.

HOUSE PIPING. See "Piping system."

IGNITION PILOT. A pilot that operates during the lighting cycle and discontinues during main burner operation.

IGNITION SOURCE. A flame, spark or hot surface capable of igniting flammable vapors or fumes. Such sources include appliance burners, burner ignitors, and electrical switching devices.

INCINERATOR. An appliance used to reduce combustible refuse material to ashes and which is manufactured, sold and installed as a complete unit.

INDUSTRIAL AIR HEATERS, DIRECT-FIRED NONRECIRCULATING. A heater in which all the products of combustion generated by the burners are released into the airstream being heated. The purpose of the heater is to offset building heat loss by heating only outdoor air.

INDUSTRIAL AIR HEATERS, DIRECT-FIRED RECIRCULATING. A heater in which all the products of combustion generated by the burners are released into the air stream being heated. The purpose of the heater is to offset building heat loss by heating outdoor air, and, if applicable, indoor air.

INFRARED RADIANT HEATER. A heater that directs a substantial amount of its energy output in the form of infrared radiant energy into the area to be heated. Such heaters are of either the vented or unvented type.

INTEGRAL VENT APPLIANCES. Appliances designed for outdoor installation that have built-in natural or mechanical venting means and are constructed and installed so that all air for combustion is derived from the outdoor atmosphere and all flue gases are discharged to the outdoor atmosphere through an integral vent termination.

INTERLOCK. A device actuated by another device with which it is directly associated, to govern succeeding operations of the same or allied devices. A circuit in which a given action cannot occur until after one or more other actions have taken place.

JOINT, FLANGED. A joint made by bolting together a pair of flanged ends.

JOINT, FLARED. A metal-to-metal compression joint in which a conical spread is made on the end of a tube that is compressed by a flare nut against a mating flare.

JOINT, MECHANICAL. A general form of gas-tight joints obtained by the joining of metal parts through a positive-holding mechanical construction, such as flanged joint, threaded joint, flared joint or compression joint.

JOINT, PLASTIC ADHESIVE. A joint made in thermoset plastic piping by the use of an adhesive substance which forms a continuous bond between the mating surfaces without dissolving either one of them.

JOINT, PLASTIC HEAT FUSION. A joint made in thermoplastic piping by heating the parts sufficiently to permit fusion of the materials when the parts are pressed together.

JOINT, WELDED. A gas-tight joint obtained by the joining of metal parts in molten state.

LABEL. Identification applied to material by the manufacturer or an approved agency that contains the name of the manufacturer, the function and performance characteristics of the material, and the name and identification of the approved agency that conducted the evaluation of a representative sample of such material.

LABELED. Equipment, appliances, material or products to which has been attached a label, symbol or other identifying mark of the manufacturer that contains the name of the manufacturer, the function and performance characteristics of the equipment, appliances, material or products, and the name and identification of an approved agency and that indicates that a representative sample of the equipment, appliances, material, or products has been tested and evaluated by an approved agency for compliance with nationally recognized standards or tests to determine suitable usage in a specified manner. See Section 28-101.5 of the *Administrative Code*.

LEAK CHECK. An operation performed on a gas piping system to verify that the system does not leak. Leakage checks are intended to discover open outlets, defective appliance connections and defects that have developed since the initial installation, normally performed after pressure testing.

LIMIT CONTROL. A device responsive to changes in pressure, temperature or level for turning on, shutting off or throttling the gas supply to an appliance.

LIQUEFIED PETROLEUM GAS or LPG (LP-GAS). Liquefied petroleum gas composed predominately of propane, propylene, butanes or butylenes, or mixtures thereof that is gaseous under normal atmospheric conditions, but is capable of being liquefied under moderate pressure at normal temperatures.

LISTED. Material identified in a list published by an approved agency that maintains periodic inspection of production of listed material or periodic evaluation of services and whose listing states either that the material meets identified nationally recognized standards or has been tested and found suitable for a specified purpose when installed in accordance with the manufacturer's installation instructions. See Section 28-101.5 of the *Administrative Code*.

LIVING SPACE. Space within a dwelling unit utilized for living, sleeping, eating, cooking, bathing, washing and sanitation purposes.

LOG LIGHTER. A manually operated solid fuel ignition appliance for installation in a vented solid fuel-burning fireplace.

LUBRICATED PLUG-TYPE VALVE. A valve of the plug and barrel type provided with means for maintaining a lubricant between the bearing surfaces.

MAIN BURNER. A device or group of devices essentially forming an integral unit for the final conveyance of gas or a mixture of gas and air to the combustion zone, and in which combustion takes place to accomplish the function for which the appliance is designed.

METER. The instrument installed to measure the volume of gas delivered through it.

MODULATING. Modulating or throttling is the action of a control from its maximum to minimum position in either predetermined steps or increments of movement as caused by its actuating medium.

NPS. An abbreviation for "Nominal pipe size."

OCCUPANCY. The purpose or activity for which a building or space is used or is designed, arranged or intended to be used.

OFFSET (VENT). A combination of approved bends that makes two changes in direction bringing one section of the vent out of line but into a line parallel with the other section.

ORIFICE. The opening in a cap, spud or other device whereby the flow of gas is limited and through which the gas is discharged to the burner.

OUTLET. The point at which a gas-fired appliance connects to the gas piping system.

OXYGEN DEPLETION SAFETY SHUTOFF SYSTEM (ODS). A system designed to act to shut off the gas supply to the main and pilot burners if the oxygen in the surrounding atmosphere is reduced below a predetermined level.

PILOT. A small flame that is utilized to ignite the gas at the main burner or burners.

PIPING. Where used in this code, "piping" refers to either pipe or tubing, or both.

Pipe. A rigid conduit of iron, steel, copper, brass or plastic.

Tubing. Semirigid conduit of copper, aluminum, plastic or steel.

PIPING SYSTEM. All fuel piping, valves and fittings from the outlet of the point of delivery to the outlets of the appliance shutoff valves.

PLASTIC, THERMOPLASTIC. A plastic that is capable of being repeatedly softened by increase of temperature and hardened by decrease of temperature.

POINT OF DELIVERY. For natural gas systems, the point of delivery is the outlet of the service meter assembly.

PORTABLE FUEL CELL APPLIANCE. A fuel cell generator of electricity, which is not fixed in place. A portable fuel cell appliance utilizes a cord and plug connection to a grid-isolated load and has an integral fuel supply.

PRESSURE DROP. The loss in pressure due to friction or obstruction in pipes, valves, fittings, regulators and burners.

PRESSURE TEST. An operation performed to verify the gas-tight integrity of gas piping following its installation or modification.

PURGE. To free a gas conduit of air or gas, or a mixture of gas and air.

QUICK-DISCONNECT DEVICE. A hand-operated device that provides a means for connecting and disconnecting an appliance or an appliance connector to a gas supply and that is equipped with an automatic means to shut off the gas supply when the device is disconnected.

READY ACCESS (TO). That which enables a device, appliance or equipment to be directly reached, without requiring the removal or movement of any panel, door or similar obstruction (see "Access").

REGISTERED DESIGN PROFESSIONAL. An architect or engineer.

REGISTERED DESIGN PROFESSIONAL OF RECORD. The registered design professional who prepared or supervised the preparation of applicable construction documents filed with the department.

REGULATOR. A device for controlling and maintaining a uniform supply pressure, either pounds-to-inches water column (MP regulator) or inches-to-inches water column (appliance regulator).

REGULATOR, GAS APPLIANCE. A pressure regulator for controlling pressure to the manifold of the appliance. Types of appliance regulators are as follows:

Adjustable.

1. **Spring type, limited adjustment.** A regulator in which the regulating force acting upon the diaphragm is derived principally from a spring, the loading of which is adjustable over a range of not more than 15 percent of the outlet pressure at the midpoint of the adjustment range.

2. **Spring type, standard adjustment.** A regulator in which the regulating force acting upon the diaphragm is derived principally from a spring, the loading of which is adjustable. The adjustment means shall be concealed.

Multistage. A regulator for use with a single gas whose adjustment means is capable of being positioned manually or automatically to two or more predetermined outlet pressure settings. Each of these settings shall be adjustable or nonadjustable. The regulator may modulate outlet pressures automatically between its maximum and minimum predetermined outlet pressure settings.

Nonadjustable.

1. **Spring type, nonadjustable.** A regulator in which the regulating force acting upon the diaphragm is derived principally from a spring, the loading of which is not field adjustable.

2. **Weight type.** A regulator in which the regulating force acting upon the diaphragm is derived from a weight or combination of weights.

REGULATOR, LINE GAS PRESSURE. A device placed in a gas line between the service pressure regulator and the appliance for controlling, maintaining or reducing the pressure in that portion of the piping system downstream of the device.

REGULATOR, MEDIUM-PRESSURE (MP Regulator). A line pressure regulator that reduces gas pressure from the range of greater than 0.5 psig (3.4 kPa) and less than or equal to 5 psig (34.5 kPa) to a lower pressure.

REGULATOR, PRESSURE. A device placed in a gas line for reducing, controlling and maintaining the pressure in that portion of the piping system downstream of the device.

REGULATOR, SERVICE PRESSURE. A device installed by the serving gas supplier to reduce and limit the service line pressure to delivery pressure.

RELIEF OPENING. The opening provided in a draft hood to permit the ready escape to the atmosphere of the flue products from the draft hood in the event of no draft, back draft, or stoppage beyond the draft hood, and to permit air into the draft hood in the event of a strong chimney updraft.

RELIEF VALVE (DEVICE). A safety valve designed to forestall the development of a dangerous condition by relieving either pressure, temperature or vacuum in the hot water supply system.

RELIEF VALVE, PRESSURE. An automatic valve that opens and closes a relief vent, depending on whether the pressure is above or below a predetermined value.

RELIEF VALVE, TEMPERATURE.

Manual reset type. A valve that automatically opens a relief vent at a predetermined temperature and that must be manually returned to the closed position.

Reseating or self-closing type. An automatic valve that opens and closes a relief vent, depending on whether the temperature is above or below a predetermined value.

RELIEF VALVE, VACUUM. A valve that automatically opens and closes a vent for relieving a vacuum within the hot water supply system, depending on whether the vacuum is above or below a predetermined value.

RISER, GAS. A vertical pipe supplying fuel gas.

ROOM HEATER, UNVENTED. See “Unvented room heater.”

ROOM HEATER, VENTED. See “Vented room heater.”

ROOM LARGE IN COMPARISON WITH SIZE OF THE APPLIANCE. Rooms having a volume equal to at least 12 times the total volume of a furnace, water heater or air-conditioning appliance and at least 16 times the total volume of a boiler. Total volume of the appliance is determined from exterior dimensions and is to include fan compartments and burner vestibules, when used. When the actual ceiling height of a room is greater than 8 feet (2438 mm), the volume of the room is figured on the basis of a ceiling height of 8 feet (2438 mm).

SAFETY SHUTOFF DEVICE. See “Flame safeguard.”

SERVICE PIPING. All fuel-gas piping, valves and fittings upstream of the point of delivery.

SHAFT. An enclosed space extending through one or more stories of a building, connecting vertical openings in successive floors, or floors and the roof.

SLEEPING UNIT. A dwelling unit, which may contain either toilet or kitchen facilities but not both. Any sleeping unit housing more than one family shall also be classified as a congregate living unit. The creation of or conversion to sleeping units shall be limited by Section 27-2077 of the New York City Housing Maintenance Code.

SPECIFIC GRAVITY. As applied to gas, specific gravity is the ratio of the weight of a given volume to that of the same volume of air, both measured under the same condition.

STATIONARY FUEL CELL POWER PLANT. A self-contained package or factory-matched packages which constitute an automatically operated assembly of integrated systems for generating electrical energy and recoverable thermal energy that is permanently connected and fixed in place.

THERMOSTAT

Electric switch type. A device that senses changes in temperature and controls electrically, by means of separate components, the flow of gas to the burner(s) to maintain selected temperatures.

Integral gas valve type. An automatic device, actuated by temperature changes, designed to control the gas supply to the burner(s) in order to maintain temperatures between predetermined limits, and in which the thermal actuating element is an integral part of the device.

1. **Graduating thermostat.** A thermostat in which the motion of the valve is approximately in direct proportion to the effective motion of the thermal element induced by temperature change.

2. **Snap-acting thermostat.** A thermostat in which the thermostatic valve travels instantly from the closed to the open position, and vice versa.

TRANSITION FITTINGS, PLASTIC TO STEEL. An adapter for joining plastic pipe to steel pipe. The purpose of this fitting is to provide a permanent, pressure-tight connection between two materials which cannot be joined directly one to another.

UNIT HEATER

High-static pressure type. A self-contained, automatically controlled, vented appliance having integral means for circulation of air against 0.2 inch (15 mm H₂O) or greater static pressure. Such appliance is equipped with provisions for attaching an outlet air duct and, where the appliance is for indoor installation remote from the space to be heated, is also equipped with provisions for attaching an inlet air duct.

Low-static pressure type. A self-contained, automatically controlled, vented appliance, intended for installation in the space to be heated without the use of ducts, having integral means for circulation of air. Such units are allowed to be equipped with louvers or face extensions made in accordance with the manufacturer's specifications.

UNLISTED BOILER. A boiler not listed by a nationally recognized testing agency.

UNVENTED ROOM HEATER. An unvented heating appliance designed for stationary installation and utilized to provide comfort heating. Such appliance provides radiant heat or convection heat by gravity or fan circulation directly from the heater and does not utilize ducts.

VALVE. A device used in piping to control the gas supply to any section of a system of piping or to an appliance.

Appliance shutoff. A valve located in the piping system, used to isolate individual appliances for purposes such as service or replacement.

Automatic. An automatic or semiautomatic device consisting essentially of a valve and operator that control the gas supply to the burner(s) during operation of an appliance. The operator shall be actuated by application of gas pressure on a flexible diaphragm, by electrical means, by mechanical means, or by other approved means.

Automatic gas shutoff. A valve used in conjunction with an automatic gas shutoff device to shut off the gas supply to a water-heating system. It shall be constructed integrally with the gas shutoff device or shall be a separate assembly.

Individual main burner. A valve that controls the gas supply to an individual main burner.

Main burner control. A valve that controls the gas supply to the main burner manifold.

Manual main gas-control. A manually operated valve in the gas line for the purpose of completely turning on or shutting off the gas supply to the appliance, except to pilot or pilots that are provided with independent shutoff.

Manual reset. An automatic shutoff valve installed in the gas supply piping and set to shut off when unsafe conditions occur. The device remains closed until manually reopened.

Service shutoff. A valve, installed by the serving gas supplier between the service meter or source of supply and the customer piping system, to shut off the entire piping system.

VENT. A pipe or other conduit composed of factory-made components, containing a passageway for conveying combustion products and air to the atmosphere, listed and labeled for use with a specific type or class of appliance.

Special gas vent. A vent listed and labeled for use with listed Category II, III and IV appliances.

Type B vent. A vent listed and labeled for use with appliances with draft hoods and other Category I appliances that are listed for use with Type B vents.

Type BW vent. A vent listed and labeled for use with wall furnaces.

Type L vent. A vent listed and labeled for use with appliances that are listed for use with Type L or Type B vents.

VENT CONNECTOR. See “Connector.”

VENT GASES. Products of combustion from appliances plus excess air plus dilution air in the vent connector, gas vent or chimney above the draft hood or draft regulator.

VENT PIPING.

Breather. Piping run from a pressure-regulating device to the outdoors, designed to provide a reference to atmospheric pressure. If the device incorporates an integral pressure relief mechanism, a breather vent can also serve as a relief vent.

Relief. Piping run from a pressure-regulating or pressure-limiting device to the outdoors, designed to provide for the safe venting of gas in the event of excessive pressure in the gas piping system.

VENTED APPLIANCE CATEGORIES. Appliances that are categorized for the purpose of vent selection are classified into the following four categories:

Category I. An appliance that operates with a nonpositive vent static pressure and with a vent gas temperature that avoids excessive condensate production in the vent.

Category II. An appliance that operates with a nonpositive vent static pressure and with a vent gas temperature that is capable of causing excessive condensate production in

the vent.

Category III. An appliance that operates with a positive vent static pressure and with a vent gas temperature that avoids excessive condensate production in the vent.

Category IV. An appliance that operates with a positive vent static pressure and with a vent gas temperature that is capable of causing excessive condensate production in the vent.

VENTED ROOM HEATER. A vented self-contained, free-standing, nonrecessed appliance for furnishing warm air to the space in which it is installed, directly from the heater without duct connections.

VENTED WALL FURNACE. A self-contained vented appliance complete with grilles or equivalent, designed for incorporation in or permanent attachment to the structure of a building, mobile home or travel trailer, and furnishing heated air circulated by gravity or by a fan directly into the space to be heated through openings in the casing. This definition shall exclude floor furnaces, unit heaters and central furnaces as herein defined.

VENTING SYSTEM. A continuous open passageway from the flue collar or draft hood of an appliance to the outside atmosphere for the purpose of removing flue or vent gases. A venting system is usually composed of a vent or a chimney and vent connector, if used, assembled to form the open passageway.

Forced-draft venting system. A portion of a venting system using a fan or other mechanical means to cause the removal of flue or vent gases under positive static vent pressure.

Induced draft venting system. A portion of a venting system using a fan or other mechanical means to cause the removal of flue or vent gases under nonpositive static vent pressure.

Mechanical draft venting system. A venting system designed to remove flue or vent gases by mechanical means, that consists of an induced draft portion under nonpositive static pressure or a forced draft portion under positive static pressure.

Natural draft venting system. A venting system designed to remove flue or vent gases under nonpositive static vent pressure entirely by natural draft.

WALL HEATER, UNVENTED-TYPE. A room heater of the type designed for insertion in or attachment to a wall or partition. Such heater does not incorporate concealed venting arrangements in its construction and discharges all products of combustion through the front into the room being heated.

WATER HEATER. Any heating appliance or equipment that heats potable water and supplies such water to the potable hot water distribution system.

Chapter 3: General Regulations

Section FGC 301: General

301.1 Scope.

This chapter shall govern the approval and installation of all equipment and appliances that comprise parts of the installations regulated by this code in accordance with Section 101.2.

301.1.1 Other fuels.

The requirements for combustion and dilution air for gas-fired appliances shall be governed by Section 304. The requirements for combustion and dilution air for appliances operating with fuels other than fuel gas shall be regulated by the *New York City Mechanical Code*.

301.2 Energy utilization.

Heating, ventilating and air-conditioning systems of all structures shall be designed and installed for efficient utilization of energy in accordance with the *New York City Energy Conservation Code*.

301.3 Listed and labeled.

Appliances regulated by this code shall be listed and labeled.

301.4 Labeling.

Refer to Section 28-113.4 of the *Administrative Code* and Article 114 of Chapter 1 of Title 28 of the *Administrative Code*.

301.5 Label information.

A permanent factory-applied nameplate(s) shall be affixed to appliances on which shall appear, in legible lettering, the manufacturer's name or trademark, the model number, serial number and, for listed appliances, the seal or mark of the testing agency. A label shall also include the hourly rating in British thermal units per hour (Btu/h) (W), the type of fuel approved for use with the appliance, and the minimum clearance requirements.

301.6 Plumbing connections.

Potable water supply and building drainage system connections to appliances regulated by this code shall be in accordance with the *New York City Plumbing Code*.

301.7 Fuel types.

Appliances shall be designed for use with the type of fuel gas that will be supplied to them.

301.7.1 Appliance fuel conversion.

Appliances shall not be converted to utilize a different fuel gas except where complete instructions for such conversion are provided in the installation instructions by the serving gas supplier or by the appliance manufacturer.

301.7.2 Liquid petroleum gas.

Storage or use of LPG for a stationary LPG installation shall comply with the *New York City Fire Code*.

301.8 Vibration isolation.

Where means for isolation of vibration of an appliance is installed, means for support and restraint of that appliance shall be provided as designed by a registered design professional.

301.9 Repair.

Defective material or parts shall be replaced or repaired in such a manner so as to preserve the original approval or listing.

301.10 Wind resistance.

Appliances and supports that are exposed to wind shall be designed and installed to resist the wind pressures determined in accordance with the *New York City Building Code*.

301.11 Flood hazard.

For structures located in areas of special flood hazard, the appliance, equipment and system installations regulated by this code shall comply with Appendix G of the *New York City Building Code*.

301.12 Seismic resistance.

When earthquake loads are applicable in accordance with the *New York City Building Code*, the supports shall be designed and installed for the seismic forces in accordance with that code.

301.13 Ducts.

All ducts required for the installation of systems regulated by this code shall be designed and installed in accordance with the *New York City Mechanical Code*.

301.14 Rodent-proofing.

Buildings or structures and the walls enclosing habitable or occupiable rooms and spaces in which persons live, sleep or work, or in which feed, food or foodstuffs are stored,

prepared, processed, served or sold, shall be constructed to protect against rodents in accordance with the *New York City Building Code*.

301.15 Prohibited location.

The appliances, equipment and systems regulated by this code shall not be located in an elevator shaft.

301.16 Mechanical systems.

Hydronic piping, ventilation and other mechanical systems not covered by this code shall be in accordance with the *New York City Mechanical Code*.

301.17 Electrical systems.

Electrical wiring, controls and connections to equipment and appliances regulated by this code shall be in accordance with the *New York City Electrical Code*.

301.18 Noise control requirements.

Appliances and equipment regulated by this code must comply with Section 928 of the *New York City Mechanical Code*.

Section FGC 302: Structural Safety

302.1 Structural safety.

The building shall not be weakened by the installation of any gas piping. In the process of installing or repairing any gas piping, finished floors, walls, ceilings, tile work or any other part of the building or premises which is required to be changed or replaced shall be left in a safe structural condition in accordance with the requirements of the *New York City Building Code*.

302.2 Penetrations of floor/ceiling assemblies and fire-resistance-rated assemblies.

Penetrations of floor/ceiling assemblies and assemblies required to have a fire-resistance rating shall be protected in accordance with the *New York City Building Code*.

302.3 Cutting, notching and boring in wood members.

The cutting, notching and boring of wood members shall comply with Sections 302.3.1 through 302.3.4.

302.3.1 Engineered wood products.

Cuts, notches and holes bored in trusses, structural composite lumber, structural glued-laminated members and I-joists are prohibited except where permitted by the manufacturer's recommendations or where the effects of such alterations are specifically considered in the design of the member by a registered design professional.

302.3.2 Joist notching and boring.

Notching at the ends of joists shall not exceed one-fourth the joist depth. Holes bored in joists shall not be within 2 inches (51 mm) of the top and bottom of the joist and their diameter shall not exceed one-third the depth of the member. Notches in the top or bottom of the joist shall not exceed one-sixth the depth and shall not be located in the middle one-third of the span.

302.3.3 Stud cutting and notching.

In exterior walls and bearing partitions, any wood stud is permitted to be cut or notched to a depth not exceeding 25 percent of its width. Cutting or notching of studs to a depth not greater than 40 percent of the width of the stud is permitted in nonload-bearing partitions supporting no loads other than the weight of the partition.

302.3.4 Bored holes.

A hole not greater in diameter than 40 percent of the stud depth is permitted to be bored in any wood stud. Bored holes not greater than 60 percent of the depth of the stud are permitted in nonload-bearing partitions or in any wall where each bored stud is doubled, provided not more than two such successive doubled studs are so bored. In no case shall the edge of the bored hole be nearer than 5/8 inch (15.9 mm) to the edge of the stud. Bored holes shall not be located at the same section of stud as a cut or notch.

302.4 Alterations to trusses.

Truss members and components shall not be cut, drilled, notched, spliced or otherwise altered in any way without the written concurrence and approval of a registered design professional. Alterations resulting in the addition of loads to any member (e.g., HVAC equipment, water heaters) shall not be permitted without verification that the truss is capable of supporting such additional loading.

302.5 Cutting, notching and boring holes in structural steel framing.

The cutting, notching and boring of holes in structural steel framing members shall be as prescribed by the registered design professional.

302.6 Cutting, notching and boring holes in cold-formed steel framing.

Flanges and lips of load-bearing, cold-formed steel framing members shall not be cut or notched. Holes in webs of load-bearing, cold-formed steel framing members shall be permitted along the centerline of the web of the framing member and shall not exceed the dimensional limitations, penetration spacing or minimum hole edge distance as prescribed by a registered design professional. Cutting, notching and boring holes of steel floor/roof decking shall be as prescribed by a registered design professional.

302.7 Cutting, notching and boring holes in nonstructural cold-formed steel wall framing.

Flanges and lips of nonstructural cold-formed steel wall studs shall be permitted along the centerline of the web of the framing member, shall not exceed 1 1/2 inches (38 mm) in width or 4 inches (102 mm) in length, and the holes shall not be spaced less than 24 inches (610 mm) center to center from another hole or less than 10 inches (254 mm) from the bearing end.

Section FGC 303: Appliance Location

303.1 General.

Appliances shall be located as required by this section, specific requirements elsewhere in this code and the conditions of the equipment and appliance listing.

303.2 Hazardous locations.

Appliances shall not be located in a hazardous location unless listed and approved for the specific installation.

303.3 Prohibited locations.

Appliances shall not be located in sleeping rooms, bathrooms, toilet rooms, storage closets or surgical rooms, or in a space that opens only into such rooms or spaces.

Exceptions:

1. In rooms other than those used for sleeping purposes, direct-vent appliances that obtain all combustion air directly from the outdoors and installed in accordance with the conditions of the listing and the manufacturer's instructions.
2. In rooms other than those used for sleeping purposes, vented room heaters, wall furnaces, vented decorative appliances, vented gas fireplaces, vented gas fireplace heaters and decorative appliances for installation in vented solid fuel-burning fireplaces that are installed in rooms that meet the required volume criteria of Section 304.5.
3. In rooms other than those used for sleeping purposes, appliances installed in an enclosure in which all combustion air is taken from the outdoors, in accordance with Section 304.6. Access to such enclosure shall be through a solid weather-stripped door, equipped with an approved self-closing device.

303.3.1 Gas-fired direct vent appliances.

Gas-fired direct vent space-heating appliances used for providing heat in rooms for sleeping purposes shall be deemed to be located outside of the sleeping room provided that such a unit is factory assembled and manufactured with an integral factory assembled carbon monoxide detector interlock with automatic main gas shut-off valve. Such unit shall be of direct vent type, such that all air for combustion is derived from the outdoors and that all flue gases are discharged directly to the outdoors. All gas piping shall be hard-piped with no flexible connectors. Such unit shall be installed through a sleeve located in an exterior wall. Pursuant to 27-2034 (f) of the *New York City Housing Maintenance Code*, each heater shall be equipped with an effective device which will automatically shut off the gas supply to the heater if its pilot light or other constantly burning flame is extinguished, or in the event of an interruption of the gas supply to the heater, and will not permit the heater to be relighted unless such shut-off device is first reset manually. Installation requirements shall be in accordance with the manufacturer's instructions and the applicable listing.

303.4 Protection from physical damage.

Appliances shall not be installed in a location where subject to physical damage, including vehicular impact, unless protected by approved barriers meeting the requirements of the *New York City Fire Code*.

303.5 Indoor locations.

Furnaces and boilers installed in closets and alcoves shall be listed for such installation.

303.5.1 Gas Fired Appliances.

Gas fired appliances, regardless of btu per hour input, shall be located in an enclosure in accordance with Section 509 of the *New York City Building Code*.

Exception: Gas fired direct vented appliances with a 350,000 btu per hour input or less may be installed in a non-fire rated enclosure.

303.5.2 Maximum temperature.

Maximum indoor temperature in spaces surrounding appliances shall not exceed the operational temperature of the installed equipment and/or 104°F (40°C).

303.6 Outdoor locations.

Appliances installed in outdoor locations shall be either listed for outdoor installation or provided with protection from outdoor environmental factors that influence the operability, durability and safety of the appliances.

303.7 Pit locations.

Appliances installed in pits or excavations shall not come in direct contact with the surrounding soil. The sides of the pit or excavation shall be held back a minimum of 12 inches (305 mm) from the appliance. Where the depth exceeds 12 inches (305 mm) below adjoining grade, the walls of the pit or excavation shall be lined with concrete or masonry, such concrete or masonry shall extend a minimum of 4 inches (102 mm) above adjoining grade and shall have sufficient lateral load-bearing capacity to resist collapse. The appliance shall be protected from flooding in a manner approved by the commissioner.

Section FGC 304: Combustion, Ventilation and Dilution Air

304.1 General.

Air for combustion, ventilation and dilution of flue gases for appliances installed in buildings shall be provided by application of one of the methods prescribed in Sections 304.5 through 304.9. Where the requirements of Section 304.5 are not met, outdoor air shall be introduced in accordance with one of the methods prescribed in Sections 304.6 through 304.9. Direct-vent appliances, gas appliances of other than natural draft design and vented gas appliances other than Category I shall be provided with combustion, ventilation and dilution air in accordance with the appliance manufacturer's instructions. Combustion, ventilation, and dilution air shall be obtained solely from the outdoors for fuel-burning appliances with an input greater than 350,000 Btu/h.

Exception: Type 1 clothes dryers that are provided with makeup air in accordance with Section 614.5.

304.1.1 Crawl space and attic space.

For the purposes of this chapter, an opening to a naturally ventilated crawl space or attic space shall be considered equivalent to an opening to the outdoors.

304.1.2 Crawl space.

Where lower combustion air openings connect with crawl spaces, such spaces shall have unobstructed openings to the outdoors at least twice that required for the combustion air openings. The height of the crawl space shall comply with the requirements of the *New York City Building Code* and shall be without obstruction to the free flow of air.

304.1.3 Attic space.

Where combustion air is obtained from an attic area, the attic ventilating openings shall not be subject to ice or snow blockage, and the attic shall have not less than 30 inches (762 mm) vertical clear height at its maximum point. Attic ventilation openings shall be sufficient to provide the required volume of combustion air and the attic ventilation required by the *New York City Building Code*. The combustion air openings shall be provided with a sleeve of not less than 0.019 inch (0.48 mm) (No.26 Gage) galvanized steel or other approved material extending from the appliance enclosure to at least 6 inches (152 mm) above the top of the ceiling joists and insulation.

304.2 Appliance location.

Appliances shall be located so as not to interfere with proper circulation of combustion, ventilation and dilution air.

304.3 Draft hood/regulator location.

Where used, a draft hood or a barometric draft regulator shall be installed in the same room or enclosure as the equipment served so as to prevent any difference in pressure between the hood or regulator and the combustion air supply. A barometric damper may be installed in an adjacent room provided that a louver is installed in the adjacent room to the outside air. The net free area of the louver shall be equal to or greater than the area of the barometric damper.

304.4 Circulation of air.

The equipment and appliances within every room containing fuel-burning appliances shall be installed so as to allow free circulation of air. Provisions shall be made to allow for the simultaneous operation of mechanical exhaust systems, fireplaces or other equipment and appliances operating in the same room or space from which combustion, ventilation, and dilution air is being drawn. Such provisions shall prevent the operation of such appliances, equipment and systems from affecting the supply of combustion, ventilation, and dilution air.

304.4.1 Makeup air for fuel burning devices.

Where exhaust fans are installed, makeup air shall be provided to replace the exhausted air. Calculations shall be provided on the construction documents to validate the use of the exhaust fan(s) and compliance with this Chapter.

304.4.2 Ventilation air for fuel burning devices.

Where ventilation air is brought in by mechanical means for heat generation mitigation, provisions must be made for proper air balance to prevent a negative or positive pressure in the boiler room and to discharge the ventilation directly to the outside.

304.4.3 Prohibited sources.

Openings and ducts shall not connect appliance enclosures with a space in which the operation of a fan will adversely affect the flow of the combustion, ventilation, and dilution air. Combustion, ventilation, and dilution air shall not be subject to ice or snow blockage. No combustion, ventilation, and dilution air inlet shall be less than 30 inches above grade. Combustion, ventilation, and dilution air shall not be obtained from a hazardous location, except where the fuel-fired appliances are located within the hazardous location and are installed in accordance with this code. Combustion, ventilation, and dilution air shall not be taken from a refrigeration machinery room, except where a refrigerant vapor detector system is installed to automatically shut off the combustion process in the event of refrigerant leakage. For structures in areas of special flood hazard, air shall be obtained from a location complying with Appendix G of the *New York City Building Code*.

304.5 Indoor combustion air.

The required volume of indoor air shall be determined in accordance with Section 304.5.1 or 304.5.2, except that where the air infiltration rate is known to be less than 0.40 air changes per hour (ACH), Section 304.5.2 shall be used. The total required volume shall be the sum of the required volume calculated for all appliances located within the space. Rooms communicating directly with the space in which the appliances are installed through openings not furnished with doors, and through combustion air openings sized and located in accordance with Section 304.5.3, are considered to be part of the required volume.

Exception: Combustion, ventilation, and dilution air shall be obtained solely from the outdoors for fuel-burning appliances with an input greater than 350,000 Btu/h.

304.5.1 Standard method.

The minimum required volume shall be 50 cubic feet per 1,000 Btu/h (4.8 m³ /kW) of the appliance input rating.

304.5.2 Known air-infiltration-rate method.

Where the air infiltration rate of a structure is known, the minimum required volume shall be determined as follows:

For appliances other than fan-assisted, calculate volume using Equation 3-1.

$$Required\ Volume_{other} \geq \frac{21\ ft^3}{ACH} \left(\frac{I_{other}}{1,000\ Btu/hr} \right)$$

(Equation 3-1)

For fan-assisted appliances, calculate volume using Equation 3-2.

$$Required\ Volume_{fan} \geq \frac{15\ ft^3}{ACH} \left(\frac{I_{fan}}{1,000\ Btu/hr} \right)$$

(Equation 3-2)

where:

I_{other} = All appliances other than fan assisted (input in Btu/h).

I_{fan} = Fan assistend appliance (input in Btu/h).

ACH = Air change per hour (percent of volume of space exchanged per hour, expressed as a decimal).

For purposes of this calculation, an infiltration rate greater than 0.60 ACH shall not be used in Equations 3-1 and 3-2.

304.5.3 Indoor opening size and location.

Openings used to connect indoor spaces shall be sized and located in accordance with Sections 304.5.3.1 and 304.5.3.2 (see Figure 304.5.3).

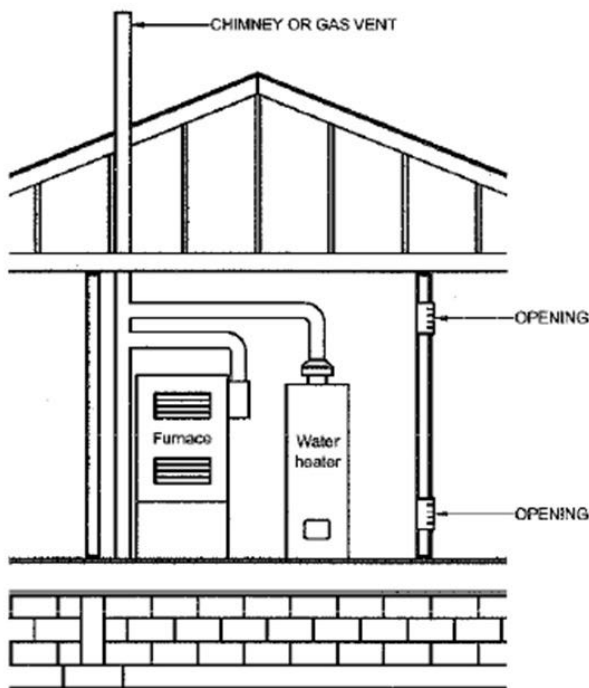


Figure 304.5.3

All Air from Inside the Building

(see Section 304.5.3)

304.5.3.1 Combining spaces on the same story.

Each opening shall have a minimum free area of 1 square inch per 1,000 Btu/h (2200 mm² /kW) of the total input rating of all appliances in the space, but not less than 100 square inches (0.06 m²). One opening shall commence within 12 inches (305 mm) of the top and one opening shall commence within 12 inches (305 mm) of the bottom of the enclosure. The minimum dimension of air openings shall be not less than 3 inches (76 mm).

304.5.3.2 Combining spaces in different stories.

The volumes of spaces in different stories shall be considered as communicating spaces where such spaces are connected by one or more openings in doors or floors having a total minimum free area of 2 square inches per 1,000 Btu/h (4402 mm² /kW) of total input rating of all appliances.

304.6 Outdoor combustion air.

Outdoor combustion air shall be provided through opening(s) to the outdoors in accordance with Section 304.6.1 or 304.6.2. The minimum dimension of air openings shall be not less than 3 inches (76 mm). The size of the openings connecting the room to the outdoor air supply shall also comply with any applicable rules of the New York City Department of Environmental Protection.

304.6.1 Two-permanent-openings method.

Two permanent openings, one commencing within 12 inches (305 mm) of the top and one commencing within 12 inches (305 mm) of the bottom of the enclosure, shall be provided. The openings shall communicate directly, or by ducts, with the outdoors or spaces that freely communicate with the outdoors. Where directly communicating with the outdoors, or where communicating with the outdoors through vertical ducts, each opening shall have a minimum free area of 1 square inch per 4,000 Btu/h (550 mm² /kW) of total input rating of all appliances in the enclosure (see Figures 304.6.1(1) and 304.6.1(2)). Where communicating with the outdoors through horizontal ducts, each opening shall have a minimum free area of not less than 1 square inch per 2,000 Btu/h (1100 mm² /kW) of total input rating of all appliances in the enclosure. (see Figure 304.6.1(3)).

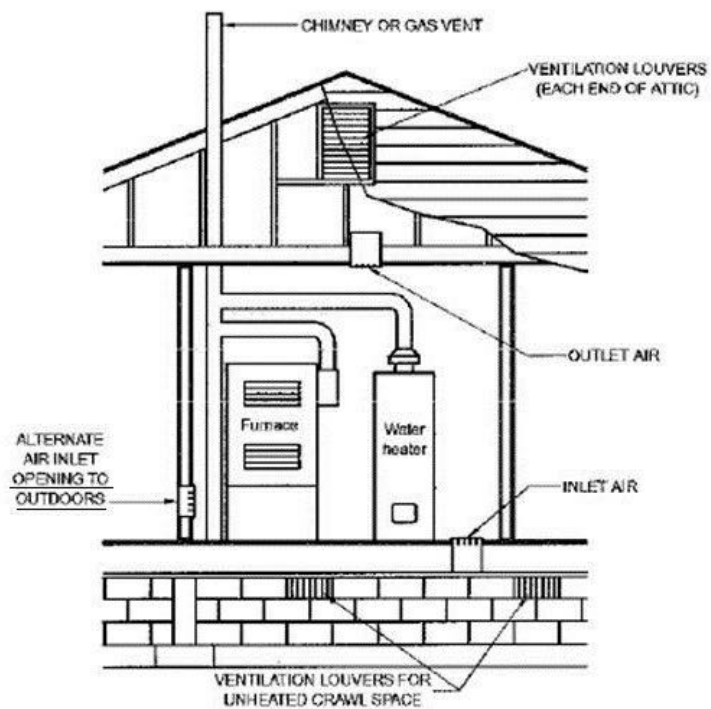
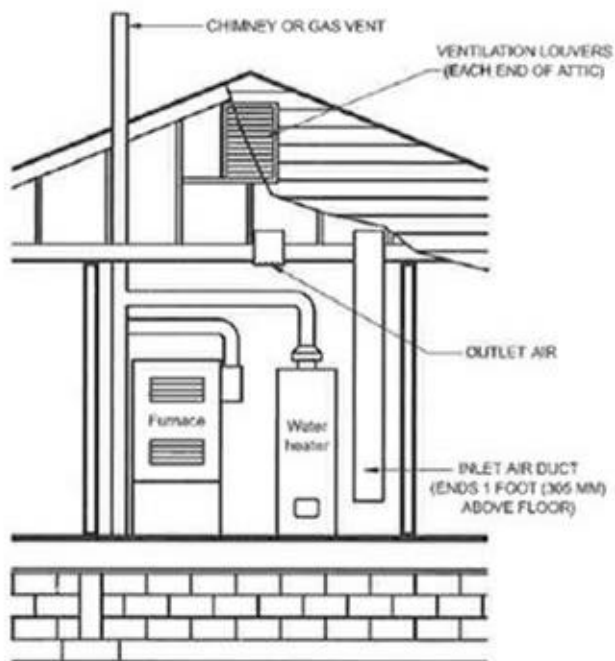


Figure 304.6.1(1)

All Air from Outdoors - Inlet Air from Ventilated Crawl Space and Outlet Air to Ventilated Attic

(see Section 304.6.1)

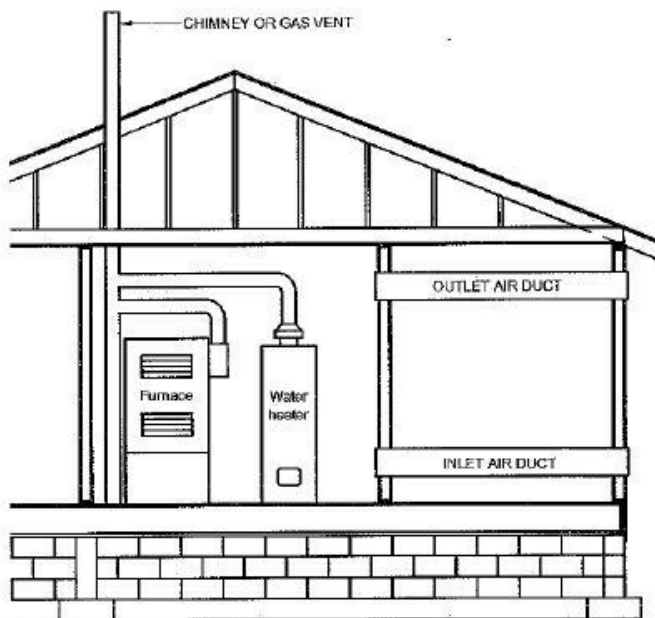


For SI: 1 foot = 304.8 mm.

Figure 304.6.1(2)

All Air from Outdoors through Ventilated Attic

(see Section 304.6.1)



For SI: 1 foot = 304.8 mm.

Figure 304.6.1(3)

All Air from Outdoors

(see Section 304.6.1)

304.6.2 One-permanent-opening method.

One permanent opening, commencing within 12 inches (305 mm) of the top of the enclosure, shall be provided. The appliance shall have clearances of at least 1 inch (25 mm) from the sides and back and 6 inches (152 mm) from the front of the appliance. The opening shall directly communicate with the outdoors or through a vertical or horizontal duct to the outdoors or spaces that freely communicate with the outdoors (see Figure 304.6.2) and shall have a minimum free area of 1 square inch per 3,000 Btu/h (734 mm²/kW) of the total input rating of all appliances located in the enclosure, and not less than the sum of the areas of all vent connectors in the space.

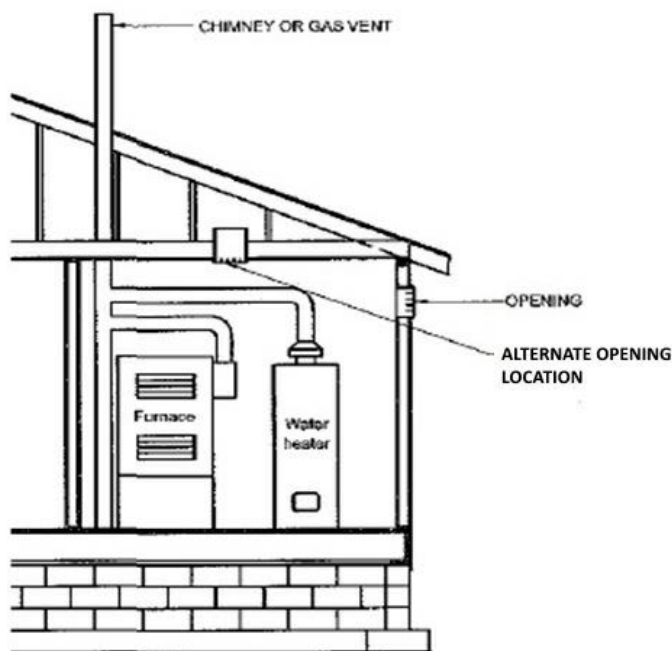


Figure 304.6.2

Single Combustion Air Opening, All Air from the Outdoors

(see Section 304.6.2)

304.7 Combination indoor and outdoor combustion air.

The use of a combination of indoor and outdoor combustion air shall be in accordance with Sections 304.7.1 through 304.7.3.

304.7.1 Indoor openings.

Where used, openings connecting the interior spaces shall comply with Section 304.5.3.

304.7.2 Outdoor opening location.

Outdoor opening(s) shall be located in accordance with Section 304.6.

304.7.3 Outdoor opening(s) size.

The outdoor opening(s) size shall be calculated in accordance with the following:

1. The ratio of interior spaces shall be the available volume of all communicating spaces divided by the required volume.

2. The outdoor size reduction factor shall be one minus the ratio of interior spaces.

3. The minimum size of outdoor opening(s) shall be the full size of outdoor opening(s) calculated in accordance with Section 304.6, multiplied by the reduction factor. The minimum dimension of air openings shall be not less than 3 inches (76 mm).

304.8 [Reserved.]

304.9 Mechanical combustion air supply.

Where all combustion air is provided by a mechanical air supply system, the combustion air shall be supplied from the outdoors at a rate not less than 0.35 cubic feet per minute per 1,000 Btu/h (0.034 m³/min per kW) of total input rating of all appliances located within the space. Combustion air rates shall also comply with any applicable rules of the New York City Department of Environmental Protection. The mechanical air supply shall be sufficient to accommodate combustion air, ventilation air, and dilution air requirements of the installation.

304.9.1 Makeup air.

Where exhaust fans are installed, makeup air shall be provided to replace the exhausted air.

304.9.2 Appliance interlock.

Each of the appliances served shall be interlocked with the mechanical air supply system to prevent main burner operation when the mechanical air supply system is not in operation. The air flow and the damper operation shall be proven prior to burner operation.

304.9.3 [Reserved.]

304.10 Opening obstructions locations, and protection.

The required size of openings for combustion, ventilation, and dilution air shall be based on the net free area of each opening. The net free area of an opening shall be that specified by the manufacturer of the opening covering. In the absence of such information, openings covered with metal louvers shall be deemed to have a net free area of 60 percent of the area of the opening, and openings covered with wood louvers shall be deemed to have a net free area of 10 percent of the area of the opening. Louvers and grilles shall be fixed in the open position.

Exception: Operable louvers shall be interlocked with the appliance so that they are proven to be in the full open position prior to main burner ignition and during main burner operation. Means shall be provided to prevent the main burner from igniting if the louvers fail to open during burner startup and to shut down the main burner if the louvers close during operation.

304.10.1 Dampened openings.

Where the combustion air openings are provided with automatic, smoke or fire dampers, the dampers shall be electrically interlocked with the appliances served, so as to prevent operation of any appliance when any of the dampers are closed. Manually operated dampers shall not be installed in combustion air openings. The damper opening shall be proven prior to burner operation.

304.10.2 Caution sign.

A sign stating, "Louvers, dampers and/or ventilation openings must not be blocked or disabled." shall be permanently affixed, in clear view, adjacent to the opening(s) within the room containing the equipment. The letters used on the sign shall be at least 1-inch (25 mm) in height.

304.10.3 Opening location and protection.

Combustion air openings to the outdoors shall comply with the location and protection provisions applicable to outside air intake openings of Sections 401.5 and 401.6 of the *New York City Mechanical Code*.

304.11 Combustion air ducts.

Combustion air ducts shall comply with all of the following:

1. Be of galvanized steel complying with Chapter 6 of the *New York City Mechanical Code* or of equivalent corrosion-resistant material approved for this application.

Exception: Within dwelling units, unobstructed stud and joist spaces shall not be prohibited from conveying combustion air, provided that not more than one required fireblock is removed.

2. Have a minimum cross-sectional dimension of 3 inches (76 mm).
3. Terminate in an unobstructed space allowing free movement of combustion air to the appliances.
4. Have the same cross-sectional areas as the free area of the openings to which they connect.
5. Serve a single appliance enclosure.
6. Not serve both upper and lower combustion air openings where both such openings are used. The separation between ducts serving upper and lower combustion air openings shall be maintained to the source of combustion air.
7. Not be screened where terminating in an attic space.
8. Not slope downward toward the source of combustion air, where serving the upper required combustion air opening.
9. Be constructed so that the remaining space surrounding a chimney or chimney liner, installed within a masonry, metal or factory-built chimney cannot be used to supply combustion, ventilation and dilution air, except for direct vent appliances designed and installed in accordance with the equipment manufacturer's instructions and listing."

304.12 Protection from fumes and gases.

Where corrosive or flammable process fumes or gases, other than products of combustion, are present, means for the disposal of such fumes or gases shall be provided. Such fumes or gases include carbon monoxide, hydrogen sulfide, ammonia, chlorine and halogenated hydrocarbons. In barbershops, beauty shops and other facilities where chemicals that generate corrosive or flammable products, such as aerosol sprays, are routinely used, nondirect-vent-type appliances shall be located in a mechanical room separated or partitioned off from other areas with provisions for combustion air and dilution air from the outdoors. Direct-vent appliances shall be installed in accordance with the appliance manufacturer's installation instructions.

Section FGC 305: Installation

305.1 General.

Equipment and appliances shall be installed as required by the terms of their approval, in accordance with the conditions of listing, the manufacturer's instructions and this code. Manufacturers' installation instructions shall be available on the job site at the time of inspection. Where a code provision is less restrictive than the conditions of the listing of the equipment or appliance or the manufacturer's installation instructions, the conditions of the listing and the manufacturer's installation instructions shall apply.

305.2 Hazardous area.

Equipment and appliances having an ignition source shall not be installed in Group H occupancies or control areas where open use, handling or dispensing of combustible, flammable or explosive materials occurs.

305.3 Elevation of ignition source.

Equipment and appliances having an ignition source shall be elevated such that the source of ignition is not less than 18 inches (457 mm) above the floor in hazardous locations and public garages, private garages, repair garages, motor fuel-dispensing facilities and parking garages. For the purpose of this section, rooms or spaces that are not part of the living space of a dwelling unit and that communicate directly with a private garage through openings shall be considered to be part of the private garage.

Exception: Elevation of the ignition source is not required for appliances that are listed as flammable vapor ignition resistant.

305.3.1 Installation in residential garages.

In residential garages where appliances are installed in a separate, enclosed space having access only from outside of the garage, such appliances shall be permitted to be installed at floor level, provided that the required combustion air is taken from the exterior of the garage.

305.3.2 Parking garages.

Connection of a parking garage with any room in which there is a fuel-fired appliance shall be by means of a vestibule providing a two-doorway separation, except that a single door is permitted where the sources of ignition in the appliance are elevated in accordance with Section 305.3.

Exception: This section shall not apply to appliance installations complying with Section 305.4.

305.4 Public garages, motor fuel-dispensing facilities and repair garages.

Appliances located in public garages, motor fuel-dispensing facilities, repair garages or other areas frequented by motor vehicles shall be installed a minimum of 8 feet (2438 mm) above the floor. Where motor vehicles are capable of passing under an appliance, the appliance shall be installed at the clearances required by the appliance manufacturer and not less than 1 foot (305 mm) higher than the tallest vehicle garage door opening.

Exceptions:

1. The requirements of this section shall not apply where the appliances are protected from motor vehicle impact and installed in accordance with Section 305.3 of this code and NFPA 30A.
2. Appliances installed in repair garages shall be separated from repair areas by walls or partitions, floors, or floor ceiling assemblies that are constructed so as to prohibit the transmission of vapors and having a fire-resistance rating of not less than 1 hour, and that have no openings in the wall separating the repair area within 8 feet (2438mm) of the floor. Wall penetration shall be firestopped. Air for combustion purposes shall be obtained from the outdoors. The heating room shall not be used for the storage of combustible materials.
3. Heating appliances for vehicle repair areas where there is no dispensing or transferring of Class I or Class II flammable or combustible liquids or liquefied petroleum gas shall be installed in accordance with NFPA 30A.

305.5 Private garages.

Appliances located in private garages shall be installed with a minimum clearance of 6 feet (1829 mm) above the floor.

Exception: The requirements of this section shall not apply where the appliances are protected from motor vehicle impact and installed in accordance with Section 305.3.

305.6 Construction and protection.

Boiler rooms and furnace rooms shall be protected as required by the *New York City Building Code*.

305.7 Clearances from grade.

Appliances installed at grade level shall be supported on a level concrete slab or other approved material extending not less than 3-inches (76 mm) above adjoining grade or shall be suspended not less than 6 inches (152 mm) above adjoining grade. Such supports shall be installed in accordance with the manufacturer's installation instructions.

305.8 Clearances to combustible construction.

Heat-producing equipment and appliances shall be installed to maintain the required clearances to combustible construction as specified in the listing and manufacturer's instructions. Such clearances shall be reduced only in accordance with Section 308. Clearances to combustibles shall include such considerations as door swing, drawer pull, overhead projections or shelving and window swing. Devices, such as door stops or limits and closers, shall not be used to provide the required clearances.

305.9 Parking structures.

Appliances installed in enclosed, basement and underground parking structures shall be installed in accordance with NFPA 88A.

305.10 Repair garages.

Appliances installed in repair garages shall be installed in a detached building or room, separated from repair areas by walls or partitions, floors or floor-ceiling assemblies that are constructed so as to prohibit the transmission of vapors and having a fire-resistance rating of not less than 1 hour, and that have no openings in the wall separating the repair area within 8 feet (2438 mm) of the floor. Wall penetrations shall be firestopped. Air for combustion purposes shall be obtained from the outdoors. The appliance room shall not be used for the storage of combustible materials.

Exceptions:

1. Overhead heaters where installed not less than 8 feet (2438 mm) above the floor shall be permitted.
2. Heating appliances for vehicle repair areas where there is no dispensing or transferring of Class I or II flammable or combustible liquids or liquefied petroleum gas shall be installed in accordance with NFPA 30A.

305.11 Installation in aircraft hangars.

Heaters in aircraft hangars shall be installed in accordance with NFPA 409.

305.12 Avoid strain on gas piping.

Appliances shall be supported and connected to the piping so as not to exert undue strain on the connections.

Section FGC 306: Access and Service Space

306.1 Clearances for maintenance and replacement.

Appliances shall be accessible for inspection, service, repair and replacement without disabling the function of a fire-resistance-rated assembly or removing permanent construction, other appliances, or any other piping or ducts not connected to the appliance being inspected, serviced, repaired or replaced. A level working space at least 30 inches deep and 30 inches wide (762 mm by 762 mm) shall be provided in front of the control side to service an appliance.

306.2 Appliances in rooms.

Rooms containing appliances shall be provided with a door and an unobstructed passageway measuring not less than 36 inches (914 mm) wide and 80 inches (2032 mm) high.

Exception: Within a dwelling unit, appliances installed in a compartment, alcove, basement or similar space shall be provided with access by an opening or door and an unobstructed passageway measuring not less than 24 inches (610 mm) wide and large enough to allow removal of the largest appliance in the space, provided that a level service space of not less than 30 inches (762 mm) deep and the height of the appliance, but not less than 30 inches (762mm), is present at the front or service side of the appliance with the door open.

306.3 Appliances in attics.

Attics containing appliances shall be provided with an opening and unobstructed passageway large enough to allow removal of the largest appliance. The passageway shall not be less than 30 inches (762 mm) high and 22 inches (559 mm) wide and not more than 20 feet (6096 mm) in length when measured along the centerline of the passageway from the opening to the appliance. The passageway shall have continuous solid flooring not less than 24 inches (610 mm) wide. A level service space not less than 30 inches (762 mm) deep and 30 inches (762 mm) wide shall be present at the front or service side of the appliance. The clear access opening dimensions shall be a minimum of 20 inches by 30 inches (508 mm by 762 mm), and large enough to allow removal of the largest component of the appliance.

Exceptions:

1. The passageway and level service space are not required where the appliance is capable of being serviced and removed through the required opening.
2. Where the passageway is not less than 6 feet (1829 mm) high for its entire length, the passageway shall be not greater than 50 feet (15 250 mm) in length.

306.3.1 Electrical requirements.

A luminaire controlled by a switch located at the required passageway opening and a receptacle outlet shall be provided at or near the appliance location in accordance with the *New York City Electrical Code*.

306.4 Appliances under floors.

Under-floor spaces containing appliances shall be provided with an access opening and unobstructed passageway large enough to remove the largest component of the

appliance. The passageway shall not be less than 30 inches (762 mm) high and 22 inches (559 mm) wide, nor more than 20 feet (6096 mm) in length when measured along the centerline of the passageway from the opening to the appliance. A level service space not less than 30 inches (762 mm) deep and 30 inches (762 mm) wide shall be present at the front or service side of the appliance. If the depth of the passageway or the service space exceeds 12 inches (305 mm) below the adjoining grade, the walls of the passageway shall be lined with concrete or masonry extending 4 inches (102 mm) above the adjoining grade and having sufficient lateral-bearing capacity to resist collapse. The clear access opening dimensions shall be a minimum of 22 inches by 30 inches (559 mm by 762 mm), and large enough to allow removal of the largest appliance.

Exceptions:

1. The passageway is not required where the level service space is present when the access is open and the appliance is capable of being serviced and removed through the required opening.
2. Where the passageway is unobstructed and not less than 6 feet (1829 mm) high and 22 inches (559 mm) wide for its entire length, the passageway shall not be limited in length.

306.4.1 Electrical requirements.

A luminaire controlled by a switch located at the required passageway opening and a receptacle outlet shall be provided at or near the appliance location in accordance with the *New York City Electrical Code*.

306.5 Equipment and appliances on roofs or elevated structures.

Where equipment and appliances requiring access are installed on roofs or elevated structures at a height exceeding 16 feet (4877mm), such access shall be provided by a permanent approved means of access, the extent of which shall be from grade or floor level to the equipment and appliances' level service space. Such access shall not require climbing over obstructions greater than 30 inches (762 mm) high or walking on roofs having a slope greater than 4 units vertical in 12 units horizontal (33-percent slope). Where access involves climbing over parapet walls, the height shall be measured to the top of the parapet wall. Permanent ladders installed to provide the required access shall comply with the following minimum design criteria.

1. The side railing shall extend above the parapet or roof edge not less than 30 inches (762 mm).
2. Ladders shall have rung spacing not to exceed 12 inches (305 mm) on center.
3. Ladders shall have a toe spacing not less than 7 inches (178 mm) deep.
4. There shall be a minimum of 18 inches (457 mm) between rails.
5. Rungs shall have a minimum diameter of 0.75-inch (19 mm) and shall be capable of withstanding a 300-pound (136.1 kg) load.
6. Where a cage, well or ladder safety device is provided, ladders over 20 feet (6096 mm) in height shall be provided with landing platforms for each 30 feet (9144 mm) of height. Where a cage, well or ladder safety device is not provided, ladders over 20 feet (6096 mm) in height shall be provided with landing platforms for each 20 feet (6096 mm) in height. Landings shall be capable of withstanding a load of 100 pounds per square foot (488.2 kg/m²). Landing dimensions shall be not less than 30 inches (762 mm) and not less than 24 inches (610 mm) in width. A guardrail and toeboard shall be provided on all open sides of the landing.
7. Where ladder extensions are installed the side rails of through or side-step ladder extensions shall extend 3 1/2 feet above the parapets and landings. For through ladder extensions, the rungs shall be omitted from the extensions and shall have not less 18 nor more than 24 inches of clearance between rails. For side-step or offset fixed ladder sections, at landings, the side rails and rungs shall be carried to the next regular rung beyond or above the 3 1/2 feet minimum. 8. Ladders shall be protected against corrosion by approved means.
9. Catwalks installed to provide the required access shall be not less than 24 inches wide (610 mm) and shall have railings as required for service platforms.

Exception: This section shall not apply to Group R-3 occupancies.

306.5.1 Sloped roofs.

Where appliances, equipment, fans or other components that require service are installed on a roof having a slope of 3 units vertical in 12 units horizontal (25-percent slope) or greater and having an edge more than 30 inches (762 mm) above grade at such edge, a level platform shall be provided on each side of the appliance or equipment to which access is required for service, repair or maintenance. The platform shall be not less than 30 inches (762 mm) in any dimension and shall be provided with guards. The guards shall extend not less than 42 inches (1067 mm) above the platform, shall be constructed so as to prevent the passage of a 21-inch-diameter (533 mm) sphere and shall comply with the loading requirements for guards specified in the *New York City Building Code*. Access shall not require walking on roofs having a slope greater than 4 units vertical in 12 units horizontal (33-percent slope). Where access involves obstructions greater than 30 inches (762 mm) in height, such obstructions shall be provided with ladders installed in accordance with Section 306.5 or stairs installed in accordance with the requirements specified in the *New York City Building Code* in the path of travel to and from appliances, fans or equipment requiring service.

306.5.2 Electrical requirements.

A receptacle outlet shall be provided at or near the appliance location in accordance with the *New York City Electrical Code*.

306.6 Guards.

Guards shall be provided where appliances, equipment or other components that require service and roof hatch openings are located within 10 feet (3048 mm) of a roof edge or open side of a walking surface and such edge or open side is located more than 30 inches (762 mm) above the floor, roof or grade below. The guard shall extend not less than 30 inches (762 mm) beyond each end of such appliances, fans or other components and roof hatch openings and the top of the guard shall be located not less than 42 inches (1067 mm) above the elevated surface adjacent to the guard. The guard shall be constructed so as to prevent the passage of a 21-inch-diameter (533 mm) sphere and shall comply with the loading requirements for guards specified in the *New York City Building Code*.

306.7. Rooftop access and obstructions.

Equipment and appliances installed on rooftops of buildings shall be installed in accordance with the requirements of the *New York City Fire Code* regarding rooftop access and obstructions, and shall not obstruct or interfere with firefighting operations or the operation of any doors, windows, fire escapes, or other means of egress or other building components requiring operation or access.

Section FGC 307: Condensate Disposal

307.1 Evaporators and cooling coils.

Condensate drainage systems shall be provided for equipment and appliances containing evaporators and cooling coils in accordance with the *New York City Mechanical Code*.

307.2 Fuel-burning appliances.

Liquid combustion by-products of condensing appliances shall be collected and discharged to an approved plumbing fixture, or disposal area in accordance with the manufacturer's installation instructions. Condensate piping shall be of approved corrosion-resistant material and shall not be smaller than the drain connection on the appliance. Such piping shall maintain a minimum horizontal slope in the direction of discharge of not less than one-eighth unit vertical in 12 units horizontal (1-percent slope).

307.2.1 Condensate disposal.

Condensate from all fuel-burning appliances and associated flues shall be neutralized to a pH of at least 6 and no more than 8 prior to disposal to a sanitary system.

307.3 Drain pipe materials and sizes.

Components of the condensate disposal system shall be cast iron, galvanized steel, copper, cross-linked polyethylene, polybutylene, polyethylene, ABS, CPVC or PVC pipe or tubing. All components shall be selected for the pressure and temperature rating of the installation. Joints and connections shall be made in accordance with the applicable provisions of Chapter 7 of the *New York City Plumbing Code* relative to the material type. Condensate waste and drain line size shall be not less than 3/4-inch (19 mm) internal diameter and shall not decrease in size from the drain pan connection to the place of condensate disposal. Where the drain pipes from more than one unit are manifolded together for condensate drainage, the pipe or tubing shall be sized by a registered design professional.

307.4. Traps.

Condensate drains shall be trapped as required by the equipment or appliance manufacturer.

307.5 Auxiliary drain pan.

Category IV condensing appliances shall be provided with an auxiliary drain pan where damage to any building component will occur as a result of stoppage in the condensate

drainage system. Such pan shall be installed in accordance with the applicable provisions of Section 307 of the *New York City Mechanical Code*.

Exception: An auxiliary drain pan shall not be required for appliances that automatically shut down operation in the event of a stoppage in the condensate drainage system.

Section FGC 308: Clearance Reduction

308.1 Scope.

This section shall govern the reduction in required clearances to combustible materials and combustible assemblies for chimneys, vents, appliances, devices and equipment. Clearance requirements for air-conditioning equipment and central heating boilers and furnaces shall comply with Sections 308.3 and 308.4.

308.2 Reduction table.

The allowable clearance reduction shall be based on one of the methods specified in Table 308.2 or shall utilize an assembly listed for such application. Where required clearances are not listed in Table 308.2, the reduced clearances shall be determined by linear interpolation between the distances listed in the table. Reduced clearances shall not be derived by extrapolation below the range of the table. The reduction of the required clearances to combustibles for listed and labeled appliances and equipment shall be in accordance with the requirements of this section except that such clearances shall not be reduced where reduction is specifically prohibited by the terms of the appliance or equipment listing.

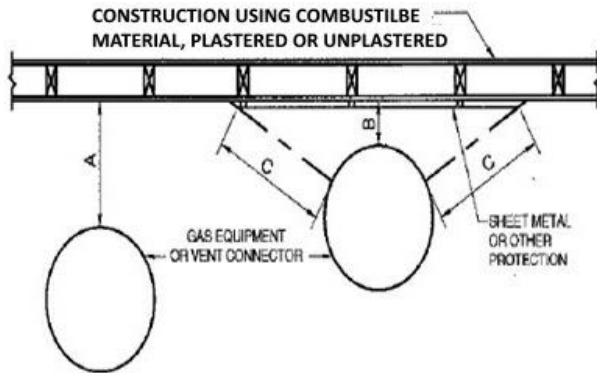
Table 308.2^{a-k}

Reduction of Clearances With Specified Forms of Protection

Type of Protection Applied to and Covering All Surfaces of Combustible Material Within the Distance Specified as the Required Clearance With No Protection [see Figures 308.2(1), 308.2(2), and 308.2(3)]	Where the Required Clearance With No Protection Appliance, Vent Connector, or Single-Wall Metal Pipe is: (inches)									
	36		18		12		9		6	
	Allowable clearances with specified protection (inches)									
	Use Column 1 for clearances above appliance or horizontal connector. Use Column 2 for clearances from appliance, vertical connector, and single-wall metal pipe.									
	Above Col. 1	Sides and rear Col. 2	Above Col. 1	Sides and rear Col. 2	Above Col. 1	Sides and rear Col. 2	Above Col. 1	Sides and rear Col. 2	Above Col. 1	Sides and rear Col. 2
1. 3 1/2-inch-thick masonry wall without ventilated airspace	—	24	—	12	—	9	—	6	—	5
2. 1/2-inch insulation board over 1-inch glass fiber or mineral wool batts	24	18	12	9	9	6	6	5	4	3
3. 0.0296 inch (No. 22 gauge) galvanized sheet metal over 1-inch glass fiber or mineral wool batts reinforced with wire on rear face with ventilated airspace	18	12	9	6	6	4	5	3	3	3
4. 3 1/2-inch-thick masonry wall with ventilated airspace	—	12	—	6	—	6	—	6	—	6
5. 0.024-inch (nominal 24 gage) sheet metal with ventilated airspace	18	12	9	6	6	4	5	3	3	3
6. 1/2-inch thick insulation board with ventilated airspace	18	12	9	6	6	4	5	3	3	3
7. 0.024-inch (nominal 24 gage) sheet metal with ventilated airspace over 0.024-inch (nominal 24 gage) sheet metal with ventilated airspace	18	12	9	6	6	4	5	3	3	3
8. 1-inch glass fiber or mineral wool batts sandwiched between two sheets 0.024-inch (nominal 24 gage) sheet metal with ventilated airspace	18	12	9	6	6	4	5	3	3	3

For SI: 1 inch = 25.4 mm, °C = [(°F-32)/1.8], 1 pound per cubic foot = 16.02 kg/m³, 1 Btu per inch per square foot per hour per °F = 0.144 W/m² K.

- a. Reduction of clearances from combustible materials shall not interfere with combustion air, draft hood clearance and relief, and accessibility of servicing.
- b. All clearances shall be measured from the outer surface of the combustible material to the nearest point on the surface of the appliance, disregarding any intervening protection applied to the combustible material.
- c. Spacers and ties shall be of noncombustible material. No spacer or tie shall be used directly opposite an appliance or connector.
- d. For all clearance reduction systems using a ventilated airspace, adequate provision for air circulation shall be provided as described [see Figures 308.2(2) and 308.2(3)].
- e. There shall be at least 1 inch between clearance reduction systems and combustible walls and ceilings for reduction systems using ventilated airspace.
- f. Where a wall protector is mounted on a single flat wall away from corners, it shall have a minimum 1-inch air gap. To provide air circulation, the bottom and top edges, or only the side and top edges, or all edges shall be left open.
- g. Mineral wool batts (blanket or board) shall have a minimum density of 8 pounds per cubic foot and a minimum melting point of 1500°F.
- h. Insulation material used as part of a clearance reduction system shall have a thermal conductivity of 1.0 Btu per inch per square foot per hour per °F or less.
- i. There shall be at least 1 inch between the appliance and the protector. In no case shall the clearance between the appliance and the combustible surface be reduced below that allowed in this table.
- j. All clearances and thicknesses are minimum; larger clearances and thicknesses are acceptable.
- k. Listed single-wall connectors shall be installed in accordance with the terms of their listing and the manufacturer's installation instructions.



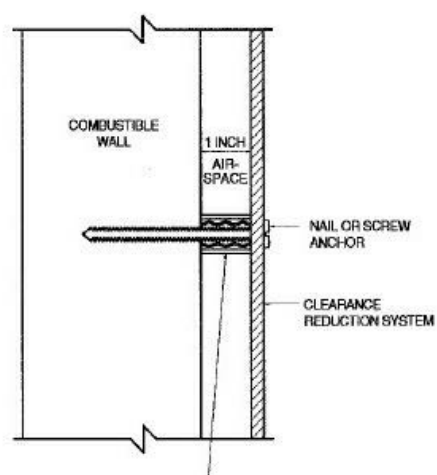
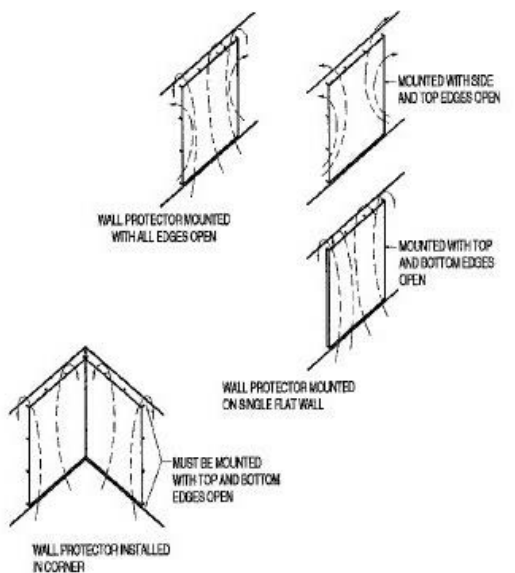
Notes:

"A" equals the reduced clearance with no protection.

"B" equals the reduced clearance permitted in accordance with Table 308.2. The protection applied to the construction using combustible materials shall extend far enough in each direction to make "C" equal to "A".

Figure 308.2(1)

Extent of Protection Necessary to Reduce Clearances from Gas Equipment or Vent Connections



1-INCH NONCOMBUSTIBLE SPACER SUCH AS STACKED WASHERS, SMALL-DIAMETER PIPE, TUBING OR ELECTRICAL CONDUIT.

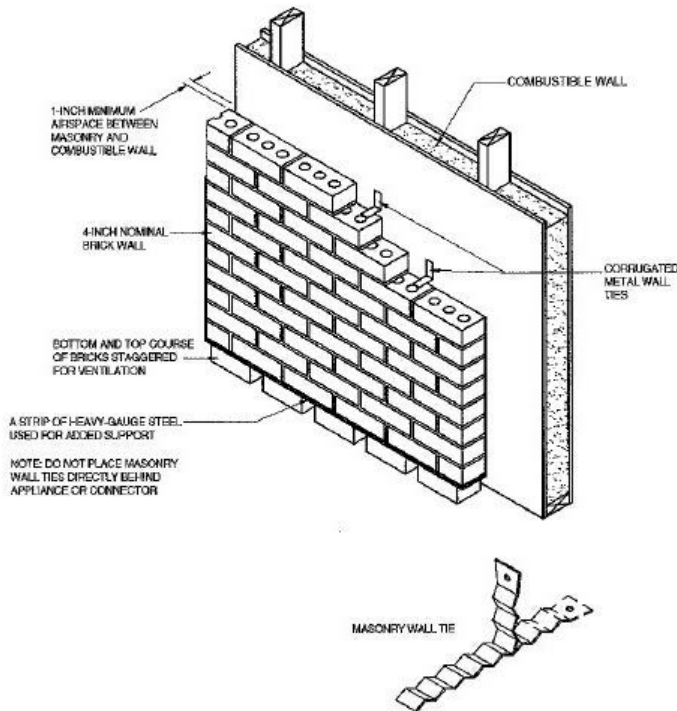
MASONRY WALLS CAN BE ATTACHED TO COMBUSTIBLE WALLS USING WALL TIES.

DO NOT USE SPACERS DIRECTLY BEHIND APPLIANCE OR CONNECTOR.

For SI: 1 Inch = 25.4 mm.

Figure 308.2(2)

Wall Protector Clearance Reduction System



For SI: 1 Inch = 25.4 mm.

Figure 308.2(3)

Masonry Clearance Reduction System

308.3 Clearances for indoor air-conditioning appliances.

Clearance requirements for indoor air-conditioning equipment shall comply with Sections 308.3.1 through 308.3.5.

308.3.1 Appliances installed in rooms that are large in comparison with the size of the appliance.

Air-conditioning appliances installed in rooms that are large in comparison with the size of the appliance shall be installed with clearances in accordance with the terms of their listing and the manufacturer's instructions.

308.3.2 Appliances installed in rooms that are not large in comparison with the size of the appliance.

Air-conditioning appliances installed in rooms that are not large in comparison with the size of the appliance, such as alcoves and closets, shall be listed for such installations and installed in accordance with the manufacturer's instructions. Listed clearances shall not be reduced by the protection methods described in Table 308.2, regardless of whether the enclosure is of combustible or noncombustible material.

308.3.3 Clearance reduction.

Air-conditioning appliances installed in rooms that are large in comparison with the size of the appliance shall be permitted to be installed with reduced clearances to combustible material provided the combustible material or appliance is protected as described in Table 308.2.

308.3.4 Plenum clearances.

Where the furnace plenum is adjacent to plaster on metal lath or noncombustible material attached to combustible material, the clearance shall be measured to the surface of the plaster or other noncombustible finish where the clearance specified is 2 inches (51 mm) or less.

308.3.5 Clearance from supply ducts.

Air-conditioning appliance shall have the clearance from supply ducts within 3 feet (914 mm) of the furnace plenum be not less than that specified from the furnace plenum. Clearance is not necessary beyond this distance.

308.4 Central-heating boilers and furnaces.

Clearance requirements for central-heating boilers and furnaces shall comply with Sections 308.4.1 through 308.4.6. The clearance to these appliances shall not interfere with combustion air; draft hood clearance and relief; and accessibility for servicing.

308.4.1 Appliances installed in rooms that are large in comparison with the size of the appliance.

Central-heating furnaces and low-pressure boilers installed in rooms large in comparison with the size of the appliance shall be installed with clearances in accordance with the manufacturer's instructions.

308.4.2 Appliances installed in rooms that are not large in comparison with the size of the appliance.

Central-heating furnaces and low-pressure boilers installed in rooms that are not large in comparison with the size of the appliance, such as alcoves and closets, shall be listed for such installations. Listed clearances shall not be reduced by the protection methods described in Table 308.2 and illustrated in Figures 308.2(1) through 308.2(3), regardless of whether the enclosure is of combustible or noncombustible material.

308.4.3 Clearance reduction.

Central-heating furnaces and low-pressure boilers installed in rooms that are large in comparison with the size of the appliance shall be permitted to be installed with reduced clearances to combustible material provided the combustible material or appliance is protected as described in Table 308.2.

308.4.4 Clearance for servicing appliances

. Front clearance shall be sufficient for servicing the burner and the furnace or boiler.

308.4.5 Plenum clearances.

Where the furnace plenum is adjacent to plaster on metal lath or noncombustible material attached to combustible material, the clearance shall be measured to the surface of the plaster or other noncombustible finish where the clearance specified is 2 inches (51 mm) or less.

308.4.6 Clearance from supply ducts.

Central-heating furnaces shall have the clearance from supply ducts within 3 feet (914 mm) of the furnace plenum be not less than that specified from the furnace plenum. No clearance is necessary beyond this distance.

Section FGC 309: Electrical

309.1 Grounding.

Gas piping shall not be used as a grounding electrode.

309.2 Connections.

Electrical connections between appliances and the building wiring, including the grounding of the appliance, shall conform to the *New York City Electrical Code*.

Section FGC 310: Electrical Bonding

310.1 Pipe and tubing.

Each above-ground portion of a gas piping system that is likely to become energized shall be continuously bonded electrically to an effective ground-fault current path. Gas piping shall be considered to be bonded where it is connected to appliances that are connected to the equipment grounding conductor of the circuit supplying that appliance.

Chapter 4: Gas Piping Installations

Section FGC 401: General

401.1 Scope.

This chapter shall govern the design, installation, modification and maintenance of fuel-gas piping systems. The scope covered by this chapter includes piping systems from the point of delivery to the connections with the appliances and includes the design, materials, components, fabrication, assembly, installation, testing, inspection, operation and maintenance of such piping systems.

401.1.1 Meters and service piping.

Service piping includes the fuel-gas piping up to the point of delivery. Meters and service piping shall comply with the requirements of Appendix E of this code. In addition, service piping located within buildings shall be designed and installed in accordance with the structural integrity, firestopping, and fire protection provisions of the *New York City Building Code*.

401.1.2 [Reserved.]

401.2 [Reserved.]

401.3 Modifications to existing systems.

In modifying or adding to existing piping systems, sizes shall be maintained in accordance with this chapter.

401.4 Additional appliances.

Where an additional appliance is to be served, the existing piping shall be checked to determine if it has adequate capacity for all appliances served. If inadequate, the existing system shall be enlarged as required or separate piping of adequate capacity shall be provided.

401.5 Identification.

All piping installed in new construction and all new piping installed in existing buildings, whether or not the piping is intended to be enclosed when construction is completed, shall be identified by a yellow label marked "Gas" in black letters. Where the installation requires a gas test such labeling shall be completed prior to such test. Labels shall be provided in accordance with ASME A13.1 and the marking shall be spaced at intervals not exceeding 5 feet (1524 mm). The marking shall not be required on pipe located in the same room as the appliance served.

401.6 Interconnections.

Where two or more meters are installed on the same premises but supply separate consumers, the piping systems shall not be interconnected on the outlet side of the meters.

401.7 Piping meter identification.

Piping from multiple meter installations shall be marked with an approved permanent identification by the installer so that the piping system supplied by each meter is readily identifiable.

401.8 Minimum sizes.

All pipe utilized for the installation, extension and alteration of any piping system shall be sized to supply the full number of outlets for the intended purpose and shall be sized in accordance with Section 402.

Section FGC 402: Pipe Sizing

402.1 General considerations.

Piping systems shall be of such size and so installed as to provide a supply of gas sufficient to meet the maximum demand and supply gas to each appliance inlet at not less than the minimum supply pressure required by the appliance.

402.2 Maximum gas demand.

The volume of gas to be provided, in cubic feet per hour, shall be determined directly from the manufacturer's input ratings of the appliance served. Where an input rating is not indicated, the gas supplier, appliance manufacturer or a qualified agency shall be contacted, or the rating from Table 402.2 shall be used for estimating the volume of gas to be supplied. The total connected hourly load shall be used as the basis for pipe sizing, assuming that all equipment could be operating at full capacity simultaneously. Where a diversity of load can be established, pipe sizing shall be permitted to be based on such loads.

Table 402.2

Approximate Gas Input for Typical Appliances

Appliance	Input BTU/H (Approx.)
Space Heating Units	
Hydronic boiler	
Single family	100,000
Multifamily, per unit	60,000
Warm-air furnace	
Single family	100,000
Multifamily, per unit	60,000
Space and Water Heating Units	
Hydronic boiler	
Single family	120,000
Multifamily, per unit	75,000

Water Heating Appliances	
Water heater, automatic instantaneous	35,000
Capacity at 2 gal./minute	50,000
Capacity at 4 gal./minute	
Capacity at 6 gal./minute	142,800
Water heater, automatic storage, 30- to 40-gal. tank	285,000
Water heater, automatic storage, 50-gal. tank	428,400
Water heater, domestic, circulating or side-arm	35,000
Cooking Appliances	
Built-in oven or broiler unit, domestic	65,000
Built-in top unit, domestic	25,000
Range, free-standing, domestic	40,000
Other Appliances	
Barbecue	3,000
Clothes dryer, Type 1 (domestic)	35,000
Gas fireplace, direct vent	40,000
Gas light	80,000
Gas log	40,000
Refrigerator	2,500

For SI: 1 British thermal unit per hour = 0.293 W, 1 gallon = 3.785 L, 1 gallon per minute = 3.785 L/m.

402.3 Sizing.

Gas piping shall be sized in accordance with one of the following:

1. Pipe sizing tables or sizing equations in accordance with Section 402.4.
2. The sizing tables included in a listed piping system's manufacturer's installation instructions.
3. Other approved engineering methods.
4. Individual outlets to gas ranges shall not be less than 3/4 inches (19 mm) NPS.

402.4 Sizing tables and equations.

Where Tables 402.4(1) through 402.4(5) are used to size piping or tubing, the pipe length shall be determined in accordance with Section 402.4.1, 402.4.2 or 402.4.3. Where Equations 4-1 and 4-2 are used to size piping or tubing, the pipe or tubing shall have smooth inside walls and the pipe length shall be determined in accordance with Section 402.4.1, 402.4.2 or 402.4.3.

1. Low-pressure gas equation (Less than 1 1/2 pounds per square inch (psi) (10.3 kPa)):

$$D = Q^{0.381} / 19.17 (\Delta H / C_r \times L)^{0.206} \quad \text{(Equation 4-1)}$$

2. High-pressure gas equation (1 1/2 psi (10.3 kPa) and above):

$$D = Q^{0.381} / 18.93 \{(P_1^2 - P_2^2) \times Y / C_r \times L\}^{0.206} \quad \text{(Equation 4-2)}$$

where:

- D = Inside diameter of pipe, inches (mm).
 Q = Input rate appliance(s), cubic feet per hour at 60°F (16 °C) and 30-inch mercury column
 P_1 = Upstream pressure, psia ($P_1 + 14.7$)
 P_2 = Downstream pressure, psia ($P_2 + 14.7$)
 L = Equivalent length of pipe, feet
 ΔH = Pressure drop, inch water column (27.7 inch water column = 1 psi)

Table 402.4

C_r and Y Values for Natural Gas at Standard Conditions

Gas	Equation Factors	
	C_r	Y

Natural gas	0.6094	0.9992
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For SI: 1 cubic foot = 0.028 m³ , 1 foot = .305 mm, 1-inch water column = 0.2488 kPa, 1 pound per square inch = 6.895 kPa, 1 British thermal unit per hour = 0.293 W.

402.4.1 Longest length method.

The pipe size of each section of gas piping shall be determined using the longest length of piping from the point of delivery to the most remote outlet and the load of the section.

402.4.2 Branch length method.

Pipe shall be sized as follows:

1. Pipe size of each section of the longest pipe run from the point of delivery to the most remote outlet shall be determined using the longest run of piping and the load of the section.
2. The pipe size of each section of branch piping not previously sized shall be determined using the length of piping from the point of delivery to the most remote outlet in each branch and the load of the section.

402.4.3 Hybrid pressure.

The pipe size for each section of higher pressure gas piping shall be determined using the longest length of piping from the point of delivery to the most remote line pressure regulator. The pipe size from the line pressure regulator to each outlet shall be determined using the length of piping from the regulator to the most remote outlet served by the regulator.

Table 402.4(1)

Schedule 40 Metallic Pipe

Gas	Natural
Inlet Pressure	Less than 2 psi
Pressure Drop	0.3 in. w.c.
Specific Gravity	0.60

PIPE SIZE (inch)														
Nominal	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	4	5	6	8	10	12
Actual ID	0.622	0.824	1.049	1.380	1.610	2.067	2.469	3.068	4.026	5.047	6.065	7.981	10.020	11.938
Length (ft)	Capacity in Cubic Feet of Gas Per Hour													
10	131	273	514	1,060	1,580	3,050	4,860	8,580	17,500	31,700	51,300	105,000	191,000	303,000
20	90	188	353	726	1,090	2,090	3,340	5,900	12,000	21,800	35,300	72,400	132,000	208,000
30	72	151	284	583	873	1,680	2,680	4,740	9,660	17,500	28,300	58,200	106,000	167,000
40	62	129	243	499	747	1,440	2,290	4,050	8,270	15,000	24,200	49,800	90,400	143,000
50	55	114	215	442	662	1,280	2,030	3,590	7,330	13,300	21,500	44,100	80,100	127,000
60	50	104	195	400	600	1,160	1,840	3,260	6,640	12,000	19,500	40,000	72,600	115,000
70	46	95	179	368	552	1,060	1,690	3,000	6,110	11,100	17,900	36,800	66,800	106,000
80	42	89	167	343	514	989	1,580	2,790	5,680	10,300	16,700	34,200	62,100	98,400
90	40	83	157	322	482	928	1,480	2,610	5,330	9,650	15,600	32,100	58,300	92,300
100	38	79	148	304	455	877	1,400	2,470	5,040	9,110	14,800	30,300	55,100	87,200
125	33	70	131	269	403	777	1,240	2,190	4,460	8,080	13,100	26,900	48,800	77,300
150	30	63	119	244	366	704	1,120	1,980	4,050	7,320	11,900	24,300	44,200	70,000
175	28	58	109	224	336	648	1,030	1,820	3,720	6,730	10,900	22,400	40,700	64,400
200	26	54	102	209	313	602	960	1,700	3,460	6,260	10,100	20,800	37,900	59,900
250	23	48	90	185	277	534	851	1,500	3,070	5,550	8,990	18,500	33,500	53,100
300	21	43	82	168	251	484	771	1,360	2,780	5,030	8,150	16,700	30,400	48,100
350	19	40	75	154	231	445	709	1,250	2,560	4,630	7,490	15,400	28,000	44,300
400	18	37	70	143	215	414	660	1,170	2,380	4,310	6,970	14,300	26,000	41,200
450	17	35	66	135	202	389	619	1,090	2,230	4,040	6,540	13,400	24,400	38,600
500	16	33	62	127	191	367	585	1,030	2,110	3,820	6,180	12,700	23,100	36,500
550	15	31	59	121	181	349	556	982	2,000	3,620	5,870	12,100	21,900	34,700
600	14	30	56	115	173	333	530	937	1,910	3,460	5,600	11,500	20,900	33,100
650	14	29	54	110	165	318	508	897	1,830	3,310	5,360	11,000	20,000	31,700
700	13	27	52	106	159	306	488	862	1,760	3,180	5,150	10,600	19,200	30,400
750	13	26	50	102	153	295	470	830	1,690	3,060	4,960	10,200	18,500	29,300
800	12	26	48	99	148	285	454	802	1,640	2,960	4,790	9,840	17,900	28,300
850	12	25	46	95	143	275	439	776	1,580	2,860	4,640	9,530	17,300	27,400
900	11	24	45	93	139	267	426	752	1,530	2,780	4,500	9,240	16,800	26,600
950	11	23	44	90	135	259	413	731	1,490	2,700	4,370	8,970	16,300	25,800
1,000	11	23	43	87	131	252	402	711	1,450	2,620	4,250	8,720	15,800	25,100
1,100	10	21	40	83	124	240	382	675	1,380	2,490	4,030	8,290	15,100	23,800
1,200	NA	20	39	79	119	229	364	644	1,310	2,380	3,850	7,910	14,400	22,700

1,300	NA	20	37	76	114	219	349	617	1,260	2,280	3,680	7,570	13,700	21,800
1,400	NA	19	35	73	109	210	335	592	1,210	2,190	3,540	7,270	13,200	20,900
1,500	NA	18	34	70	105	203	323	571	1,160	2,110	3,410	7,010	12,700	20,100
1,600	NA	18	33	68	102	196	312	551	1,120	2,030	3,290	6,770	12,300	19,500
1,700	NA	17	32	66	98	189	302	533	1,090	1,970	3,190	6,550	11,900	18,800
1,800	NA	16	31	64	95	184	293	517	1,050	1,910	3,090	6,350	11,500	18,300
1,900	NA	16	30	62	93	178	284	502	1,020	1,850	3,000	6,170	11,200	17,700
2,000	NA	16	29	60	90	173	276	488	1,000	1,800	2,920	6,000	10,900	17,200

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square inch = 6.895kPa, 1-inch water column = 0.2488 kPa, 1 British thermal unit per hour = 0.293 1 W, 1 cubic foot per hour = 0.0283 m³ /h, 1 degree = 0.0 1745 rad.

Notes:

1. NA means a flow of less than 10 cfh.
2. All table entries have been rounded to three significant digits.

Table 402.4(2)

Schedule 40 Metallic Pipe

Gas	Natural
Inlet Pressure	Less than 2 psi
Pressure Drop	0.5 in. w.c.
Specific Gravity	0.60

PIPE SIZE (inch)														
Nominal	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	4	5	6	8	10	12
Actual ID	0.622	0.824	1.049	1.380	1.610	2.067	2.469	3.068	4.026	5.047	6.065	7.981	10.020	11.938
Length (ft)	Capacity in Cubic Feet of Gas Per Hour													
10	172	360	678	1,390	2,090	4,020	6,400	11,300	23,100	41,800	67,600	139,000	252,000	399,000
20	118	247	466	957	1,430	2,760	4,400	7,780	15,900	28,700	46,500	95,500	173,000	275,000
30	95	199	374	768	1,150	2,220	3,530	6,250	12,700	23,000	37,300	76,700	139,000	220,000
40	81	170	320	657	985	1,900	3,020	5,350	10,900	19,700	31,900	65,600	119,000	189,000
50	72	151	284	583	873	1,680	2,680	4,740	9,660	17,500	28,300	58,200	106,000	167,000
60	65	137	257	528	791	1,520	2,430	4,290	8,760	15,800	25,600	52,700	95,700	152,000
70	60	126	237	486	728	1,400	2,230	3,950	8,050	14,600	23,600	48,500	88,100	139,000
80	56	117	220	452	677	1,300	2,080	3,670	7,490	13,600	22,000	45,100	81,900	130,000
90	52	110	207	424	635	1,220	1,950	3,450	7,030	12,700	20,600	42,300	76,900	122,000
100	50	104	195	400	600	1,160	1,840	3,260	6,640	12,000	19,500	40,000	72,600	115,000
125	44	92	173	355	532	1,020	1,630	2,890	5,890	10,600	17,200	35,400	64,300	102,000
150	40	83	157	322	482	928	1,480	2,610	5,330	9,650	15,600	32,100	58,300	92,300
175	37	77	144	296	443	854	1,360	2,410	4,910	8,880	14,400	29,500	53,600	84,900
200	34	71	134	275	412	794	1,270	2,240	4,560	8,260	13,400	27,500	49,900	79,000
250	30	63	119	244	366	704	1,120	1,980	4,050	7,320	11,900	24,300	44,200	70,000
300	27	57	108	221	331	638	1,020	1,800	3,670	6,630	10,700	22,100	40,100	63,400
350	25	53	99	203	305	587	935	1,650	3,370	6,100	9,880	20,300	36,900	58,400
400	23	49	92	189	283	546	870	1,540	3,140	5,680	9,190	18,900	34,300	54,300
450	22	46	86	177	266	512	816	1,440	2,940	5,330	8,620	17,700	32,200	50,900
500	21	43	82	168	251	484	771	1,360	2,780	5,030	8,150	16,700	30,400	48,100
550	20	41	78	159	239	459	732	1,290	2,640	4,780	7,740	15,900	28,900	45,700
600	19	39	74	152	228	438	699	1,240	2,520	4,560	7,380	15,200	27,500	43,600
650	18	38	71	145	218	420	669	1,180	2,410	4,360	7,070	14,500	26,400	41,800
700	17	36	68	140	209	403	643	1,140	2,320	4,190	6,790	14,000	25,300	40,100
750	17	35	66	135	202	389	619	1,090	2,230	4,040	6,540	13,400	24,400	38,600
800	16	34	63	130	195	375	598	1,060	2,160	3,900	6,320	13,000	23,600	37,300
850	16	33	61	126	189	363	579	1,020	2,090	3,780	6,110	12,600	22,800	36,100
900	15	32	59	122	183	352	561	992	2,020	3,660	5,930	12,200	22,100	35,000
950	15	31	58	118	178	342	545	963	1,960	3,550	5,760	11,800	21,500	34,000
1,000	14	30	56	115	173	333	530	937	1,910	3,460	5,600	11,500	20,900	33,100
1,100	14	28	53	109	164	316	503	890	1,810	3,280	5,320	10,900	19,800	31,400
1,200	13	27	51	104	156	301	480	849	1,730	3,130	5,070	10,400	18,900	30,000

1,300	12	26	49	100	150	289	460	813	1,660	3,000	4,860	9,980	18,100	28,700
1,400	12	25	47	96	144	277	442	781	1,590	2,880	4,670	9,590	17,400	27,600
1,500	11	24	45	93	139	267	426	752	1,530	2,780	4,500	9,240	16,800	26,600
1,600	11	23	44	89	134	258	411	727	1,480	2,680	4,340	8,920	16,200	25,600
1,700	11	22	42	86	130	250	398	703	1,430	2,590	4,200	8,630	15,700	24,800
1,800	10	22	41	84	126	242	386	682	1,390	2,520	4,070	8,370	15,200	24,100
1,900	10	21	40	81	122	235	375	662	1,350	2,440	3,960	8,130	14,800	23,400
2,000	NA	20	39	79	119	229	364	644	1,310	2,380	3,850	7,910	14,400	22,700

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square inch = 6.895kPa, 1-inch water column = 0.2488 kPa, 1 British thermal unit per hour = 0.293 1 W, 1 cubic foot per hour = 0.0283 m³/h, 1 degree = 0.01745 rad.

Notes:

1. NA means a flow of less than 10cfh.
2. All table entries have been rounded to three significant digits.

Table 402.4(3) Schedule 40 Metallic Pipe

Gas	Natural
Inlet Pressure	2.0 psi
Pressure Drop	1.0 psi
Specific Gravity	0.60

PIPE SIZE (inch)									
Nominal	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	4
Actual ID	0.622	0.824	1.049	1.380	1.610	2.067	2.469	3.068	4.026
Length (ft)	Capacity in Cubic Feet of Gas Per Hour								
10	1,510	3,040	5,560	11,400	17,100	32,900	52,500	92,800	189,000
20	1,070	2,150	3,930	8,070	12,100	23,300	37,100	65,600	134,000
30	869	1,760	3,210	6,590	9,880	19,000	30,300	53,600	109,000
40	753	1,520	2,780	5,710	8,550	16,500	26,300	46,400	94,700
50	673	1,360	2,490	5,110	7,650	14,700	23,500	41,500	84,700
60	615	1,240	2,270	4,660	6,980	13,500	21,400	37,900	77,300
70	569	1,150	2,100	4,320	6,470	12,500	19,900	35,100	71,600
80	532	1,080	1,970	4,040	6,050	11,700	18,600	32,800	67,000
90	502	1,010	1,850	3,810	5,700	11,000	17,500	30,900	63,100
100	462	934	1,710	3,510	5,260	10,100	16,100	28,500	58,200
125	414	836	1,530	3,140	4,700	9,060	14,400	25,500	52,100
150	372	751	1,370	2,820	4,220	8,130	13,000	22,900	46,700
175	344	695	1,270	2,601	3,910	7,530	12,000	21,200	43,300
200	318	642	1,170	2,410	3,610	6,960	11,100	19,600	40,000
250	279	583	1,040	2,140	3,210	6,180	9,850	17,400	35,500
300	253	528	945	1,940	2,910	5,600	8,920	15,800	32,200
350	232	486	869	1,790	2,670	5,150	8,210	14,500	29,600
400	216	452	809	1,660	2,490	4,790	7,640	13,500	27,500
450	203	424	759	1,560	2,330	4,500	7,170	12,700	25,800
500	192	401	717	1,470	2,210	4,250	6,770	12,000	24,400
550	182	381	681	1,400	2,090	4,030	6,430	11,400	23,200
600	174	363	650	1,330	2,000	3,850	6,130	10,800	22,100
650	166	348	622	1,280	1,910	3,680	5,870	10,400	21,200
700	160	334	598	1,230	1,840	3,540	5,640	9,970	20,300
750	154	322	576	1,180	1,770	3,410	5,440	9,610	19,600
800	149	311	556	1,140	1,710	3,290	5,250	9,280	18,900
850	144	301	538	1,100	1,650	3,190	5,080	8,980	18,300
900	139	292	522	1,070	1,600	3,090	4,930	8,710	17,800
950	135	283	507	1,040	1,560	3,000	4,780	8,460	17,200
1,000	132	275	493	1,010	1,520	2,920	4,650	8,220	16,800
1,100	125	262	468	960	1,440	2,770	4,420	7,810	15,900
1,200	119	250	446	917	1,370	2,640	4,220	7,450	15,200
1,300	114	239	427	878	1,320	2,530	4,040	7,140	14,600
1,400	110	230	411	843	1,260	2,430	3,880	6,860	14,000

1,500	106	221	396	812	1,220	2,340	3,740	6,600	13,500
1,600	102	214	382	784	1,180	2,260	3,610	6,380	13,000
1,700	99	207	370	759	1,140	2,190	3,490	6,170	12,600
1,800	96	200	358	736	1,100	2,120	3,390	5,980	12,200
1,900	93	195	348	715	1,070	2,060	3,290	5,810	11,900
2,000	91	189	339	695	1,040	2,010	3,200	5,650	11,500

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square inch = 6.895kPa, 1-inch water column = 0.2488 kPa, 1 British thermal unit per hour = 0.293 1 W, 1 cubic foot per hour = 0.0283 m³ /h, 1 degree = 0.0 1745 rad.

Note: All table entries have been rounded to three significant digits.

Table 402.4(4) Schedule 40 Metallic Pipe

Gas	Natural
Inlet Pressure	3.0 psi
Pressure Drop	2.0 psi
Specific Gravity	0.60

PIPE SIZE (inch)									
Nominal	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	4
Actual ID	0.622	0.824	1.049	1.380	1.610	2.067	2.469	3.068	4.026
Length (ft)	Capacity in Cubic Feet of Gas Per Hour								
10	2,350	4,920	9,270	19,000	28,500	54,900	87,500	155,000	316,000
20	1,620	3,380	6,370	13,100	19,600	37,700	60,100	106,000	217,000
30	1,300	2,720	5,110	10,500	15,700	30,300	48,300	85,400	174,000
40	1,110	2,320	4,380	8,990	13,500	25,900	41,300	73,100	149,000
50	985	2,060	3,880	7,970	11,900	23,000	36,600	64,800	132,000
60	892	1,870	3,520	7,220	10,800	20,800	33,200	58,700	120,000
70	821	1,720	3,230	6,640	9,950	19,200	30,500	54,000	110,000
80	764	1,600	3,010	6,180	9,260	17,800	28,400	50,200	102,000
90	717	1,500	2,820	5,800	8,680	16,700	26,700	47,100	96,100
100	677	1,420	2,670	5,470	8,200	15,800	25,200	44,500	90,800
125	600	1,250	2,360	4,850	7,270	14,000	22,300	39,500	80,500
150	544	1,140	2,140	4,400	6,590	12,700	20,200	35,700	72,900
175	500	1,050	1,970	4,040	6,060	11,700	18,600	32,900	67,100
200	465	973	1,830	3,760	5,640	10,900	17,300	30,600	62,400
250	412	862	1,620	3,330	5,000	9,620	15,300	27,100	55,300
300	374	781	1,470	3,020	4,530	8,720	13,900	24,600	50,100
350	344	719	1,350	2,780	4,170	8,020	12,800	22,600	46,100
400	320	669	1,260	2,590	3,870	7,460	11,900	21,000	42,900
450	300	627	1,180	2,430	3,640	7,000	11,200	19,700	40,200
500	283	593	1,120	2,290	3,430	6,610	10,500	18,600	38,000
550	269	563	1,060	2,180	3,260	6,280	10,000	17,700	36,100
600	257	537	1,010	2,080	3,110	5,990	9,550	16,900	34,400
650	246	514	969	1,990	2,980	5,740	9,150	16,200	33,000
700	236	494	931	1,910	2,860	5,510	8,790	15,500	31,700
750	228	476	897	1,840	2,760	5,310	8,470	15,000	30,500
800	220	460	866	1,780	2,660	5,130	8,180	14,500	29,500
850	213	445	838	1,720	2,580	4,960	7,910	14,000	28,500
900	206	431	812	1,670	2,500	4,810	7,670	13,600	27,700
950	200	419	789	1,620	2,430	4,670	7,450	13,200	26,900
1,000	195	407	767	1,580	2,360	4,550	7,240	12,800	26,100
1,100	185	387	729	1,500	2,240	4,320	6,890	12,200	24,800
1,200	177	369	695	1,430	2,140	4,120	6,570	11,600	23,700
1,300	169	353	666	1,370	2,050	3,940	6,290	11,100	22,700
1,400	162	340	640	1,310	1,970	3,790	6,040	10,700	21,800
1,500	156	327	616	1,270	1,900	3,650	5,820	10,300	21,000
1,600	151	316	595	1,220	1,830	3,530	5,620	10,000	20,300
1,700	146	306	576	1,180	1,770	3,410	5,440	9,610	19,600
1,800	142	296	558	1,150	1,720	3,310	5,270	9,320	19,000
1,900	138	288	542	1,110	1,670	3,210	5,120	9,050	18,400

2,000	134	280	527	1,080	1,620	3,120	4,980	8,800	18,000
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For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square inch = 6.895kPa, 1-inch water column = 0.2488 kPa, 1 British thermal unit per hour = 0.293 1 W, 1 cubic foot per hour = 0.0283 m³/h, 1 degree = 0.01745 rad.

Note: All table entries have been rounded to three significant digits.

Table 402.4(5) Schedule 40 Metallic Pipe

Gas	Natural
Inlet Pressure	5.0 psi
Pressure Drop	3.5 psi
Specific Gravity	0.60

PIPE SIZE (inch)									
Nominal	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	4
Actual ID	0.622	0.824	1.049	1.380	1.610	2.067	2.469	3.068	4.026
Length (ft)	Capacity in Cubic Feet of Gas Per Hour								
10	3,190	6,430	11,800	24,200	36,200	69,700	111,000	196,000	401,000
20	2,250	4,550	8,320	17,100	25,600	49,300	78,600	139,000	283,000
30	1,840	3,720	6,790	14,000	20,900	40,300	64,200	113,000	231,000
40	1,590	3,220	5,880	12,100	18,100	34,900	55,600	98,200	200,000
50	1,430	2,880	5,260	10,800	16,200	31,200	49,700	87,900	179,000
60	1,300	2,630	4,800	9,860	14,800	28,500	45,400	80,200	164,000
70	1,200	2,430	4,450	9,130	13,700	26,400	42,000	74,300	151,000
80	1,150	2,330	4,260	8,540	12,800	24,700	39,300	69,500	142,000
90	1,060	2,150	3,920	8,050	12,100	23,200	37,000	65,500	134,000
100	979	1,980	3,620	7,430	11,100	21,400	34,200	60,400	123,000
125	876	1,770	3,240	6,640	9,950	19,200	30,600	54,000	110,000
150	786	1,590	2,910	5,960	8,940	17,200	27,400	48,500	98,900
175	728	1,470	2,690	5,520	8,270	15,900	25,400	44,900	91,600
200	673	1,360	2,490	5,100	7,650	14,700	23,500	41,500	84,700
250	558	1,170	2,200	4,510	6,760	13,000	20,800	36,700	74,900
300	506	1,060	1,990	4,090	6,130	11,800	18,800	33,300	67,800
350	465	973	1,830	3,760	5,640	10,900	17,300	30,600	62,400
400	433	905	1,710	3,500	5,250	10,100	16,100	28,500	58,100
450	406	849	1,600	3,290	4,920	9,480	15,100	26,700	54,500
500	384	802	1,510	3,100	4,650	8,950	14,300	25,200	51,500
550	364	762	1,440	2,950	4,420	8,500	13,600	24,000	48,900
600	348	727	1,370	2,810	4,210	8,110	12,900	22,900	46,600
650	333	696	1,310	2,690	4,030	7,770	12,400	21,900	44,600
700	320	669	1,260	2,590	3,880	7,460	11,900	21,000	42,900
750	308	644	1,210	2,490	3,730	7,190	11,500	20,300	41,300
800	298	622	1,170	2,410	3,610	6,940	11,100	19,600	39,900
850	288	602	1,130	2,330	3,490	6,720	10,700	18,900	38,600
900	279	584	1,100	2,260	3,380	6,520	10,400	18,400	37,400
950	271	567	1,070	2,190	3,290	6,330	10,100	17,800	36,400
1,000	264	551	1,040	2,130	3,200	6,150	9,810	17,300	35,400
1,100	250	524	987	2,030	3,030	5,840	9,320	16,500	33,600
1,200	239	500	941	1,930	2,900	5,580	8,890	15,700	32,000
1,300	229	478	901	1,850	2,770	5,340	8,510	15,000	30,700
1,400	220	460	866	1,780	2,660	5,130	8,180	14,500	29,500
1,500	212	443	834	1,710	2,570	4,940	7,880	13,900	28,400
1,600	205	428	806	1,650	2,480	4,770	7,610	13,400	27,400
1,700	198	414	780	1,600	2,400	4,620	7,360	13,000	26,500
1,800	192	401	756	1,550	2,330	4,480	7,140	12,600	25,700
1,900	186	390	734	1,510	2,260	4,350	6,930	12,300	25,000
2,000	181	379	714	1,470	2,200	4,230	6,740	11,900	24,300

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square inch = 6.895kPa, 1-inch water column = 0.2488 kPa, 1 British thermal unit per hour = 0.293 1 W, 1 cubic foot per hour = 0.0283 m³/h, 1 degree = 0.0 1745 rad.

Note: All table entries have been rounded to three significant digits.

402.5 Allowable pressure drop.

The design pressure loss in any piping system under maximum probable flow conditions, from the point of delivery to the inlet connection of the appliance, shall be such that the supply pressure at the appliance is greater than or equal to the minimum pressure required by appliance.

402.6 Gas distribution pressures.

No gas distribution piping containing gas at a pressure in excess of 1/2 psig (3.5 kPa gauge) shall be run within a building.

Exceptions:

1. Pressure not exceeding 5 psig (34.5 kPa gauge) is permitted for: (a) commercial and industrial occupancies where fuel requirements for appliances exceed 4,000 cubic feet per hour (113.2 m³ /h) and such large volume use is supplied through separate gas distribution piping.
2. Gas pressure not exceeding 15 psig (100 kPa gauge) is permitted for appliances in excess of 100,000 cubic feet per hour (2830 m³ /h) provided the gas distribution piping is installed as provided for in Section 404. The use of pressure in excess of 15 psig (100 kPa gauge) shall be permitted for distribution piping provided all of the requirements of Section 406 and Appendix G are met.

Section FGC 403: Piping Materials

403.1 General.

Materials used for piping systems shall be new and comply with the requirements of this chapter or shall be approved.

403.1.1 Pipe size and pressure limitations.

1. All requirements for installation of gas distribution piping with operating pressures at 1/2 psig (3.5 kPa gauge) or less and above 1/2 psig (3.5 kPa gauge) shall be in accordance with Chapter 4 of this code.
2. Gas distribution piping operating at a pressure of over 1/2 psig (3.5 kPa gauge) to 5 psig (34.5 kPa gauge) and size 4 inches (102 mm) or larger shall be welded.

Exception: Manufactured and listed gas trains provided with the appliance may be threaded.

3. All gas distribution piping operating at a pressure above 5 psig (34.5 kPa gauge) shall be welded.
4. All welding of gas distribution piping shall be subject to special inspection as set forth in Section 406.
5. All piping 4 inches (102 mm) and greater operating at pressure exceeding 5 psig (34.5 kPa gauge) must be butt welded, subject to special inspection and radiographed.
6. Threaded piping may be used up to 4 inches (102 mm) at pressure no greater than 1/2 psig (3.5 kPa gauge).

403.2 Used materials.

Used pipe, fittings, valves and other materials shall not be re-used.

403.3 Other materials.

Material not covered by the standards specifications listed herein shall be investigated and tested to determine that it is safe and suitable for the proposed service, and, in addition, shall be recommended for that service by the manufacturer subject to approval by the commissioner.

403.4 Metallic pipe.

Metallic pipe shall comply with Sections 403.4.1 through 403.4.4.

403.4.1 Cast iron.

Cast-iron pipe shall not be used.

403.4.2 Steel.

Carbon steel and wrought-iron pipe shall be at least of standard weight and shall comply with one of the following standards:

1. ASME B 36.10, 10M
2. ASTM A 53/A53M; or
3. ASTM A 106.

403.4.3 Copper and brass.

Copper and brass pipe shall not be used.

403.4.4 Aluminum.

Aluminum-alloy pipe shall not be used.

403.5 Metallic tubing.

Metallic tubing shall not be used except as provided in Section 405.5.

403.5.1 Standards.

Stainless steel flexible multiple leg hose assemblies shall be designed in accordance with the requirements of this code and the manufacturer's recommendation.

403.5.2 Seismic requirements.

Stainless steel flexible multiple leg hose assemblies shall be designed to withstand seismic force and displacement in accordance with Section 1613 of the *New York City Building Code*.

403.5.3 Special inspection required.

The installation of stainless steel flexible multiple leg hose assemblies shall be subject to special inspection in accordance with Section 1707.7 of the *New York City Building Code* and Section 406 of this code.

403.6 [Reserved.]

403.7 Workmanship and defects.

Pipe and fittings shall be clear and free from cutting burrs and defects in structure or threading, and shall be thoroughly brushed, and chip and scale blown. Defects in pipe and fittings shall not be repaired. Defective pipe and fittings shall be replaced (see Section 406.1.2).

403.8 Protective coating.

Where in contact with material or atmosphere exerting a corrosive action, metallic piping and fittings coated with a corrosion-resistant material shall be used. External coatings or linings used on piping or components shall not be considered as adding strength.

403.9 Metallic pipe threads.

Metallic pipe and fitting threads shall be taper pipe threads and shall comply with ASME B1.20.1.

403.9.1 Damaged threads.

Pipe with threads that are stripped, chipped, corroded or otherwise damaged shall not be used. Where a weld opens during the operation of cutting or threading, that portion of the pipe shall not be used.

403.9.2 Number of threads.

Field threading of metallic pipe shall be in accordance with Table 403.9.2.

Table 403.9.2

Specifications for Threading Metallic Pipe

Iron Pipe Size (inches)	Approximate Length of Threaded Portion (inches)	Approximate Number of Threads to be Cut
1/2	3/4	10
3/4	3/4	10
1	7/8	10
1 1/4	1	11
1 1/2	1	11
2	1	11
2 1/2	1 1/2	12
3	1 1/2	12
4	1 5/8	13

For SI: 1 inch = 25.4 mm.

403.9.3 Thread compounds.

Thread (joint) compounds (pipe dope) shall be resistant to the action of liquefied petroleum gas or to any other chemical constituents of the gases to be conducted through the piping. Use of cotton thread (lamp wick) is prohibited.

403.10 Metallic piping joints and fittings.

The type of piping joint used shall be suitable for the pressure-temperature conditions and shall be selected giving consideration to joint tightness and mechanical strength under the service conditions. The joint shall be able to sustain the maximum end force caused by the internal pressure and any additional forces caused by temperature expansion or contraction, vibration, fatigue or the weight of the pipe and its contents.

403.10.1 Pipe joints.

Pipe joints shall be threaded, flanged, or welded.

403.10.2 Tubing joints.

Tubing joints shall not be used.

403.10.3 Flared joints.

Flared joints shall not be used.

403.10.4 Metallic fittings.

Metallic fittings shall comply with the following:

1. Threaded fittings in sizes larger than 4 inches (102 mm) shall not be used.
2. Fittings used with steel or wrought-iron pipe shall be steel or malleable iron.
3. Bushings shall not be used.

403.11 [Reserved.]

403.12 Flanges.

All flanges shall comply with ASME B16.1, ASME B16.20, or MSS SP-6. The pressure-temperature ratings shall equal or exceed that required by the application.

403.12.1 Flange facings.

Standard facings shall be permitted for use under this code. Where 150-pound (1034 kPa) pressure-rated steel flanges are bolted to Class 125 cast-iron flanges, the raised face on the steel flange shall be removed.

403.13 Flange gaskets.

Material for gaskets shall be capable of withstanding the design temperature and pressure of the piping system, and the chemical constituents of the gas being conducted, without change to its chemical and physical properties. The effects of fire exposure to the joint shall be considered in choosing material. Acceptable materials include metal or non-asbestos fiber and aluminum "O" rings and spiral wound metal gaskets. When a flanged joint is opened, the gasket shall be replaced. Full-face gaskets shall be used with all cast-iron flanges.

Section FGC 404: Piping System Installation

404.1 Prohibited locations.

Piping shall not be installed in or through a ducted supply, return or exhaust duct, or a trash or clothes chute, chimney or gas vent, ventilating duct, dumbwaiter or elevator shaft. Piping installed downstream of the point of delivery shall not extend through any townhouse unit other than the unit served by such piping. Piping, fixtures, or equipment shall be located so as not to interfere with the normal operation of windows or doors and other exit openings. The following installation limitations shall apply:

1. **Stair enclosures.** Gas piping shall not be installed within a stair enclosure or required exit or exit way.
2. **Fire standpipe riser.** Gas piping shall not be installed in any shaft containing standpipe risers.
3. **Fire pump and fire pump rooms.** Gas piping, gas consumption devices or any other gas equipment shall not be installed within any space housing a fire pump. Access to gas meter rooms shall not be permitted through rooms housing a fire pump.
4. **Fire-rated construction.** Gas piping shall not be installed within fire-rated assemblies.
5. **Public corridor.** Gas piping shall not be installed in public corridors and exit enclosures.

Exception: Gas piping may be installed in public corridors in residential buildings that do not have floors below grade or in multi-use buildings that have a residential occupancy in accordance with the following:

1. Gas piping shall be permitted to be installed within a public corridor at the lowest level of the building or the lowest residential level of the building.
2. All gas valves located within the public corridor shall be accessible for maintenance and inspection.
3. Gas pressure within the public corridor piping shall not exceed 1/2 psi (14 inch w.c.). The completed piping within the public corridor is to be tested and proven tight at 10 psig (69 kPa gauge) for a minimum of 30 minutes.
4. The public corridor shall be ventilated in accordance with the *New York City Mechanical Code*. The pipe shall not be installed in a return air plenum.
5. Pipes must be welded.

404.2 Piping in solid partitions and walls.

Concealed piping shall not be located in solid partitions and solid walls, unless installed in a ventilated chase or casing.

404.3 Piping in concealed locations.

Portions of a piping system installed in concealed locations shall not have unions, tubing fittings, bushings, compression couplings or swing joints made by combinations of fittings.

404.4 Piping through foundation wall.

Underground piping, where installed below grade through the outer foundation or basement wall of a building, shall be encased in a protective pipe sleeve. The annular space between the gas piping and the sleeve shall be sealed.

404.5 Branch take-off.

Branches shall be taken off the riser with not less than a two-elbow swing.

404.6 Piping in solid floors.

Piping in solid floors shall be laid in channels in the floor and covered in a manner that will allow access to the piping with a minimum amount of damage to the building. Where such piping is subject to exposure to excessive moisture or corrosive substances, the piping shall be protected in an approved manner. As an alternative to installation in channels, the piping shall be installed in a conduit of Schedule 40 steel or wrought iron pipe with tightly sealed ends and joints. At least one end shall have a vented outlet piped to a safe location outdoors. The vent terminal shall be outdoors, minimum 18 inches (457 mm) above grade, not under an opening to building or overhang, and shall be installed so as to prevent the entrance of water and insects. Both ends of such conduit shall extend not less than 2 inches (51 mm) beyond the point where the pipe emerges from the floor.

404.6.1 Conduit with one end terminating outdoors.

The conduit shall extend into an occupiable portion of the building and, at the point where the conduit terminates in the building, the space between the conduit and the gas piping shall be sealed to prevent the possible entrance of any gas leakage. The conduit shall extend not less than 2 inches (51 mm) beyond the point where the pipe emerges from the floor. If the end sealing is capable of withstanding the full pressure of the gas pipe, the conduit shall be designed for the same pressure as the pipe. Such conduit shall extend not less than 4 inches (102 mm) outside the building, shall be vented above grade to the outdoors and shall be installed so as to prevent the entrance of water and insects.

404.6.2 Conduit with both ends terminating indoors.

Where the conduit originates and terminates within the same building, the conduit shall originate and terminate in an accessible portion of the building and shall not be sealed. The conduit shall extend not less than 2 inches (51 mm) beyond the point where the pipe emerges from the floor.

404.7 Above-ground outdoor piping.

All piping installed outdoors shall be elevated not less than 3 1/2 inches (152 mm) above ground and where installed across roof surfaces, shall be elevated not less than 3 1/2 inches (152 mm) above the roof surface. Piping installed above ground, outdoors, and installed across the surface of roofs shall be securely supported to the structure and located where it will be protected from physical damage. Where passing through an outside wall, the piping shall also be protected against corrosion by coating or wrapping with an inert material. Where piping is encased in a protective pipe sleeve, the annular space between the piping and the sleeve shall be sealed. At least one end shall have a vented outlet piped to a safe location outdoors. The vent terminal shall be outdoors, minimum 18 inches (457 mm) above grade, not under an opening to building or overhang, and shall be installed so as to prevent the entrance of water and insects.

404.8 [Reserved.]

404.9 Protection against corrosion.

Metallic pipe exposed to corrosive action, such as soil condition or moisture, shall be protected in an approved manner. Zinc coatings (galvanizing) shall not be deemed adequate protection for gas piping underground. Ferrous metal exposed in exterior locations shall be protected from corrosion. Zinc coatings (galvanizing) shall be deemed adequate protection for gas piping exposed in exterior locations. Where dissimilar metals are joined underground, an insulating coupling or fitting shall be used. Piping shall not be laid in contact with cinders.

404.9.1 Prohibited use.

Uncoated threaded or socket-welded joints shall not be used in piping in contact with soil or where internal or external crevice corrosion is known to occur.

404.9.2 Protective coatings and wrapping.

Pipe protective coatings and wrappings shall be approved for the application and shall be factory applied.

Exception: Where installed in accordance with the manufacturer's installation instructions, field application of coatings and wrappings shall be permitted for pipe nipples, fittings and locations where the factory coating or wrapping has been damaged or necessarily removed at joints.

404.10 Minimum burial depth.

Underground piping systems shall be installed a minimum depth of 24 inches (610 mm) below grade.

404.11 Trenches.

The trench shall be graded so that the pipe has a firm, substantially continuous bearing on the bottom of the trench.

404.12 Piping underground beneath buildings.

Piping installed underground beneath buildings is prohibited except where the piping is encased in a conduit of wrought iron or steel pipe designed to withstand the superimposed loads. The conduit shall be protected from corrosion in accordance with Section 404.9 and shall be installed in accordance with Section 404.12.1 or 404.12.2.

404.12.1 Conduit with one end terminating outdoors.

The conduit shall extend into an occupiable portion of the building and, at the point where the conduit terminates in the building, the space between the conduit and the gas piping shall be sealed to prevent the possible entrance of any gas leakage. The conduit shall extend not less than 2 inches (51 mm) beyond the point where the pipe emerges from the floor. Where the end sealing is capable of withstanding the full pressure of the gas pipe, the conduit shall be designed for the same pressure as the pipe. Such conduit shall extend not less than 4 inches (102 mm) outside of the building, shall be vented above grade to the outdoors and shall be installed so as to prevent the entrance of water and insects.

404.12.2 Conduit with both ends terminating indoors.

Where the conduit originates and terminates within the same building, the conduit shall originate and terminate in an accessible portion of the building and shall not be sealed. The conduit shall extend not less than 2 inches (51 mm) beyond the point where the pipe emerges from the floor.

404.13 Outlet closures.

Gas outlets shall be permitted only under the following conditions:

1. Valved and capped gas tight outlets for single appliance outlets as approved.
2. Valved and capped outlets on each floor in non-production laboratory buildings for future laboratories.
3. Listed and labeled flush-mounted-type quick disconnect devices and listed and labeled gas convenience outlets installed in accordance with the manufacturer's installation instructions.

404.14 Location of outlets.

The unthreaded portion of piping outlets shall extend not less than 1 inch (25 mm) through finished ceilings and walls and where extending through floors or outdoor patios and slabs, shall not be less than 2 inches (51 mm) above them. The outlet fitting or piping shall be securely supported. Outlets shall not be placed behind doors. Outlets shall be located in the room or space where the appliance is installed.

Exception: Listed and labeled flush-mounted-type quick disconnect devices and listed and labeled gas convenience outlets shall be installed in accordance with the manufacturer's installation instructions.

404.15 [Reserved.]

404.16 Prohibited devices.

A device shall not be placed inside the piping or fittings that will reduce the cross-sectional area or otherwise obstruct the free flow of gas.

Exceptions:

1. Approved gas filters.
2. An approved fitting or device where the gas piping system has been sized to accommodate the pressure drop of the fitting or device.

404.17 Testing of piping.

Before any system of piping is put in service or concealed, it shall be tested to ensure that it is gas tight. Testing, inspection and purging of piping systems shall comply with Section 406.

Section FGC 405: Piping Bends and Changes In Direction

405.1 General.

Changes in direction of pipe shall be permitted to be made by the use of fittings.

405.2 [Reserved.]

405.3 [Reserved.]

405.4 Elbows.

Factory-made welding elbows or transverse segments cut therefrom shall have an arc length measured along the crotch at least 1 inch (25 mm) in pipe sizes 2 inches (51 mm) and larger.

405.5 Pipe movement.

Stainless steel flexible multiple leg hose assemblies listed and labeled as an assembly per UL 536 shall be installed for low pressure flammable and combustible gas piping systems where pipe movement resulting from thermal changes and random seismic shifts can occur in the piping systems.

405.5.1 Seismic requirements.

Stainless steel flexible multiple leg hose assemblies shall be designed to withstand seismic force and displacement in accordance with Section 1613 of the *New York City Building Code*.

405.5.2 Inspection.

The installation of stainless steel flexible multiple leg hose assemblies shall be subject to special inspections in accordance with Chapter 17 of the *New York City Building Code*.

Section FGC 406: Inspection, Testing and Purging

406.1 General.

Prior to acceptance and initial operation, all piping installations shall be inspected and pressure tested to determine that the materials, design, fabrication, and installation practices comply with the requirements of this code.

406.1.1 Inspections.

Inspection shall consist of visual examination, during or after manufacture, fabrication, assembly, or pressure tests as appropriate. Supplementary types of nondestructive inspection techniques, such as magnetic-particle, radiographic, ultrasonic, etc., shall not be required unless specifically listed herein or in the engineering design.

406.1.1.1 Welder's qualifications.

Welders installing gas piping within buildings at any pressure shall comply with the following:

1. Welders shall be qualified for all pipe sizes, wall thicknesses and all positions in accordance with the *ASME Boiler and Pressure Vessel Code*, Section IX. Requalification of welders is required on an annual basis and when requested by the commissioner.
2. Welder qualification testing shall be performed by an approved agency and the inspector witnessing the test shall be an authorized AWS Certified Welding Inspector. Radiographic test specimens shall be evaluated by a radiographic inspector having a minimum radiography qualification of Level II in accordance with the ASNT, Document No. SNT-TC-1A, Supplement A.
3. Copies of the certified welder qualification reports shall be maintained by both the approved agency and the licensed master plumber employing the welder(s) for at least six years and shall be made available to the department upon request.
4. The approved agency shall submit certified welder qualification reports to the department upon successful qualification of a welder and when requested by the commissioner.
5. The licensed master plumber employing the welder(s) shall submit a statement to the department including who welded the gas piping along with a copy(s) of the certified welder qualification report(s) witnessed by a representative of the licensed master plumber, at the time of the first roughing inspection.

406.1.1.2 Welding requirements.

All welded gas distribution and meter piping main and branch supplies to customer equipment operating in excess of 5 psig (34.5 kPa gauge) inside buildings shall be welded; and shall be subject to special inspection in accordance with Chapter 17 of the *New York City Building Code*. All piping 2 1/2 inches (63.5 mm) or greater in diameter shall be butt-welded, and piping less than 2 1/2 (63.5 mm) inches in diameter may be socket-welded or butt-welded. Radiographic testing shall be performed on all butt welds in gas meter and gas distribution piping operating at pressures exceeding 5 psig (34.5 kPa gauge) within buildings, in accordance with *ASME Boiler and Pressure Vessel Code*, Section IX.

406.1.1.3 Welding records.

The licensed master plumber employing the welder(s) shall assign to each welder an identification symbol or number to identify the welds performed by that particular welder. The welder shall identify all welds with his or her symbol or number. The licensed master plumber shall maintain records identifying the weld(s) made by each welder for at least six years and shall make such records available to the department upon request.

406.1.2 Repairs and additions.

In the event repairs or additions are made after the pressure test, the affected piping shall be tested.

406.1.3 New branches.

A piping system shall be tested as a complete unit.

406.1.4 System testing.

A piping system shall be tested as a complete unit.

406.1.5 Regulators and valve assemblies.

Regulator and valve assemblies fabricated independently of the piping system in which they are to be installed shall be permitted to be tested with inert gas or air at the time of fabrication.

406.2 Test medium.

The test medium shall be air, nitrogen, carbon dioxide or an inert gas. Oxygen shall not be used. Fresh water may be used as the test medium only where the required test pressure exceeds 100 psig (689 kPa).

406.3 Test preparation.

Pipe joints, including welds, shall be left exposed for examination during the test.

Exception: Covered or concealed pipe end joints that have been previously tested in accordance with this code.

406.3.1 Expansion joints.

Expansion joints shall be provided with temporary restraints, if required, for the additional thrust load under test.

406.3.2 Appliance and equipment isolation.

Appliances and equipment that are not to be included in the test shall be either disconnected from the piping or isolated by blanks, blind flanges, or caps. Flanged joints at which blinds are inserted to blank off other equipment during the test shall not be required to be tested.

406.3.3 Appliance and equipment disconnection.

Where the piping system is connected to appliances or equipment designed for operating pressures of less than the test pressure, such appliances or equipment shall be isolated from the piping system by disconnecting them and capping the outlet(s).

406.3.4 Valve isolation.

Where the piping system is connected to appliances or equipment designed for operating pressures equal to or greater than the test pressure, such appliances or equipment shall be isolated from the piping system by closing the individual appliance or equipment shutoff valve(s).

406.3.5 Testing precautions.

All testing of piping systems shall be done with due regard for the safety of employees and the public during the test. Bulkheads, anchorage, and bracing suitably designed to resist test pressures shall be installed if necessary. Prior to testing, the interior of the pipe shall be purged to flush out all foreign material, including weld splatter, dirt, rags, and other debris left inside the pipe during welding operations and piping installation.

406.4 Test pressure measurement.

Upon completion of the installation of a section of a gas system or of the entire gas system, and before appliances are connected thereto, the completed section or system shall be verified as to materials, and tested and proven tight as follows:

1. Gas distribution piping shall comply with the following:
 - 1.1. Distribution pressures up to 1/2 psig (3.5 kPa gauge). The completed piping is to be tested with a nonmercury gauge at a pressure of 3 psig (20 kPa gauge) for a minimum of 30 minutes.
 - 1.2. Distribution pressures over 1/2 psig (3.5 kPa gauge) through 5 psig (34.5 kPa gauge). The completed piping is to be tested at 50 psig (340 kPa gauge) for a minimum of 30 minutes.
 - 1.3. Distribution pressures over 5 psig (34.5 kPa gauge) through 15 psig (100 kPa gauge). The completed piping is to be tested at 100 psig (689 kPa gauge) for a minimum of 1 hour.
 - 1.4. Distribution pressures above 15 psig (100 kPa gauge). The completed piping is to be tested to twice the maximum allowable operating pressure, but not less than 100 psig (689 kPa gauge), for a minimum of 1 hour.
 - 1.5. Where the test pressure exceeds 125 psig (862 kPa gauge), the test pressure shall not exceed a value that produces a hoop stress in the piping greater than 50 percent of the specified minimum yield strength of the pipe.
2. Meter piping shall be pressure tested in accordance with the requirements of the serving utility. These requirements shall be either the same as those for testing distribution piping in numbered paragraph 1 of this section or, if different, the piping shall be certified by the local utility as being tested in compliance with their requirements.
3. Notwithstanding the above, all factory applied coated and wrapped pipe shall be pressure tested at a minimum of 90 psig (621 kPa gauge). For testing, the piping shall be filled with air or an inert gas, and the source of pressure shall be isolated before the pressure readings are made. All test duration time periods are to be measured after stabilization of testing medium. Fresh water may be used as the test medium only where the required test pressure exceeds 100 psig (689 kPa gauge).

406.4.1 Minimum standards for nonmercury gauges.

1. This section establishes minimum standards for nonmercury gauges to test gas piping, drainage and vent systems.
2. Each gauge shall meet the following requirements:
 - 2.1. The gauge shall be manufactured and used in accordance with ASME B 40.100, which incorporates ASME B 40.1 and ASME B 40.7, and the manufacturer shall provide with the gauge a written statement that the gauge is manufactured in accordance with such ASME standard;
 - 2.2. The gauge shall be labeled with the name of the manufacturer;
 - 2.3. The gauge shall be kept in a padded separate rigid box and the manufacturer's instructions for use and protection of the gauge shall be complied with;
 - 2.4. The units of measurement "psig" shall appear on the face of the gauge; and
 - 2.5. The gauge shall be kept in good working order.

406.4.2 Analog gauges used to measure pressure in the magnitude of 3 psig (20 kPa gauge).

Each analog gauge used to measure pressure in the magnitude of 3 psig (20 kPa gauge) shall meet the following requirements in addition to satisfying the minimum requirements set forth in section 406.4.1:

1. The face of the gauge shall not be smaller than 2 1/4 inches (57 mm) in diameter;
2. The gauge shall have a minimum of 270 degree (5 rad) dial arc;
3. The gauge shall be calibrated in increments of not greater than one-tenth of a pound;
4. The range of the gauge shall not exceed 5 psig (34.5 kPa gauge) when a 2 1/4-inch (57 mm) diameter gauge is used;
5. The 1/10 psig (0.69 kPa gauge) interval on the gauge shall not be smaller than one-tenth of an inch (2.5 mm) of arc;
6. The gauge shall be provided with an effective stop for the indicating pointer at the zero point;
7. The gauge shall be protected from excessive pressure with a shutoff valve and prior to using the 5 psig (34.5 kPa gauge) the sniffer valve shall be tested with a tire gauge to determine the magnitude of pressure; and
8. The gauge shall have a calibration screw.

406.4.3 Analog gauges used to measure pressure in the magnitude of 5 psig (34.5 kPa gauge).

Each analog gauge used to measure pressure in the magnitude of 5 psig (34.5 kPa gauge) shall meet the following requirements in addition to satisfying the minimum requirements set forth in Section 406.4.1:

1. The face of the gauge shall not be smaller than 2 1/4 inches (57 mm) in diameter;
2. The gauge shall have a minimum of 270 degree (5 rad) dial arc;
3. The gauge shall be calibrated in increments not greater than one-fifth of a pound;
4. The range of the gauge shall not exceed 10 psig (69 kPa gauge) when a 2 1/4 inch (57 mm) diameter gauge is used;
5. The one-fifth interval on the gauge shall not be smaller than one-tenth of an inch (2.5 mm) of arc;

6. The gauge shall be provided with an effective stop for the indicating pointer at the zero point;
7. The gauge shall be protected from excessive pressure with a shutoff valve and prior to using the 10 psig (69 kPa gauge) the snifter valve shall be tested with a tire gauge to determine the magnitude of pressure; and
8. The gauge shall have a calibration screw.

406.4.4 Digital gauges used to measure pressure in the magnitude of 3 psig (20 kPa gauge) and higher.

Each digital gauge used to measure pressure in the magnitude of 3 psig (20 kPa gauge) and higher shall meet the following requirements in addition to satisfying the minimum requirements set forth in Section 406.4.1:

1. The gauge shall have a minimum reading of 1/100 of a psig (69 Pa), and
2. An extra charged battery shall be readily available for immediate use with the gauge.

406.4.5 Witnessing tests of gas-piping systems.

Tests of gas piping systems in accordance with this code shall be witnessed by department plumbing inspectors, or approved agencies. The department shall prescribe qualifications for individuals who are authorized to witness such tests on behalf of approved agencies, including but not limited to the requirement that such individuals shall be licensed master plumbers or registered design professionals with not less than 5 years' experience in the inspection and testing of gas piping systems. Such tests may be conducted without any verifying inspection of tests by the department, provided that verified statements and supporting inspectorial and test reports are filed with the department within one working day of such tests.

406.4.6 Notification.

The holder of the plumbing permit shall give at least 2 days prior written notice to the commissioner that the plumbing work covered by the permit is ready for inspections and test.

406.5 Detection of leaks and defects.

The piping system shall withstand the test pressure specified without showing any evidence of leakage or other defects. Any reduction of test pressures as indicated by pressure gauges shall be deemed to indicate the presence of a leak unless such reduction can be readily attributed to some other cause.

406.5.1 Detection methods.

The leakage shall be located by means of an approved gas detector, a noncorrosive leak detection fluid, or other approved leak detection methods. Matches, candles, open flames, or other methods that could provide a source of ignition shall not be used.

406.5.2 Corrections.

Where leakage or other defects are located, the affected portion of the piping system shall be repaired or replaced and retested.

406.6 Piping system and equipment leakage check.

Leakage checking of systems and equipment shall be in accordance with Sections 406.6.1 through 406.6.4.

406.6.1 Check gases.

Leak checks using fuel gas shall be permitted in piping systems that have been pressure tested in accordance with Section 406.

406.6.2 Before turning gas on.

During the process of turning gas on into a system of new gas piping, the entire system shall be inspected to determine that there are no open fittings or ends and that all valves at unused outlets are closed and plugged or capped.

406.6.2.1 Establishing gas supply.

It shall be unlawful for any utility company to supply gas to a building, place or premises in which new meters other than replacement are required until a certificate of approval of gas installation from the department is filed with such utility company. When new gas service piping has been installed it shall be locked-off by the utility either by locking the gas service line valve or by installing a locking device on the outside gas service line valve. The lock shall not be removed until the gas meter piping (other than utility-owned) and gas distribution piping has been inspected and certified as required by the department as being ready for service.

406.6.2.2 Alterations to gas piping systems.

When alterations, extensions or repairs to existing gas meter piping or gas distribution piping requires the shutoff of gas flow to a building, the utility shall be notified by the owner or his or her authorized representative.

406.6.3 Leak check.

Immediately after the gas is turned on into a new system or into a system that has been initially restored after an interruption of service, the piping system shall be checked for leakage. Where leakage is indicated, the gas supply shall be shut off until the necessary repairs have been made.

406.6.4 Placing appliances and equipment in operation.

Gas utilization appliances and equipment shall be permitted to be placed in operation after the piping system has been checked for leakage in accordance with Section 406.6.3 and determined to be free of leakage and purged in accordance with Section 406.7.2.

406.6.4.1 Requirements for placing equipment in operation.

The following will be required prior to placing equipment in operation as applicable:

1. Required fire protection systems (sprinkler or standpipe) are completed, inspected and ready for service.
2. Such equipment and related gas piping are inspected by the department or authorized inspector.
3. Associated fire suppression system is inspected and approved by the Fire Department.

406.7 Purging.

The purging of piping shall be in accordance with Sections 406.7.1 through 406.7.3.

406.7.1 Piping systems required to be purged outdoors.

The purging of piping systems shall be in accordance with the provisions of Sections 406.7.1.1 through 406.7.1.4 where the piping system meets either of the following:

1. The design operating gas pressure is greater than 2 psig (13.79 kPa).
2. The piping being purged contains one or more sections of pipe or tubing that meet(s) the size and length criteria of Table 406.7.1.1.

406.7.1.1 Removal from service.

Where existing gas piping is opened, the section that is opened shall be isolated from the gas supply and the line pressure vented in accordance with Section 406.7.1.3. Where gas piping meeting the criteria of Table 406.7.1.1 is removed from service, the residual fuel gas in the piping shall be displaced with an inert gas.

Table 406.7.1.1

Size and Length of Piping

Nominal Pipe Size (inches)	Length of Piping (feet)
≥ 2 1/2 < 3	< 50

$\geq 3 < 4$	< 30
$\geq 4 < 6$	< 15
$\geq 6 < 8$	< 10
≥ 8	Any length

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

406.7.1.2 Placing in operation.

Where gas piping containing air and meeting the criteria of Table 406.7.1.1 is placed in operation, the air in the piping shall first be displaced with an inert gas. The inert gas shall then be displaced with fuel gas in accordance with Section 406.7.1.3.

406.7.1.3 Outdoor discharge of purged gases.

The open end of a piping system being pressure vented or purged shall discharge directly to an outdoor location. Purging operations shall comply with all of the following requirements:

1. The point of discharge shall be controlled with a shutoff valve.
2. The point of discharge shall be located at least 10 feet (3048 mm) from sources of ignition, at least 10 feet (3048 mm) from building openings and at least 25 feet (7620 mm) from mechanical air intake openings.
3. During discharge, the open point of discharge shall be continuously attended and monitored with a combustible gas indicator that complies with Section 406.7.1.4.
4. Purging operations introducing fuel gas shall be stopped when 90 percent fuel gas by volume is detected within the pipe.
5. Persons not involved in the purging operations shall be evacuated from all areas within 10 feet (3048 mm) of the point of discharge.

406.7.1.4 Combustible gas indicator.

Combustible gas indicators shall be listed and shall be calibrated in accordance with the manufacturer's instructions. Combustible gas indicators shall numerically display a volume scale from zero percent to 100 percent in 1 percent or smaller increments.

406.7.2 Piping systems allowed to be purged indoors or outdoors.

The purging of piping systems shall be in accordance with the provisions of Section 406.7.2.1 where the piping system meets both of the following:

1. The design operating gas pressure is 2 psig (13.79 kPa) or less.
2. The piping being purged is constructed entirely from pipe or tubing not meeting the size and length criteria of Table 406.7.1.1.

406.7.2.1 Purging procedure.

The piping system shall be purged in accordance with one or more of the following:

1. The piping shall be purged with fuel gas and shall discharge to the outdoors.
2. The piping shall be purged with fuel gas and shall discharge to the indoors or outdoors through an appliance burner not located in a combustion chamber. Such burner shall be provided with a continuous source of ignition.
3. The piping shall be purged with fuel gas and shall discharge to the indoors or outdoors through a burner that has a continuous source of ignition and that is designed for such purpose.
4. The piping shall be purged with fuel gas that is discharged to the indoors or outdoors, and the point of discharge shall be monitored with a listed combustible gas detector in accordance with Section 406.7.2.2. Purging shall be stopped when fuel gas is detected.
5. The piping shall be purged by the gas supplier in accordance with written procedures of the utility company.

406.7.2.2 Combustible gas detector.

Combustible gas detectors shall be listed and shall be calibrated or tested in accordance with the manufacturer's instructions. Combustible gas detectors shall be capable of indicating the presence of fuel gas.

406.7.3 Purging appliances and equipment.

After the piping system has been placed in operation, appliances and equipment subsequently installed shall be purged before being placed into operation.

Section FGC 407: Piping Support

407.1 General.

Piping shall be provided with support in accordance with Section 407.2. In addition, when earthquake loads are applicable in accordance with the *New York City Building Code*, a detailed piping system stress analysis including seismic analysis shall be performed. The pipe supports and restraints shall be designed and installed to accommodate the resultant seismic forces, moments and displacements from this stress analysis in accordance with the *New York City Building Code*.

407.2 Design and installation.

Piping shall be supported with metal pipe hooks, metal pipe straps, metal bands, metal brackets, metal hangers or building structural components suitable for the size of piping, of adequate strength and quality, and located at intervals so as to prevent or damp out excessive vibration. Piping shall be anchored to prevent undue strains on connected appliances and shall not be supported by other piping. Pipe hangers and supports shall conform to the requirements of MSS SP-58 and shall be spaced in accordance with Section 415. Supports, hangers, and anchors shall be installed so as not to interfere with the free expansion and contraction of the piping between anchors. All parts of the supporting equipment shall be designed and installed so they will not be disengaged by movement of the supported piping.

Section FGC 408: Drips and Sloped Piping

408.1 Slopes.

Piping for other than dry gas conditions shall be sloped not less than 1/4 inch in 15 feet (6.3 mm in 4572 mm) to prevent traps. The local gas supplier/utility company should be consulted to determine the type of fuel gas available for the intended service.

408.2 Drips.

Where the local gas supplier/utility company requires, a manufactured test fitting or drip leg shall be installed downstream of a lockable supply/riser valve in accordance with the requirements for installation of the serving utility. No other locations will be allowed to prevent additional unapproved gas connections.

408.3 [Reserved.]

408.4 Sediment trap.

Where a sediment trap is not incorporated as part of the appliance, a sediment trap shall be installed downstream of the appliance shutoff valve as close to the inlet of the appliance as practical. The sediment trap shall be either a tee fitting having a capped nipple of any length installed vertically in the bottom most opening of the tee or other device approved as an effective sediment trap. Illuminating appliances, ranges, clothes dryers, decorative vented appliances for installation in vented fireplaces, gas fireplaces, and outdoor grills need not be so equipped.

Section FGC 409: Shutoff Valves

409.1 General.

Piping systems shall be provided with shutoff valves in accordance with this section.

409.1.1 Valve approval.

Shutoff valves shall be of an approved type; shall be constructed of materials compatible with the piping; and shall comply with the standard that is applicable for the pressure and application, in accordance with Table 409.1.1.

Table 409.1.1

Manual Gas Valve Standards

Valve Standards	Appliance Shutoff Valve Application Up to 1/2 psig Pressure	Other Valve Applications			
		Up to 1/2 psig Pressure	Up to 2 psig Pressure	Up to 5 psig Pressure	Up to 125 psig Pressure
ANSI Z21.15	X	—	—	—	—
CSA Requirement 3-88	X	X	X ^a	X ^b	—
ASME B 16.44	X	X	X ^a	X ^b	—
ASME B16.33	X	X	X	X	X

For SI: 1 pound per square inch gauge = 6.895 kPa.

a. If labeled 2G.

b. If labeled 5G.

409.1.2 Prohibited locations.

Shutoff valves shall be prohibited in concealed locations and furnace plenums.

409.1.3 Access to shutoff valves.

Shutoff valves shall be located in places so as to provide access for operation and shall be installed so as to be protected from damage.

409.2 Meter valve.

Every meter shall be equipped with a shutoff valve located on the supply side of the meter.

409.3 Shutoff valves for multiple-house line systems.

Where a single meter is used to supply gas to more than one building or tenant, a separate shutoff valve shall be provided for each building or tenant.

409.3.1 Multiple tenant buildings.

In multiple tenant buildings, where a common piping system is installed to supply other than individual dwelling units, shutoff valves shall be provided for each tenant. Each tenant shall have access to the shutoff valve serving that tenant's space.

409.3.2 Individual buildings.

In a common system serving more than one building, shutoff valves shall be installed outdoors at each building.

409.3.3 Identification of shutoff valves.

Each house line shutoff valve shall be plainly marked with an identification tag attached by the installer so that the piping systems supplied by such valves are readily identified.

409.4 MP regulator valves.

A listed shutoff valve shall be installed immediately ahead of each MP regulator.

409.5 Appliance shutoff valve.

Each appliance shall be provided with a shutoff valve in accordance with Section 409.5.1, 409.5.2 or 409.5.3.

409.5.1 Located within same room.

The shutoff valve shall be located in the same room as the appliance. The shut-off valve shall be within 6 feet (1829 mm) of the appliance, and shall be installed upstream of the union, connector or quick disconnect device it serves. Such shutoff valves shall be provided with access. Appliance shutoff valves located in the firebox of a fireplace shall be installed in accordance with the appliance manufacturer's instructions. Where the shutoff valve is located in the firebox a remote shutoff valve shall also be provided

409.5.2 Vented decorative appliances and room heaters.

Shutoff valves for vented decorative appliances, room heaters and decorative appliances for installation in vented fireplaces shall be permitted to be installed in an area remote from the appliances where such valves are provided with ready access. Such valves shall be permanently identified and shall serve no other appliance. The piping from the shutoff valve to within 6 feet (1829 mm) of the appliance shall be designed, sized and installed in accordance with Sections 401 through 408.

409.6 Shutoff valve for laboratories.

Where provided with two or more fuel gas outlets, including table-, bench- and hood-mounted outlets, each laboratory space in educational, research, commercial and industrial occupancies shall be provided with a single dedicated shutoff valve through which all such gas outlets shall be supplied. The dedicated shutoff valve shall be readily accessible, located within the laboratory space served, located adjacent to the egress door from the space and shall be identified by approved signage stating "Gas Shutoff."

409.7 Outside gas cut-off.

An outside gas service line valve or other outside shutoff device or method acceptable to the commissioner shall be provided in accordance with Section E.2 of Appendix E of this code.

Section FGC 410: Flow Controls

410.1 Pressure regulators.

A line pressure regulator shall be installed where the appliance is designed to operate at a lower pressure than the supply pressure. Line gas pressure regulators shall be listed as complying with ANSI Z21.80. Access shall be provided to pressure regulators. Pressure regulators shall be protected from physical damage. Regulators installed on the exterior of the building shall be approved for outdoor installation.

410.2 MP regulators.

MP regulators shall comply with the following:

1. The MP regulator shall be approved and shall be suitable for the inlet and outlet gas pressures for the application.
2. The MP regulator shall maintain a reduced outlet pressure under lockup (no-flow) conditions.
3. The capacity of the MP regulator, determined by published ratings of its manufacturer, shall be adequate to supply the appliances served.
4. The MP regulator shall be provided with access. Where located indoors, the regulator shall be vented to the outdoors or shall be equipped with a leak-limiting device, in either case complying with Section 410.3.
5. A tee fitting with one opening capped or plugged shall be installed between the MP regulator and its upstream shutoff valve. Such tee fitting shall be positioned to allow

connection of a pressure-measuring instrument and to serve as a sediment trap.

6. A tee fitting with one opening capped or plugged shall be installed not less than 10 pipe diameters downstream of the MP regulator outlet. Such tee fitting shall be positioned to allow connection of a pressure-measuring instrument.

410.3 Venting of regulators.

Pressure regulators that require a vent shall be vented directly to the outdoors. The vent terminal shall be a minimum of 18 inches (457 mm) above grade, not under an opening to the building or overhang, and shall be installed so as to prevent the entrance of water and insects.

Exception: A vent to the outdoors is not required for regulators less than 1 1/4 inches (31.7 mm) NPS equipped with and labeled for utilization with approved vent-limiting devices installed in accordance with the manufacturer's instructions.

410.3.1 Vent piping.

Vent piping for relief vents and breather vents shall be constructed of materials allowed for gas piping in accordance with Section 403. Vent piping shall be not smaller than the vent connection on the pressure regulating device. Vent piping serving relief vents and combination relief and breather vents shall be run independently to the outdoors and shall serve only a single device vent. Vent piping serving only breather vents is permitted to be connected in a manifold arrangement where sized in accordance with an approved design that minimizes back pressure in the event of diaphragm rupture. Regulator vent piping shall not exceed the length specified in the regulator manufacturer's installation instructions.

410.4 Flashback arrestor check valve.

Where fuel gas is used with oxygen in any hot work operation, a listed protective device that serves as a combination flashback arrestor and backflow check valve shall be installed at an approved location on both the fuel gas and oxygen supply lines. Where the pressure of the piped fuel gas supply is insufficient to ensure such safe operation, approved equipment shall be installed between the gas meter and the appliance that increases pressure to the level required for such safe operation.

Section FGC 411: Appliance and Manufactured Home Connections

411.1 Connecting appliances.

Except as required by Section 411.1.1, appliances shall be connected to the piping system by one of the following:

1. Rigid metallic pipe and fittings. Space heaters and water heaters within dwelling units shall be connected using rigid piping and fittings only. Use of semirigid (flexible) metallic tubing, fittings, appliance connectors or quick-disconnect devices is not permitted for this application.
2. Listed and labeled appliance connectors in compliance with ANSI Z21.24 and installed in accordance with the manufacturer's installation instructions and located entirely in the same room as the appliance.
3. Listed and labeled quick-disconnect devices used in conjunction with listed and labeled appliance connectors.
4. Listed and labeled convenience outlets used in conjunction with listed and labeled appliance connectors.
5. Listed and labeled outdoor appliance connectors complying with ANSI Z21.75/CSA 6.27 and installed in accordance with the manufacturer's installation instructions.

411.1.1 Commercial cooking appliances.

Commercial cooking appliances installed on casters and appliances that are moved for cleaning and sanitation purposes shall be connected to the piping system with an appliance connector listed as complying with ANSI Z21.69 and NSF/ANSI 169 or in accordance with Item 1 of Section 411.1.

411.1.2 Protection against damage.

Connectors and tubing shall be installed so as to be protected against physical damage.

411.1.3 Connector installation.

Fuel connectors shall be installed in accordance with the manufacturer's instructions and Sections 411.1.3.1 through 411.1.3.4.

411.1.3.1 Maximum length.

Connectors shall have an overall length not to exceed 6 feet (1829 mm). Measurement shall be made along the centerline of the connector. Only one connector shall be used for each appliance.

411.1.3.2 Minimum size.

Connectors shall have the capacity for the total demand of the connected appliance.

411.1.3.3 Prohibited locations and penetrations.

Connectors shall not be concealed within, or extended through, walls, floors, partitions, ceilings or appliance housings.

Exceptions:

1. Connectors constructed of materials allowed for piping systems in accordance with Section 403 shall be permitted to pass through walls, floors, partitions and ceilings where installed in accordance with Section 409.5.2.
2. Rigid steel pipe connectors shall be permitted to extend through openings in appliance housings.
3. Fireplace inserts that are factory equipped with grommets, sleeves or other means of protection in accordance with the listing of the appliance.
4. Listed connectors shall be permitted to extend through an opening in an appliance housing, cabinet or casing where the tubing or connector is protected against damage.

411.1.3.4 Shutoff valve.

A shutoff valve not less than the nominal size of the piping system shall be installed ahead of the connector in accordance with Section 409.5.

411.1.4 Movable appliances.

Where appliances are equipped with casters or are otherwise subject to periodic movement or relocation for purposes such as routine cleaning and maintenance, such appliances shall be connected to the supply system piping by means of an approved flexible connector designed and labeled for the application. Such flexible connectors shall be installed and protected against physical damage in accordance with the manufacturer's installation instructions.

411.1.5 Connection of gas engine-powered air conditioners.

Internal combustion engines shall not be rigidly connected to the gas supply piping.

411.1.6 Unions.

A union fitting shall be provided for appliances connected by rigid metallic pipe. Such unions shall be accessible and located within 6 feet (1829mm) of the appliance.

411.2 Manufactured home connections.

Manufactured homes shall be connected to the distribution piping system by one of the following materials:

1. Metallic pipe in accordance with Section 403.4.
2. Listed and labeled connectors in compliance with ANSI Z21.75/CSA 6.27 and installed in accordance with the manufacturer's installation instructions.

411.3 Suspended low-intensity infrared tube heaters.

Suspended low-intensity infrared tube heaters shall be connected to the building piping system with a connector listed for the application complying with ANSI Z21.24/CGA 6.10. The connector shall be installed as specified by the tube heater manufacturer's instructions.

Section FGC 412: Liquefied Petroleum Gas Motor Vehicle Fuel-dispensing Stations

412.1 Applicability.

Motor fuel-dispensing facilities for LP-gas fuel shall be designed and operated in accordance with the *New York City Fire Code*.

412.2 [Reserved.]

412.3 [Reserved.]

412.4 [Reserved.]

412.5 [Reserved.]

412.6 [Reserved.]

412.7 [Reserved.]

412.8 [Reserved.]

Section FGC 413: Compressed Natural Gas Motor Vehicle Fuel-dispensing Stations

413.1 Applicability.

Motor fuel-dispensing facilities for CNG fuel shall be designed and operated in accordance with the *New York City Fire Code*.

413.2 [Reserved.]

413.3 [Reserved.]

413.4 [Reserved.]

413.5 [Reserved.]

413.6 [Reserved.]

413.7 [Reserved.]

413.8 [Reserved.]

Section FGC 414: Reserved

Section FGC 415: Piping Support Intervals

415.1 Interval of support.

Piping shall be supported at intervals not exceeding the spacing specified in Table 415.1.

Table 415.1

Support of Piping

Steel Pipe, Nominal Size of Pipe (inches)	Spacing of Supports (feet)
1/2	6
3/4 or 1	8
1 1/4 or larger (horizontal)	12
All vertical piping	Every floor level

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

Section FGC 416: Overpressure Protection Devices

416.1 General.

Overpressure protection devices shall be provided in accordance with this section to prevent the pressure in the piping system from exceeding the pressure that would cause unsafe operation of any connected and properly adjusted appliances.

416.2 Protection methods.

The requirements of this section shall be considered to be met and a piping system deemed to have overpressure protection where a service or line pressure regulator plus one other device are installed such that the following occur:

1. Each device limits the pressure to a value that does not exceed the maximum working pressure of the downstream system.
2. The individual failure of either device does not result in the over pressurization of the downstream system.

416.3 Device maintenance.

The overpressure protection device shall be properly maintained and inspected every two years by a Licensed Master Plumber and inspection records shall be maintained by the Owner and made available for the Department; and inspection procedures shall be in accordance with the commissioner; and replacements or repairs shall be promptly made.

Exception: Where the gas pressure is 15 psig (103 kPa gauge) or above, the overpressure protection device shall be inspected annually.

416.4 Where required.

A pressure-relieving or pressure-limiting device shall not be required where: (1) the gas does not contain materials that could seriously interfere with the operation of the service or line pressure regulator; (2) the operating pressure of the gas source is 5 psi (34.5 kPa) or less; and (3) the service or line pressure regulator has all of the following design features or characteristics:

1. Pipe connections to the service or line regulator do not exceed 2 inches (51 mm) nominal diameter.
2. The regulator is self-contained with no external static or control piping.
3. The regulator has a single port valve with an orifice diameter not greater than that recommended by the manufacturer for the maximum gas pressure at the regulator inlet.
4. The valve seat is made of resilient material designed to withstand abrasion of the gas, impurities in the gas and cutting by the valve, and to resist permanent deformation where it is pressed against the valve port.
5. The regulator is capable, under normal operating conditions, of regulating the downstream pressure within the necessary limits of accuracy and of limiting the discharge pressure under no-flow conditions to not more than 150 percent of the discharge pressure maintained under flow conditions.

416.5 Devices.

Pressure-relieving or pressure-limiting devices shall be one of the following:

1. Spring-loaded relief device.
2. Pilot-loaded back pressure regulator used as a relief valve and designed so that failure of the pilot system or external control piping will cause the regulator relief valve to open.
3. A monitoring regulator installed in series with the service or line pressure regulator.

4. An automatic shutoff device installed in series with the service or line pressure regulator and set to shut off when the pressure on the downstream piping system reaches the maximum working pressure or some other predetermined pressure less than the maximum working pressure. This device shall be designed so that it will remain closed until manually reset.

5. A liquid seal relief device that can be set to open accurately and consistently at the desired pressure.

The devices shall be installed either as an integral part of the service or line pressure regulator or as separate units. Where separate pressure-relieving or pressure-limiting devices are installed, they shall comply with Sections 416.5.1 through 416.5.6.

416.5.1 Construction and installation.

Pressure relieving and pressure-limiting devices shall be constructed of materials so that the operation of the devices will not be impaired by corrosion of external parts by the atmosphere or of internal parts by the gas. Pressure-relieving and pressure-limiting devices shall be designed and installed so that they can be operated to determine whether the valve is free. The devices shall also be designed and installed so that they can be tested to determine the pressure at which they will operate and examined for leakage when in the closed position.

416.5.2 External control piping.

External control piping shall be protected from falling objects, excavations and other causes of damage and shall be designed and installed so that damage to any control piping will not render both the regulator and the overpressure protective device inoperative.

416.5.3 Setting.

Each pressure-relieving or pressure-limiting device shall be set so that the pressure does not exceed a safe level beyond the maximum allowable working pressure for the connected piping and appliances.

416.5.4 Unauthorized operation.

Precautions shall be taken to prevent unauthorized operation of any shutoff valve that will make a pressure-relieving valve or pressure-limiting device inoperative. The valve shall be locked or continuously monitored in the open position.

416.5.5 Vents.

The discharge stacks, vents and outlet parts of all pressure-relieving and pressure-limiting devices shall be located so that gas is safely discharged to the outdoors. Discharge stacks and vents shall be designed to prevent the entry of water, insects and other foreign material that could cause blockage. The discharge stack or vent line shall be at least the same size as the outlet of the pressure-relieving device.

416.5.6 Size of fittings, pipe and openings.

The fittings, pipe and openings located between the system to be protected and the pressure-relieving device shall be sized to prevent hammering of the valve and to prevent impairment of relief capacity.

Chapter 5: Chimneys and Vents

Section FGC 501: General

501.1 Scope.

This chapter shall govern the installation, alteration, maintenance, design, minimum safety requirements, repair and approval of factory-built chimneys, chimney liners, vents and connectors, field built chimneys and connectors and the utilization of masonry chimneys serving gas-fired appliances. The requirements for the installation, maintenance, repair and approval of factory-built chimneys, chimney liners, vents and connectors serving appliances burning fuels other than fuel gas shall be regulated by the *New York City Mechanical Code*. The construction, repair, maintenance and approval of masonry chimneys shall be regulated by the *New York City Building Code*. Venting systems shall be designed in accordance with this chapter and comply with the requirements of the *New York City Air Pollution Control Code*.

501.1.1 Adjoining chimneys and vents.

Adjoining chimneys and vents shall be in accordance with Sections 501.1.1.1 through 501.1.1.8.

501.1.1.1 Responsibility of owner of taller building.

Whenever a building is erected, enlarged, or increased in height so that any portion of such building, except chimneys or vents, extends higher than the top of any previously constructed chimneys or vents within 100 feet (30 480 mm), the owner of such new or altered building shall have the responsibility of altering such chimneys or vents to make them conform with the requirements of this chapter. A chimney or vent that is no longer connected with a fireplace or combustion or other equipment for which a chimney or vent was required, shall be exempt from this requirement. Such alterations shall be accomplished by one of the following means or a combination thereof:

1. Carry up the previously constructed chimneys or vents to the height required in this chapter.
2. Offset such chimneys or vents to a distance beyond that required by this chapter from the new or altered building provided that the new location of the outlet of the offset chimney or vent shall otherwise comply with the requirements of this chapter.

Such requirements shall not dispense with or modify any additional requirements that may be applicable pursuant to rules of the New York City Department of Environmental Protection.

501.1.1.2 Protection of draft.

After the alteration of a chimney or vent as required by this section, it shall be the responsibility of the owner of the new or altered building to provide any mechanical equipment or devices necessary to maintain the proper draft in the equipment.

501.1.1.3 Written notification.

The owner of the new or altered building shall notify the owner of the building affected in writing at least forty-five days before starting the work required and request written consent to do such work. Such notice shall be accompanied by plans indicating the manner in which the proposed alterations are to be made.

501.1.1.4 Approval.

The plans and method of alteration shall be subject to the approval of the commissioner.

501.1.1.5 Refusal of consent.

If consent is not granted by the owner of the previously constructed building to do the alteration work required by this section, such owner shall signify his or her refusal in writing to the owner of the new or altered building and to the commissioner; and the owner of the new or altered building having submitted plans that conform to the requirements of this section, shall thereupon be released from any responsibility for the proper operation of the equipment due to loss of draft and for any health hazard or nuisance that may occur as a result of the new or altered building. Such responsibilities shall then be assumed by the owner of the previously constructed building. Similarly, should such owner fail to grant consent within forty-five days from the date of written request or fail to signify his or her refusal, he or she shall then assume all responsibilities as prescribed above.

501.1.1.6 Procedure.

It shall be the obligation of the owner of the new or altered building to:

1. Schedule this work so as to create a minimum of disturbance to the occupants of the affected building; and
2. Provide such essential services as are normally supplied by the equipment while it is out of service; and
3. Where necessary, support such extended chimneys, vents and equipment from this building or to carry up such chimneys or vents within his or her building; and
4. Provide for the maintenance, repair, and/or replacement of such extensions and added equipment; and
5. Make such alterations of the same material as the original chimney or vent so as to maintain the same quality and appearance, except where the affected owner of the chimney or vent shall give his or her consent to do otherwise. All work shall be done in such fashion as to maintain the architectural aesthetics of the existing building. Where there is practical difficulty in complying strictly with the provisions of this Item, the commissioner may permit an equally safe alternative.

501.1.1.7 Existing violations.

Any existing violations on the previously constructed equipment shall be corrected by the owner of the equipment before any equipment is added or alterations made at the expense of the owner of the new or altered building.

501.1.1.8 Variance.

The commissioner may grant a variance in accordance with the provisions of this code.

501.2 General.

Every appliance shall discharge the products of combustion to the outdoors, except for appliances exempted by Section 501.8.

Exception: Commercial cooking appliances vented by a Type I hood installed in accordance with MC Section 507.

501.2.1 Design.

Chimneys and vents shall be designed and constructed so as to provide the necessary draft and capacity for each appliance connected to completely exhaust the products of combustion to the outside air. The temperature on adjacent combustible surfaces shall not be raised above 160°F (71°C). Chimneys and vents shall be designed to resist the effects of condensation that would cause deterioration of the chimney or vent.

501.2.2 Outlets.

The outlet shall be arranged so that the flue gases are not directed so that they jeopardize people, overheat combustible structures, or enter building openings in the vicinity of the outlet. Gas-fired appliances shall be vented in accordance with this code and NFPA 54.

501.2.3 Support.

Chimneys and vents shall not be supported by the equipment they serve unless such equipment has been specifically designed for such loads.

501.2.4 Changes in appliance fuels.

Masonry chimneys shall be constructed in accordance with Section 507.

501.2.5 Exhaust gases from internal combustion engines and turbines.

Exhaust pipes shall be constructed in accordance with Section 508.

501.3 Masonry chimneys.

Masonry chimneys shall be constructed in accordance with Section 503.5.3 and the *New York City Building Code*.

501.4 Minimum size of chimney or vent.

Chimneys and vents shall be sized in accordance with Sections 503 and 504.

501.5 Abandoned inlet openings.

Abandoned inlet openings in chimneys and vents shall be closed by an approved method.

501.6 Positive pressure.

Where an appliance equipped with a mechanical forced draft system creates a positive pressure in the venting system, the venting system shall be designed for positive pressure applications.

501.7 Connection to fireplace.

Connection of appliances to chimney flues serving fireplaces shall be in accordance with Sections 501.7.1 through 501.7.3.

501.7.1 Closure and access.

A noncombustible seal shall be provided below the point of connection to prevent entry of room air into the flue. Means shall be provided for access to the flue for inspection and cleaning.

501.7.2 Connection to factory-built fireplace flue.

An appliance shall not be connected to a flue serving a factory-built fireplace unless the appliance is specifically listed for such installation. The connection shall be made in accordance with the appliance manufacturer's installation instructions.

501.7.3 Connection to masonry fireplace flue.

A connector shall extend from the appliance to the flue serving a masonry fireplace such that the flue gases are exhausted directly into the flue. The connector shall be accessible or removable for inspection and cleaning of both the connector and the flue. Listed direct connection devices shall be installed in accordance with their listing.

501.8 Appliances not required to be vented.

The following appliances shall not be required to be vented:

1. Ranges.
2. Built-in domestic cooking units listed and marked for optional venting.
3. Hot plates and laundry stoves.
4. Type 1 clothes dryers (Type 1 clothes dryers shall be exhausted in accordance with the requirements of Section 614).
5. A single booster-type automatic instantaneous water heater, where designed and used solely for the sanitizing rinse requirements of a dishwashing machine, provided that the heater is installed in a commercial kitchen having a mechanical exhaust system. Where installed in this manner, the draft hood, if required, shall be in place and unaltered and the draft hood outlet shall be not less than 36 inches (914 mm) vertically and 6 inches (152 mm) horizontally from any surface other than the heater.
6. Refrigerators.
7. Counter appliances.
8. Specialized appliances of limited input such as laboratory burners and gas lights.
9. Recirculating direct-fired industrial air heaters as provided for in Section 612.

Where the appliances listed in Items 5 through 9 above are installed so that the aggregate input rating exceeds 20 British thermal units (Btu) per hour per cubic foot (207 watts per m³) of volume of the room or space in which such appliances are installed, one or more shall be provided with venting systems or other approved means for conveying the vent gases to the outdoor atmosphere so that the aggregate input rating of the remaining unvented appliances does not exceed 20 Btu per hour per cubic foot (207 watts per m³). Where the room or space in which the appliance is installed is directly connected to another room or space by a doorway, archway, or other opening of comparable size that cannot be closed, the volume of such adjacent room or space shall be permitted to be included in the calculations.

501.9 Chimney entrance.

Connectors shall connect to a masonry chimney flue at a point not less than 12 inches (305 mm) or one chimney diameter above the lowest portion of the interior of the chimney flue.

501.10 Connections to exhauster.

Appliance connections to a chimney or vent equipped with a power exhauster shall be made on the inlet side of the exhauster. Joints and vent systems on the positive pressure side of the exhauster shall be sealed to prevent flue-gas leakage as specified by the manufacturer's installation instructions for the exhauster or in accordance with this code.

501.11 Masonry chimneys.

Masonry chimneys utilized to vent appliances shall be located, constructed and sized as specified in the manufacturer's installation instructions for the appliances being vented and Section 503.

501.12 Residential and low-heat appliances flue lining systems.

Flue lining systems for use with residential-type and low-heat appliances shall be limited to the following:

1. Clay flue lining complying with the requirements of ASTM C 315 or equivalent. Clay flue lining shall be installed in accordance with the *New York City Building Code*.
2. Listed chimney lining systems complying with UL 1777 (new and existing chimneys) or ULC-S635 (existing chimneys) or ULC-S640 (new chimneys).
3. Other approved materials that will resist, without cracking, softening or corrosion, flue gases and condensate at temperatures up to 1,800°F (982°C).

501.13 Category I appliance flue lining systems.

Flue lining systems for use with Category I appliances shall be limited to the following:

1. Flue lining systems complying with Section 501.12.
2. Chimney lining systems listed and labeled for use with gas appliances with draft hoods and other Category I gas appliances listed and labeled for use with Type B vents.

501.14 Category II, III and IV appliance venting systems.

The design, sizing and installation of vents for Category II, III and IV appliances shall be in accordance with the appliance manufacturer's installation instructions.

501.15 Existing chimneys and vents.

Where an appliance is permanently disconnected from an existing chimney or vent, or where an appliance is connected to an existing chimney or vent during the process of a new installation, the chimney or vent shall comply with Sections 501.15.1 through 501.15.4.

501.15.1 Size.

The chimney or vent shall be resized as necessary to control flue gas condensation in the interior of the chimney or vent and to provide the appliance or appliances served with the required draft. For Category I appliances, the resizing shall be in accordance with Section 502.

501.15.2 Flue passageways.

The flue gas passageway shall be free of obstructions and combustible deposits and shall be cleaned if previously used for venting a solid or liquid fuel-burning appliance or fireplace. The flue liner, chimney inner wall or vent inner wall shall be continuous and shall be free of cracks, gaps, perforations or other damage or deterioration which would allow the escape of combustion products, including gases, moisture and creosote.

501.15.3 Cleanout.

Masonry chimney flues shall be provided with a cleanout opening having a minimum height of 6 inches (152 mm). The upper edge of the opening shall be located not less than 6 inches (152 mm) below the lowest chimney inlet opening. The cleanout shall be provided with a tight-fitting, noncombustible cover of a minimum size of 8 inches by 8 inches (203 mm by 203 mm).

501.15.4 Clearances.

Chimneys and vents shall have air-space clearance to combustibles in accordance with the *New York City Building Code* and the chimney or vent manufacturer's installation instructions.

Exception: Masonry chimneys without the required air-space clearances shall be permitted to be used if lined or relined with a chimney lining system listed for use in chimneys with reduced clearances in accordance with UL 1777 or ULC-S635. The chimney clearance shall be not less than permitted by the terms of the chimney liner listing and the manufacturer's instructions.

501.15.4.1 Fireblocking.

Noncombustible fireblocking shall be provided in accordance with the *New York City Building Code*.

501.16 Drains.

A drain shall be provided for all chimneys and gas vents to remove rain water and condensation. The drain shall be a minimum of 1 inch (25 mm) in size and shall be equipped with an appropriately-sized p-trap with automatic trap seal primer in accordance with Section 1002 of the *New York City Plumbing Code* or a float drain trap installed in accordance with the manufacturer's installation requirements. The drain shall be sized by the design engineer and shall be suitable for the chimney area. For listed chimneys and gas vents, the connection tap into the chimney shall be determined by the manufacturer and connected to the drain piping in accordance with the listing and installation instructions. On all outdoor chimneys and gas vents, the connection and drain shall be installed indoors as close as practicable to the chimney base to prevent freezing.

501.17 Thermal safety (spill) switches.

Thermal safety (spill) switches shall be installed on barometric dampers, draft hoods, draft diverters, and all other appurtenances that allow dilution air into chimneys or gas vents. Thermal safety (spill) switches shall be interlocked with all of the appliances connected to the same chimney or gas vent.

Section FGC 502: Vents

502.1 General.

All vents, except as provided in Section 503.7, shall be listed and labeled. Type B and BW vents shall be tested in accordance with UL 441 and labeled or field fabricated in accordance with NFPA 211. Type L vents shall be tested in accordance with UL 641. Vents for Category II and III appliances shall be tested in accordance with UL 1738. Plastic piping shall be listed and installed in accordance with the terms of its listing and the manufacturers' instructions.

502.2 Connectors required.

Connectors shall be used to connect appliances to the vertical chimney or vent, except where the chimney or vent is attached directly to the appliance. Vent connector size, material, construction and installation shall be in accordance with Section 503.

502.3 Vent application.

The application of vents shall be in accordance with Table 503.4.

502.4 Insulation shield.

Where vents pass through insulated assemblies, an insulation shield constructed of steel having a minimum thickness of 0.0187 inch (0.4712 mm) (No. 26 gage) shall be installed to provide clearance between the vent and the insulation material. The clearance shall not be less than the clearance to combustibles specified by the vent manufacturer's installation instructions. Where vents pass through attic space, the shield shall terminate not less than 2 inches (51 mm) above the insulation materials and shall be secured in place to prevent displacement. Insulation shields provided as part of a listed vent system shall be installed in accordance with the manufacturer's installation instructions.

502.5 Installation.

Vent systems shall be sized, installed and terminated in accordance with the vent and appliance manufacturer's installation instructions and Section 503.

502.6 Support of vents.

All portions of vents shall be adequately supported for the design and weight of the materials employed.

502.7 Protection against physical damage.

In concealed locations, where a vent is installed through holes or notches in studs, joists, rafters or similar members less than 1 1/2 inches (38 mm) from the nearest edge of the member, the vent shall be protected by shield plates. Protective steel shield plates having a minimum thickness of 0.0575 inch (1.463 mm) (No. 16 gage) shall cover the area of the vent where the member is notched or bored and shall extend a minimum of 4 inches (102 mm) above sole plates, below top plates and to each side of a stud, joist or rafter.

Section FGC 503: Venting of Appliances

503.1 General.

This section recognizes that the choice of venting materials and the methods of installation of venting systems are dependent on the operating characteristics of the appliance being vented. The operating characteristics of vented appliances can be categorized with respect to (1) positive or negative pressure within the venting system; and (2) whether or not the appliance generates flue or vent gases that might condense in the venting system. See Section 202 for the definition of these vented appliance categories.

503.2 Venting systems required.

Except as permitted in Sections 503.2.1 through 503.2.3 and 501.8, all appliances shall be connected to venting systems.

503.2.1 Ventilating hoods.

Ventilating hoods and exhaust systems shall be permitted to be used to vent appliances installed in commercial applications (see Section 503.3.4) and to vent industrial appliances, such as where the process itself requires fume disposal.

503.2.2 Direct-vent appliances.

Listed direct-vent appliances shall be considered properly vented where installed in accordance with the terms of its listing, the manufacturer's instructions and Section 503.8.

503.2.3 Appliances with integral vents.

An appliance incorporating integral venting means shall be considered properly vented where installed in accordance with its listing, the manufacturer's instructions and Section 503.8.

503.3 Design and construction.

A venting system shall be designed and constructed so as to develop a positive flow adequate to convey flue or vent gases to the outdoors.

503.3.1 Appliance draft requirements.

A venting system shall satisfy the draft requirements of the appliance in accordance with the manufacturer's instructions.

503.3.2 Design and construction.

Appliances required to be vented shall be connected to a venting system designed and installed in accordance with the provisions of Sections 503.4 through 503.16.

503.3.3 Mechanical draft systems.

Mechanical draft systems shall comply with the following:

- 1. Mechanical draft systems shall be listed and shall be installed in accordance with the terms of their listing and both the appliance and the mechanical draft system manufacturer's instructions.
- 2. Appliances, except incinerators, requiring venting shall be permitted to be vented by means of mechanical draft systems of either forced or induced draft design.
- 3. Forced draft systems and all portions of induced draft systems under positive pressure during operation shall be designed and installed so as to prevent leakage of flue or vent gases into a building.
- 4. Vent connectors serving appliances vented by natural draft shall not be connected into any portion of mechanical draft systems operating under positive pressure.
- 5. Where a mechanical draft system is employed, provisions shall be made to prevent the flow of gas to the main burners when the draft system is not performing so as to satisfy the operating requirements of the appliance for safe performance.
- 6. The exit terminals of mechanical draft systems shall be not less than 7 feet (2134 mm) above finished ground level where located adjacent to public walkways and shall be located as specified in Section 503.8, Items 1 and 2.

503.3.4 Ventilating hoods and exhaust systems.

Ventilating hoods and exhaust systems shall be permitted to be used to vent appliances installed in commercial applications. Where automatically operated appliances, other than commercial cooking appliances, are vented through a ventilating hood or exhaust system equipped with a damper or with a power means of exhaust, provisions shall be made to allow the flow of gas to the main burners only when the damper is open to a position to properly vent the appliance and when the power means of exhaust is in operation.

503.3.5 Air ducts and furnace plenums.

Venting systems shall not extend into or pass through any fabricated air duct or furnace plenum.

503.3.6 Above-ceiling air-handling spaces.

Where a venting system passes through an above-ceiling air-handling space or other nonducted portion of an air-handling system, such space shall be accessible for inspection. The venting system shall conform to one of the following requirements:

- 1. The venting system shall be a listed special gas vent; other venting system serving a Category III or Category IV appliance; or other positive pressure vent, with joints sealed in accordance with the appliance or vent manufacturer's instructions.
- 2. The venting system shall be installed such that fittings and joints between sections are not installed in the above-ceiling space.
- 3. The venting system shall be installed in a sealed metal conduit or enclosure with sealed joints separating the interior of the conduit or enclosure from the ceiling space.

503.4 Type of venting system to be used.

The type of venting system to be used shall be in accordance with Table 503.4.

503.4.1 Plastic piping.

Plastic piping used for venting appliances listed for use with such venting materials shall be listed and installed in accordance with the terms of its listing and the manufacturers' instructions. Installation shall be in accordance with the *New York City Building Code*. PVC shall not be permitted.

503.4.2 Special gas vent.

Special gas vent shall be listed and installed in accordance with the terms of the special gas vent listing and the manufacturers' instructions.

Table 503.4

Type of Venting System to be Used

Gas Utilization Equipment	Type of Venting System
Listed Category I equipmentListed equipment equipped with draft hoodEquipment listed for use with Type B gas vent	Type B gas vent (Section 503.6)Chimney (Section 503.5)Single-wall metal pipe (Section 503.7)Listed chimney lining system for gas venting (Section 503.5.3)Special gas vent listed for this equipment (Section 503.4.2)

Listed vented wall furnaces	Type B-W gas vent (Sections 503.6, 608)
Category II equipment	As specified or furnished by manufacturers of listed equipment (Sections 503.4.1, 503.4.2)
Category III equipment	As specified or furnished by manufacturers of listed equipment (Sections 503.4.1, 503.4.2)
Category IV equipment	As specified or furnished by manufacturers of listed equipment (Sections 503.4.1, 503.4.2)
Incinerators, indoors	Chimney (Section 503.5)
Incinerators, outdoors	Single-wall metal pipe (Sections 503.7, 503.7.6)
Equipment which may be converted to use of solid fuel	Chimney (Section 503.5)
Unlisted combination gas and oil-burning equipment	Chimney (Section 503.5)
Listed combination gas and oil-burning equipment	Type L vent (Section 503.6) or chimney (Section 503.5)
Combination gas and solid fuel-burning equipment	Chimney (Section 503.5)
Equipment listed for use with chimneys only	Chimney (Section 503.5)
Unlisted equipment	Chimney (Section 503.5)
Decorative appliance in vented fireplace	Chimney
Direct vent equipment	See Section 503.2.2, 503.2.3
Appliances with integral vent	See Section 503.2.3, 503.2.4

503.5 Masonry, metal, and factory-built chimneys.

Masonry, metal and factory-built chimneys shall comply with Sections 503.5.1 through 503.5.10.

503.5.1 Factory-built chimneys.

Factory-built chimneys shall be installed in accordance with their listing and the manufacturers' instructions. Factory-built chimneys used to vent appliances that operate at positive vent pressure shall be listed for such application.

503.5.2 Metal chimneys.

Metal chimneys shall be built and installed in accordance with NFPA 211.

503.5.3 Masonry chimneys.

Masonry chimneys shall be built and installed in accordance with Chapter 21 of the *New York City Building Code* and NFPA 211, and shall be lined with approved clay flue lining, a listed chimney lining system, or other approved material that will resist corrosion, erosion, softening, or cracking from vent gases at temperatures up to 1800°F (982°C).

Exception: Masonry chimney flues serving listed gas appliances with draft hoods, Category I appliances and other gas appliances listed for use with Type B vent shall be permitted to be lined with a chimney lining system specifically listed for use only with such appliances. The liner shall be installed in accordance with the liner manufacturer's instructions and the terms of the listing. A permanent identifying label shall be attached at the point where the connection is to be made to the liner. The label shall read: "This chimney liner is for appliances that burn gas only. Do not connect to solid or liquid fuel-burning appliances or incinerators." For information on installation of gas vents in existing masonry chimneys, see Section 503.6.3.

503.5.4 Chimney termination.

Chimneys serving gas-fired equipment shall comply with the appliance listing, the manufacturer's instructions and the following requirements:

1. Chimneys serving appliances less than 600°F (316°C) shall extend at least 3 feet (914 mm) above the highest construction, such as a roof ridge, parapet wall, or penthouse, within 10 feet (3048 mm) of the chimney outlet, whether the construction is on the same building as the chimney or on another building. However, such constructions do not include other chimneys, vents, or open structural framing. Any chimney located beyond 10 feet (3048 mm) from such construction, but not more than the distance determined by Equation 5-1 shall be at least as high as the construction.
2. Chimneys serving appliances between 600°F (316°C) and 1,000°F (538°C) shall extend at least 10 feet (3048 mm) above the highest construction, such as a roof ridge, or parapet wall or penthouse within 20 feet (6096 mm) of the chimney outlet, whether the construction is on the same building as the chimney or on another building. However, such constructions do not include other chimneys, vents, or open structural framing. Any chimney located beyond 20 feet (6096 mm) from such construction but not more than the distance determined by Equation 5-1 shall be at least as high as the construction.
3. Chimneys serving appliances greater than 1,000°F (538°C) shall extend at least 20 feet (6096mm) above the highest construction, such as roof ridge, parapet wall, penthouse, or other obstruction within 50 feet (15 240 mm) of the chimney outlet, whether the construction is on the same building as the chimney or in another building. However, such constructions do not include other chimneys, vents, or open structural framing. Any chimney located beyond 50 feet (15 240 mm) from such construction but not more than the distance determined by Equation 5-1 shall be at least as high as the construction.
4. Termination caps shall not be permitted. A drain shall be installed in accordance with Section 801.21 of the *New York City Mechanical Code*. A positive means shall be provided to prevent water from entering the appliance.

Exception: Termination caps shall be permitted on listed factory-built chimneys.

5. Decorative shrouds shall not be installed at the termination of factory-built chimneys except where such shrouds are listed and labeled for use with the specific factory-built chimney system and are installed in accordance with the manufacturers' installation instructions.

6. The following equation shall be used for determining the distances referred to in Items 1, 2 and 3 of this section.

$$D = F \times \sqrt{A}$$

(Equation 5-1)

where:

D

=

Distance, in feet, measured from the center of the chimney outlet to the nearest edge of the construction.

F

=

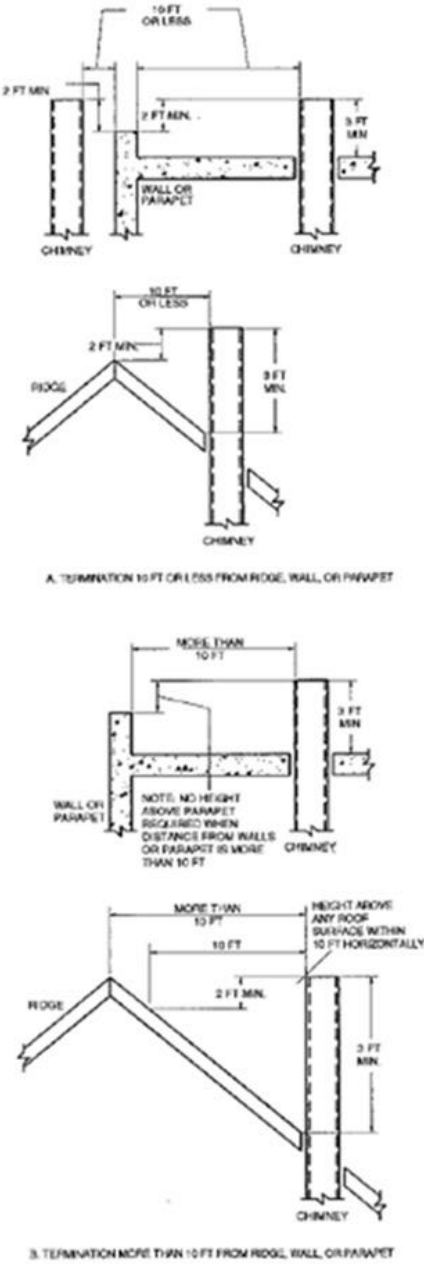
Value determined from table below

A

=

Free area, in square inches, of chimney flue space.

"F" Factor for Determining Chimney Distances			
Type of Fuel	"F" Factor		
	600°F (316°C) and less	600°F (316°C) to 1,000°F (538°C)	Greater than 1,000°F (538°C)
Gas	2	2	3



For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

Figure 503.5.4

Typical Termination Locations for Chimneys and Single-Wall Metal Pipes Serving Residential-Type and Low-Heat Appliances

503.5.5 Size of chimneys.

The effective area of a chimney venting system serving listed appliances with draft hoods, Category I appliances, and other appliances listed for use with Type B vents shall be determined in accordance with one of the following methods:

1. The provisions of Section 504.

2. For sizing an individual chimney venting system for a single appliance with a draft hood, the effective areas of the vent connector and chimney flue shall be not less than the area of the appliance flue collar or draft hood outlet, nor greater than seven times the draft hood outlet area.
3. For sizing a chimney venting system connected to two appliances with draft hoods, the effective area of the chimney flue shall be not less than the area of the larger draft hood outlet plus 50 percent of the area of the smaller draft hood outlet, nor greater than seven times the smallest draft hood outlet area.
4. Chimney venting systems using mechanical draft shall be sized in accordance with approved engineering methods.
5. Other approved engineering methods.

503.5.6 Inspection of chimneys.

Before replacing an existing appliance or connecting a vent connector to a chimney, the chimney passageway shall be examined to ascertain that it is clear and free of obstructions and it shall be cleaned if previously used for venting solid or liquid fuel-burning appliances or fireplaces.

503.5.6.1 Chimney lining.

Chimneys shall be lined in accordance with NFPA 211.

Exception: Where an existing chimney complies with Sections 503.5.6 through 503.5.6.5 and its sizing is in accordance with Section 503.5.5, its continued use shall be allowed where the appliance vented by such chimney is replaced by an appliance of similar type, input rating and efficiency.

503.5.6.2 Cleanouts.

Cleanouts shall be examined to determine if they will remain tightly closed when not in use.

503.5.6.3 Unsafe chimneys.

Where inspection reveals that an existing chimney is not safe for the intended application, it shall be repaired, rebuilt, lined, relined, or replaced with a vent or chimney to conform to NFPA 211 and it shall be suitable for the appliances to be vented.

503.5.6.4 Test run.

All new chimneys shall be test run by the registered design professional responsible for the testing under operating conditions to demonstrate fire safety and the complete exhausting of smoke and the products of combustion to the outer air. The results of such test run shall be certified as correct by the registered design professional responsible for the test and shall be submitted in writing to the department.

503.5.6.5 Requirement of a smoke test.

A smoke test shall be made as outlined below. Any faults or leaks found shall be corrected. Such smoke test shall be witnessed by a representative of the commissioner. In lieu thereof, the commissioner may accept the test report of the registered design professional or special inspector responsible for the test which shall be submitted in writing to the department.

503.5.6.5.1 Smoke test.

To determine the tightness of chimney construction, a smoke test shall be made in accordance with the following conditions and requirements:

1. The equipment, materials, power and labor necessary for such test shall be furnished by, and at the expense of, the owner or holder of the work permit.
2. If the test shows any evidence of leakage or other defects, such defects shall be corrected in accordance with the requirement of this chapter and the test shall be repeated until the results are satisfactory.
3. Method of test. The chimney shall be filled with a thick penetrating smoke produced by one or more smoke machines, or smoke bombs, or other equivalent method. As the smoke appears at the stack opening on the roof, such opening shall be tightly closed and a pressure equivalent to 1/2 inch (12.7 mm) column of water measured at the base of the stack, shall be applied. The test shall be applied for a length of time sufficient to permit the inspection of the chimney.

503.5.7 Chimneys serving appliances burning other fuels.

Chimneys serving appliances burning other fuels shall comply with Sections 503.5.7.1 through 503.5.7.4.

503.5.7.1 Solid fuel-burning appliances.

An appliance shall not be connected to a chimney flue serving a separate appliance designed to burn solid fuel.

503.5.7.2 Liquid fuel-burning appliances.

Where one chimney flue serves gas appliances and liquid fuel-burning appliances, the appliances shall be connected through separate openings or shall be connected through a single opening where joined by a suitable fitting located as close as practical to the chimney. Where two or more openings are provided into one chimney flue, they shall be at different levels. Where the appliances are automatically controlled, they shall be equipped with safety shutoff devices.

503.5.7.3 Combination gas and solid fuel-burning appliances.

A combination gas- and solid fuel-burning appliance shall be permitted to be connected to a single chimney flue where equipped with a manual reset device to shut off gas to the main burner in the event of sustained back draft or flue gas spillage. The chimney flue shall be sized to properly vent the appliance.

503.5.7.4 Combination gas- and oil fuel-burning appliances.

A listed combination gas- and oil fuel-burning appliance shall be permitted to be connected to a single chimney flue. The chimney flue shall be sized to properly vent the appliance.

503.5.8 Support of chimneys.

All portions of chimneys shall be supported for the design and weight of the materials employed. Factory-built chimneys shall be supported and spaced in accordance with their listings and the manufacturer's instructions.

503.5.9 Cleanouts.

Where a chimney that formerly carried flue products from liquid or solid fuel-burning appliances is used with an appliance using fuel gas, an accessible cleanout shall be provided. The cleanout shall have a tight-fitting cover and shall be installed at the base of all chimneys in accordance with the rules of the New York City Department of Environmental Protection. The cleanout shall be gas tight if the chimney is to be of positive pressure.

503.5.10 Space surrounding lining or vent.

The remaining space surrounding a chimney liner, gas vent, special gas vent, or plastic piping installed within a masonry chimney flue shall not be used to vent another appliance. The insertion of another liner or vent within the chimney as provided in this code and the liner or vent manufacturer's instructions shall not be prohibited. The remaining space surrounding a chimney liner, gas vent, special gas vent, or plastic piping installed within a masonry, metal or factory-built chimney, shall not be used to supply combustion air. Such space shall not be prohibited from supplying combustion air to direct-vent appliances designed for installation in a solid fuel-burning fireplace and installed in accordance with the listing and the manufacturer's instructions.

503.6 Gas vents.

Gas vents shall comply with Sections 503.6.1 through 503.6.13 (see Section 202, Definitions).

503.6.1 Installation, general.

Gas vents shall be installed in accordance with the terms of their listings and the manufacturer's instructions.

503.6.2 Type B-W vent capacity.

A Type B-W gas vent shall have a listed capacity not less than that of the listed vented wall furnace to which it is connected.

503.6.3 Gas vents installed within masonry chimneys.

Gas vents installed within masonry chimneys shall be installed in accordance with the terms of their listing and the manufacturer's installation instructions. Gas vents installed

within masonry chimneys shall be identified with a permanent label installed at the point where the vent enters the chimney. The label shall contain the following language: "This gas vent is for appliances that burn gas. Do not connect to solid or liquid fuel-burning appliances or incinerators."

503.6.4 Gas vent terminations.

A gas vent shall terminate in accordance with one of the following:

- 1. Gas vents that are 12 inches (305 mm) or less in size and located not less than 8 feet (2438 mm) from a vertical wall or similar obstruction shall terminate above the roof in accordance with Figure 503.6.6.
- 2. Gas vents that are over 12 inches (305 mm) in size or are located less than 8 feet (2438 mm) from a vertical wall or similar obstruction shall terminate not less than 2 feet (610 mm) above the highest point where they pass through the roof and not less than 2 feet (610 mm) above any portion of a building within 10 feet (3048 mm) horizontally.
- 3. As provided for direct-vent systems in Section 503.2.2.
- 4. As provided for appliances with integral vents in Section 503.2.3.
- 5. As provided for mechanical draft systems in Section 503.3.3.
- 6. As provided for ventilating hoods and exhaust systems in Section 503.3.4.

However, such constructions do not include chimneys or other vents, or open structural framing. The vent shall be as high as such construction which is located beyond 10 feet (3048 mm) from the vent and up to and including the distance determined by the following formula:

$$D = 2 \sqrt{A}$$

(Equation 5-2)

where:

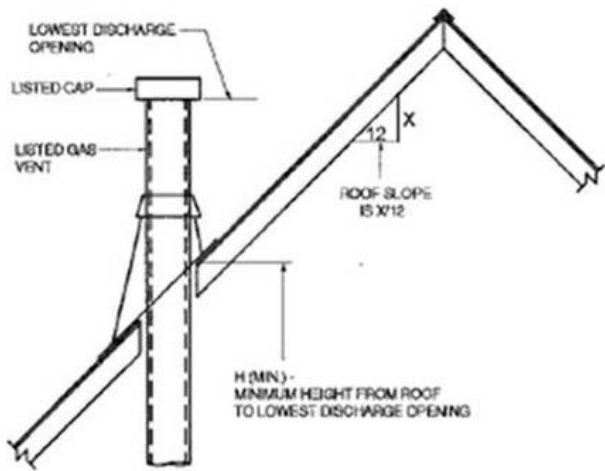
- D = Distance, in feet, measured from the center of the vent outlet to the nearest edge of the construction.
- A = Free area, in square inches, of vent flue space.

503.6.4.1 Decorative shrouds.

Decorative shrouds shall not be installed at the termination of gas vents except where such shrouds are listed for use with the specific gas venting system and are installed in accordance with the manufacturer's installation instructions.

503.6.4.2 Rain and debris.

All gas vents shall terminate in an approved vent or cowl, which shall prevent downdrafts and prevent rain and debris from entering the vent.



Roof Slope	H (min) ft
Roof Slope	H (min) ft
Flat to 6/12	1.0
Over 6/12 to 7/12	1.25
Over 7/12 to 8/12	1.5
Over 8/12 to 9/12	2.0
Over 9/12 to 10/12	2.5
Over 10/12 to 11/12	3.25
Over 11/12 to 12/12	4.0
Over 12/12 to 14/12	5.0
Over 14/12 to 16/12	6.0
Over 16/12 to 18/12	7.0
Over 18/12 to 20/12	7.5
Over 20/12 to 21/12	8.0

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

Figure 503.6.4

Termination locations for Gas Vents with Listed Caps 12 Inches or Less in Size at least 8 Feet from a Vertical Wall

503.6.5 Minimum height.

A Type B or a Type L gas vent shall terminate at least 5 feet (1524 mm) in vertical height above the highest connected equipment draft hood or flue collar. A Type B-W gas vent shall terminate at least 12 feet (3658 mm) in vertical height above the bottom of the wall furnace.

503.6.6 Roof terminations.

Gas vents shall extend through the roof flashing, roof jack or roof thimble and terminate with a listed cap or listed roof assembly.

503.6.7 Forced air inlets.

Gas vents shall terminate not less than 3 feet (914 mm) above any forced air inlet located within 10 feet (3048 mm).

503.6.8 Exterior wall penetrations.

A gas vent extending through an exterior wall shall not terminate adjacent to the wall or below eaves or parapets, except as provided in Sections 503.2.3 and 503.3.3.

503.6.9 Size of gas vents.

Venting systems shall be sized and constructed in accordance with Section 504 or other approved engineering methods acceptable to the commissioner. Gas vents shall also comply with the manufacturers' instructions.

503.6.9.1 Category I appliances.

The sizing of natural draft venting systems serving one or more listed appliances equipped with a draft hood or appliances listed for use with Type B gas vent, installed in a single story of a building, shall be in accordance with one of the following methods:

1. The provisions of Section 504.
2. For sizing an individual gas vent for a single, draft-hood-equipped appliance, the effective area of the vent connector and the gas vent shall be not less than the area of the appliance draft hood outlet, nor greater than seven times the draft hood outlet area.
3. For sizing a gas vent connected to two appliances with draft hoods, the effective area of the vent shall be not less than the area of the larger draft hood outlet plus 50 percent of the area of the smaller draft hood outlet, nor greater than seven times the smaller draft hood outlet area.
4. Engineering practices acceptable to the commissioner.

503.6.9.2 Vent offsets.

Type B and L vents sized in accordance with Item 2 or 3 of Section 503.6.9.1 shall extend in a generally vertical direction with offsets not exceeding 45 degrees (0.79 rad), except that a vent system having not more than one 60-degree (1.04 rad) offset shall be permitted. Any angle greater than 45 degrees (0.79 rad) from the vertical is considered horizontal. The total horizontal distance of a vent plus the horizontal vent connector serving draft hood-equipped appliances shall be not greater than 75 percent of the vertical height of the vent.

503.6.9.3 Category II, III, and IV appliances.

The sizing of gas vents for Category II, III, and IV appliances shall be in accordance with the appliance manufacturer's instructions.

503.6.9.4 Mechanical draft.

Chimney venting systems using mechanical draft shall be designed and sized to develop a positive flow adequate to carry all products of combustion to the outside atmosphere.

503.6.10 Multistory prohibited.

Common venting systems for appliances located on more than one floor level shall be prohibited.

503.6.11 Support of gas vents.

Gas vents shall be supported and spaced in accordance with their listings and the manufacturer's instructions.

503.6.12 Marking.

Gas vents shall be permanently identified by a label attached to the wall or ceiling at a point where the vent connector enters the gas vent. The label shall read: "This gas vent is for appliances that burn gas. Do not connect to solid or liquid fuel- burning appliances or incinerators."

503.6.13 Fastener penetrations.

Screws, rivets and other fasteners shall not penetrate the inner wall of double-wall gas vents, except at the transition from an appliance draft hood outlet, a flue collar or a single-wall metal connector to a double-wall vent.

503.7 Single-wall metal pipe.

Single-wall metal pipe vents shall comply with Sections 503.7.1 through 503.7.13.

503.7.1 Construction.

Single-wall metal pipe shall be constructed of galvanized sheet steel not less than 0.0304 inch (0.7 mm) thick or other approved, noncombustible, corrosion- resistant material.

503.7.2 Climate protection.

Uninsulated single-wall metal pipe shall not be used outdoors for venting appliances.

503.7.3 Termination.

Single-wall metal pipe shall terminate at least 5 feet (1524 mm) in vertical height above the highest connected appliance draft hood outlet or flue collar. Single-wall metal pipe shall extend at least 2 feet (610 mm) above the highest point where it passes through a roof of a building and at least 2 feet (610 mm) higher than any portion of a building within a horizontal distance of 10 feet (3048 mm) (see Figure 503.5.4). An approved cap or roof assembly shall be attached to the terminus of a single-wall metal pipe (see also Section 503.7.9, Item 3). However, such constructions do not include chimneys or other vents, or open structural framing. The single-wall metal pipe shall be as high as such construction which is located beyond 10 feet (3048 mm) from the vent and up to and including the distance determined by Equation 5-2.

503.7.4 Limitations of use.

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 outdoor atmosphere.

503.7.5 Roof penetrations.

A pipe passing through a roof shall extend without interruption through the roof flashing, roof jack, or roof thimble. Where a single-wall metal pipe passes through a roof constructed of combustible material, a noncombustible, non-ventilating thimble shall be used at the point of passage. The thimble shall extend at least 18 inches (457 mm) above and 6 inches (152 mm) below the roof with the annular space open at the bottom and closed only at the top. The thimble shall be sized in accordance with Section 503.7.7.

503.7.6 Installation.

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, or floor. The installation of a single-wall metal pipe through an exterior combustible wall shall comply with Section 503.7.7. Single-wall metal pipe used for venting an incinerator shall be exposed and readily examinable for its full length and shall have suitable clearances maintained.

503.7.7 Single-wall penetrations of combustible walls.

A single-wall metal pipe shall not pass through a combustible exterior wall unless guarded at the point of passage by a ventilated metal thimble not smaller than the following:

1. For listed appliances equipped with draft hoods and appliances listed for use with Type B gas vents, the thimble shall be not less than 4 inches (102 mm) larger in diameter than the metal pipe. Where there is a run of not less than 6 feet (1829 mm) of metal pipe in the open between the draft hood outlet and the thimble, the thimble shall be permitted to be not less than 2 inches (51 mm) larger in diameter than the metal pipe.
2. For unlisted appliances having draft hoods, the thimble shall be not less than 6 inches (152 mm) larger in diameter than the metal pipe.
3. For residential and low-heat appliances, the thimble shall be not less than 12 inches (305 mm) larger in diameter than the metal pipe.

Exception: In lieu of thimble protection, all combustible material in the wall shall be removed a sufficient distance from the metal pipe to provide the specified clearance from such metal pipe to combustible material. Any material used to close up such opening shall be noncombustible.

503.7.8 Clearances.

Minimum clearances from single-wall metal pipe to combustible material shall be in accordance with Table 503.10.5. The clearance from single-wall metal pipe to combustible material shall be permitted to be reduced where the combustible material is protected as specified for vent connectors in Table 308.2.

503.7.9 Size of single-wall metal pipe.

A venting system constructed of single-wall metal pipe shall be sized in accordance with one of the following methods and the appliance manufacturer's instructions:

1. For a draft-hood-equipped appliance, in accordance with Section 504.
2. For a venting system for a single appliance with a draft hood, the areas of the connector and the pipe each shall be not less than the area of the appliance flue collar or draft hood outlet, whichever is smaller. The vent area shall not be greater than seven times the draft hood outlet area.
3. Other approved engineering methods.

503.7.10 Pipe geometry.

Any shaped single-wall metal pipe shall be permitted to be used, provided that its equivalent effective area is equal to the effective area of the round pipe for which it is substituted, and provided that the minimum internal dimension of the pipe is not less than 2 inches (51mm).

503.7.11 Termination capacity.

The vent cap or a roof assembly shall have a venting capacity not less than that of the pipe to which it is attached.

503.7.12 Support of single-wall metal pipe.

All portions of single-wall metal pipe shall be supported for the design and weight of the material employed.

503.7.13 Marking.

Single-wall metal pipe shall comply with the marking provisions of Section 503.6.12.

503.8 Venting system termination location.

The location of venting system terminations shall comply with the following:

1. Gas venting systems shall be extended at least 3 feet (914 mm) above the highest construction, such as a roof ridge, parapet wall, or penthouse, within 10 feet (3048 mm) of the vent outlet whether the construction is on the same building as the chimney or on another building. However, such constructions do not include chimneys or other vents, or open structural framing. The vent shall be as high as such construction which is located beyond 10 feet (3048 mm) from the vent and up to and including the distance determined by Equation 5-2.

Exception: Direct-vent appliances and integral vent appliances approved by the commissioner and installed in accordance with the manufacturer's instructions and Section 503.8 Item 3.

2. Where permitted, through-the-wall vents for Category I, II, III and IV appliances and noncategorized condensing appliances shall not terminate over public walkways or over an area where condensate or vapor could create a nuisance or hazard or could be detrimental to the operation of regulators, relief valves or other equipment.

3. Horizontal terminations shall only be allowed if they are in a nonhazardous location and if the appliance has a sealed combustion chamber (direct vent) or integral vent in accordance with the appliance listing and manufacturer's instructions. In addition, horizontal terminations shall comply with the following requirements:

- 3.1. Where located adjacent to walkways, the termination shall be not less than 7 feet (2134 mm) above the level of the walkway.
- 3.2. Vents shall terminate at least 3 feet (914 mm) above any forced air inlet, other than the forced air inlet for the subject direct vent or integral vent appliance, located within 10 feet (3048 mm).
- 3.3. The vent system shall terminate at least 4 feet (1219 mm) below, 4 feet (1219 mm) horizontally from or 1 foot (305 mm) above any door, window or gravity air inlet into the building.
- 3.4. The vent termination point shall not be located closer than 3 feet (914 mm) to an interior corner formed by two walls perpendicular to each other.
- 3.5. The vent termination shall not be mounted directly above or within 3 feet (914 mm) horizontally from any gas or electric metering, regulating, venting relief equipment or other building opening.
- 3.6. The bottom of the vent termination shall be located at least 24 inches (610 mm) above finished grade.
- 3.7. The maximum heat input of an appliance served by single horizontal vent termination shall be 350,000 Btu/h (1025 kW), unless otherwise approved by the Commissioner.
- 3.8. The maximum heat input of all appliances served by horizontal vent terminations located within a 10 foot (3048 mm) radius shall be 350,000 Btu/h (1025 kW), unless otherwise approved by the commissioner.
- 3.9. The vent termination shall be located a minimum of 4 feet from the lot line or from adjacent buildings. The termination shall be installed in accordance with the gas vent manufacturer's listing and installation instructions.

503.9 Condensation drainage.

Provision shall be made to collect and dispose of condensate from venting systems serving Category II and IV appliances and noncategorized condensing appliances in accordance with Section 307.

503.10 Vent connectors for Category I appliances.

Vent connectors for Category I appliances shall comply with Sections 503.10.1 through 503.10.15.

503.10.1 Where required.

A vent connector shall be used to connect an appliance to a gas vent, chimney, or single-wall metal pipe, except where the gas vent, chimney, or single-wall metal pipe is directly connected to the appliance.

503.10.2 Materials.

Vent connectors shall be constructed in accordance with Sections 503.10.2.1 through 503.10.2.5.

503.10.2.1 General.

A vent connector shall be made of noncombustible corrosion-resistant material capable of withstanding the vent gas temperature produced by the appliance and of sufficient thickness to withstand physical damage.

503.10.2.2 Vent connectors located in unconditioned areas.

Where the vent connector used for an appliance having a draft hood or a Category I appliance is located in or passes through attics, crawl spaces or other unconditioned spaces, that portion of the vent connector shall be listed Type B, Type L or listed vent material having equivalent insulation properties.

503.10.2.3 Residential-type appliance connectors.

Where vent connectors for residential-type appliances are not installed in attics or other unconditioned spaces, connectors for listed appliances having draft hoods, appliances having draft hoods and equipped with listed conversion burners and Category I appliances shall be one of the following:

1. Type B or Type L vent material;
2. Galvanized sheet steel not less than 0.018 inch (0.46 mm) thick;
3. Aluminum (1100 or 3003 alloy or equivalent) sheet not less than 0.027 inch (0.69 mm) thick;

4. Stainless steel sheet not less than 0.012 inch (0.31 mm) thick;
5. Smooth interior wall metal pipe having resistance to heat and corrosion equal to or greater than that of Item 2, 3 or 4 above; or
6. A listed vent connector. Vent connectors shall not be covered with insulation.

Exception: Listed insulated vent connectors shall be installed according to the terms of their listing and the manufacturer's installation instructions.

503.10.2.4 Low-heat equipment.

A vent connector for a non-residential low-heat appliance shall be a factory-built chimney section or steel pipe having resistance to heat and corrosion equivalent to that for the appropriate galvanized pipe as specified in Table 503.10.2.4. Factory-built chimney sections shall be joined together in accordance with the chimney manufacturers' instructions.

Table 503.10.2.4

Minimum Thickness for Galvanized Steel Vent Connectors for Low-Heat Appliances

Diameter of Connector (inches)	Minimum Thickness (inch)
Less than 6	0.019
6 to less than 10	0.023
10 to 12 inclusive	0.029
14 to 16 inclusive	0.034
Over 16	0.056

For SI: 1 inch = 25.4 mm.

503.10.2.5 Medium-heat appliances.

Vent connectors for medium-heat appliances and commercial and industrial incinerators shall be constructed of factory-built medium-heat chimney sections or steel of a thickness not less than that specified in Table 503.10.2.5 and shall comply with the following:

1. A steel vent connector for an appliance with a vent gas temperature in excess of 1,000°F (538°C), measured at the entrance to the connector shall be lined with medium-duty fire brick (ASTM C 64, Type F), or the equivalent.
2. The lining shall be at least 2 1/2 inches (64 mm) thick for a vent connector having a diameter or greatest cross-sectional dimension of 18 inches (457 mm) or less.
3. The lining shall be at least 4 1/2 inches (114 mm) thick laid on the 4 1/2-inch (114 mm) bed for a vent connector having a diameter or greatest cross-sectional dimension greater than 18 inches (457 mm).
4. Factory-built chimney sections, if employed, shall be joined together in accordance with the chimney manufacturers' instructions.

Table 503.10.2.5

Minimum Thickness for Steel Vent Connectors for Medium-Heat Appliances and Commercial and Industrial Incinerators Vent Connector Size

Diameter (inches)	Area (square inches)	Minimum Thickness (inch)
Up to 14	Up to 154	0.053
Over 14 to 16	154 to 201	0.067
Over 16 to 18	201 to 254	0.093
Over 18	Larger than 254	0.123

For SI: 1 inch = 25.4 mm. 1 square inch = 645.16 mm².

503.10.3 Size of vent connector.

Vent connectors shall be sized in accordance with Sections 503.10.3.1 through 503.10.3.5.

503.10.3.1 Single draft hood and fan-assisted.

A vent connector for an appliance with a single draft hood or for a Category I fan-assisted combustion system appliance shall be sized and installed in accordance with Section 504 or other approved engineering methods.

503.10.3.2 Multiple draft hoods.

For a single appliance having more than one draft hood outlet or flue collar, the manifold shall be constructed according to the instructions of the appliance manufacturer. Where there are no instructions, the manifold shall be designed and constructed in accordance with approved engineering practices. As an alternate method, the effective area of the manifold shall equal the combined area of the flue collars or draft hood outlets and the vent connectors shall have a minimum 1-foot (305 mm) rise.

503.10.3.3 Multiple appliances.

Where two or more appliances are connected to a common vent or chimney, each vent connector shall be sized in accordance with Section 504 or other approved engineering methods. As an alternative method applicable only when all of the appliances are draft hood equipped, each vent connector shall have an effective area not less than the area of the draft hood outlet of the appliance to which it is connected.

503.10.3.4 Common connector/manifold.

Where two or more appliances are vented through a common vent connector or vent manifold, the common vent connector or vent manifold shall be located at the highest level consistent with available headroom and the required clearance to combustible materials and shall be sized in accordance with Section 504 or other approved engineering methods. As an alternate method applicable only where there are two draft hood equipped appliances, the effective area of the common vent connector or vent manifold and all junction fittings shall be not less than the area of the larger vent connector plus 50 percent of the area of the smaller flue collar outlet.

503.10.3.5 Size increase.

Where the size of a vent connector is increased to overcome installation limitations and obtain connector capacity equal to the appliance input, the size increase shall be made at the appliance draft hood outlet.

503.10.4 Two or more appliances connected to a single vent or chimney.

Where two or more vent connectors enter a common gas vent, chimney flue, or single-wall metal pipe, the smaller connector shall enter at the highest level consistent with the available headroom or clearance to combustible material. Vent connectors serving Category I appliances shall not be connected to any portion of a mechanical draft system operating under positive static pressure, such as those serving Category III or IV appliances.

503.10.4.1 Two or more openings.

Where two or more openings are provided into one chimney flue or vent, the openings shall be at different levels, or the connectors shall be attached to the vertical portion of the chimney or vent at an angle of 45 degrees (0.79 rad) or less relative to the vertical.

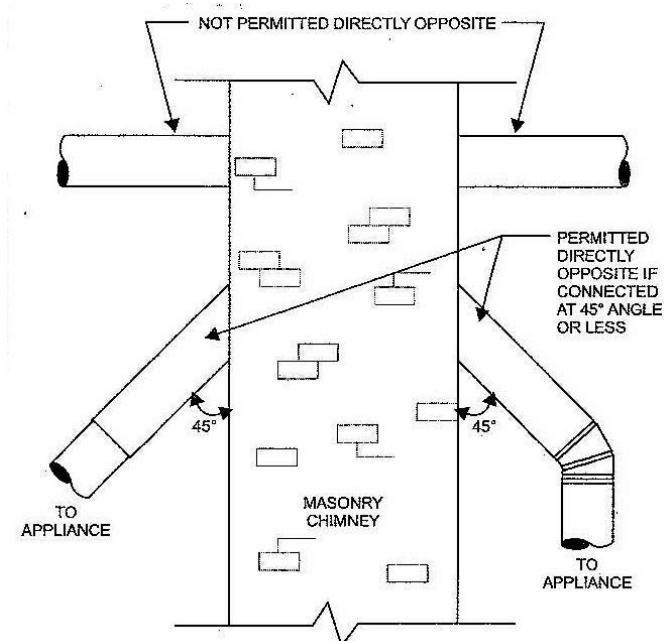


Figure 503.10.4.1

Opposing Openings in Chimney

503.10.5 Clearance.

Minimum clearances from vent connectors to combustible material shall be in accordance with Table 503.10.5.

Exception: The clearance between a vent connector and combustible material shall be permitted to be reduced where the combustible material is protected as specified for vent connectors in Table 308.2.

Table 503.10.5^a Clearances for Connectors

Appliance	Minimum Distance from Combustible Material			
	Listed Type B Gas Vent Material	Listed Type L Vent Material	Single-Wall Metal Pipe	Factory- Built Chimney Sections
Listed appliances with draft hoods and appliances listed for use with Type B gas vents	As listed	As listed	6 inches	As listed
Residential boilers and furnaces with listed gas conversion burner and with draft hood	6 inches	6 inches	9 inches	As listed
Residential appliances listed for use with Type L vents	Not permitted	As listed	9 inches	As listed
Listed gas-fired toilets	Not permitted	As listed	As listed	As listed
Unlisted residential appliances with draft hood	Not permitted	6 inches	9 inches	As listed
Residential and low-heat equipment other than above	Not permitted	9 inches	18 inches	As listed
Medium-heat appliances	Not permitted	Not permitted	36 inches	As listed

For SI: 1 inch = 25.4 mm.

a. These clearances shall apply unless the manufacturer's installation instructions for a listed appliance or connector specify different clearances, in which case the listed clearances shall apply.

503.10.6 Flow resistance.

A vent connector shall be installed so as to avoid turns or other construction features that create excessive resistance to flow of vent gases.

503.10.7 Joints.

Joints between sections of connector piping and connections to flue collars and hood outlets shall be fastened by one of the following methods:

1. Sheet metal screws.
2. Vent connectors of listed vent material assembled and connected to flue collars or draft hood outlets in accordance with the manufacturers' instructions.
3. Welding.

503.10.8 Slope.

A vent connector shall be installed without dips or sags and shall slope upward toward the vent or chimney at least 1/4 inch per foot (21 mm/m).

Exception: Vent connectors attached to a mechanical draft system installed in accordance with the manufacturers' instructions.

503.10.9 Length of vent connector.

A vent connector shall be as short as practical and the appliance located as close as practical to the chimney or vent. The maximum horizontal length of a single-wall connector shall be 75 percent of the height of the chimney or vent except for engineered systems. The maximum horizontal length of a Type B double-wall connector shall be 100 percent of the height of the chimney or vent except for engineered systems.

503.10.10 Support.

A vent connector shall be supported in accordance with the manufacturer's recommendations for the design and weight of the material employed to maintain clearances and prevent physical damage and separation of joints.

503.10.11 Chimney connection.

Where entering a flue in a masonry or metal chimney, the vent connector shall be installed above the extreme bottom to avoid stoppage. Where a thimble or slip joint is used to facilitate removal of the connector, the connector shall be firmly attached to or inserted into the thimble or slip joint to prevent the connector from falling out. Means shall be employed to prevent the connector from entering so far as to restrict the space between its end and the opposite wall of the chimney flue (see Section 501.9).

503.10.12 Inspection.

The entire length of a vent connector shall be provided with ready access for inspection, cleaning, and replacement.

503.10.13 Fireplaces.

A vent connector shall not be connected to a chimney flue serving a fireplace.

503.10.14 Passage through ceilings, floors, or walls.

Single-wall metal pipe connectors shall not pass through any wall, floor or ceiling except as permitted by Section 503.7.4.

503.10.15 Medium-heat connectors.

Vent connectors for medium-heat appliances shall not pass through walls or partitions constructed of combustible material.

503.11 Vent connectors for Category II, III, and IV appliances.

Vent connectors for Category II, III and IV appliances shall be as specified for the venting systems in accordance with Section 503.4.

503.12 Draft hoods and draft controls.

The installation of draft hoods and draft controls shall comply with Sections 503.12.1 through 503.12.7.

503.12.1 Appliances requiring draft hoods.

Vented appliances shall be installed with draft hoods.

Exception: Incinerators, direct-vent appliances, fan-assisted combustion system appliances, appliances requiring chimney draft for operation, appliances equipped with blast, power, or pressure burners that are not listed for use with draft hoods, and appliances designed for forced venting.

503.12.2 Installation.

A draft hood supplied with or forming a part of a listed vented appliance shall be installed without alteration, exactly as furnished and specified by the appliance manufacturer. Draft hoods shall be equipped with a thermal safety (spill) switch installed in accordance with its listing and the manufacturer's instructions.

503.12.2.1 Draft hood required.

If a draft hood is not supplied by the appliance manufacturer where one is required, a draft hood shall be installed, shall be of a listed or approved type and, in the absence of other instructions, shall be of the same size as the appliance flue collar. Where a draft hood is required with a conversion burner, it shall be of a listed or approved type.

503.12.2.2 Special design draft hood.

Where it is determined that a draft hood of special design is needed or preferable for a particular installation, the installation shall be in accordance with the recommendations of the appliance manufacturer and shall be approved by the department.

503.12.3 Draft control devices.

Where a draft control device is part of the appliance or is supplied by the appliance manufacturer, it shall be installed in accordance with the manufacturers' instructions. In the absence of manufacturers' instructions, the device shall be attached to the flue collar of the appliance or as near to the appliance as practical.

503.12.4 Additional devices.

Appliances requiring a controlled chimney draft shall be permitted to be equipped with a listed double-acting barometric-draft regulator installed and adjusted in accordance with the manufacturers' instructions. Barometric-draft regulators shall be equipped with a thermal safety (spill) switch installed in accordance with its listing and the manufacturer's instructions.

503.12.5 Location.

Draft hoods and barometric draft regulators shall be installed in the same room or enclosure as the appliance in such a manner as to prevent any difference in pressure between the hood or regulator and the combustion air supply.

503.12.6 Positioning.

Draft hoods and draft regulators shall be installed in the position for which they were designed with reference to the horizontal and vertical planes and shall be located so that the relief opening is not obstructed by any part of the appliance or adjacent construction. The appliance and its draft hood shall be located so that the relief opening is accessible for checking vent operation.

503.12.7 Clearance.

A draft hood shall be located so its relief opening is not less than 6 inches (152 mm) from any surface except that of the appliance it serves and the venting system to which the draft hood is connected. Where a greater or lesser clearance is indicated on the appliance label, the clearance shall be not less than that specified on the label. Such clearances shall not be reduced.

503.13 Manually operated dampers.

A manually operated damper shall not be placed in the vent connector for any appliance. Fixed baffles shall not be classified as manually operated dampers.

503.14 Automatically operated vent dampers.

An automatically operated vent damper shall be of a listed type complete with safety controls to prove open position of the damper before equipment operation.

503.15 Obstructions.

Devices that retard the flow of vent gases shall not be installed in a vent connector, chimney, or vent. The following shall not be considered as obstructions:

1. Draft regulators and safety controls specifically listed for installation in venting systems and installed in accordance with the terms of their listing and manufacturer's installation instructions.
2. Approved draft regulators and safety controls that are designed and installed in accordance with approved engineering methods.
3. Listed heat reclaimers and automatically operated vent dampers installed in accordance with the terms of their listing and manufacturer's installation instruction.
4. Approved economizers, heat reclaimers, and recuperators installed in venting systems of appliances not required to be equipped with draft hoods, provided that the appliance manufacturer's instructions cover the installation of such a device in the venting system and performance in accordance with Sections 503.3 and 503.3.1 is obtained.
5. Vent dampers serving listed appliances installed in accordance with Sections 504.2.1 and 504.3.1 or other approved engineering methods.

503.16 Outside wall penetrations.

Where vents, including those for direct-vent appliances, penetrate outside walls of buildings, the annular spaces around such penetrations shall be permanently sealed using approved materials to prevent entry of combustion products into the building.

Section FGC 504: Sizing of Category I Appliance Venting Systems

504.1 Definitions.

The following definitions apply to the tables in this section.

APPLIANCE CATEGORIZED VENT DIAMETER/ AREA. The minimum vent area/diameter permissible for Category I appliances to maintain a non-positive vent static pressure when tested in accordance with nationally recognized standards.

FAN-ASSISTED COMBUSTION SYSTEM. An appliance equipped with an integral mechanical means to either draw or force products of combustion through the combustion chamber or heat exchanger.

FAN Min. The minimum input rating of a Category I fan-assisted appliance attached to a vent or connector.

FAN Max. The maximum input rating of a Category I fan-assisted appliance attached to a vent or connector.

NAT Max. The maximum input rating of a Category I draft-hood-equipped appliance attached to a vent or connector.

FAN + FAN. The maximum combined appliance input rating of two or more Category I fan-assisted appliances attached to the common vent.

FAN + NAT. The maximum combined appliance input rating of one or more Category I fan-assisted appliances and one or more Category I draft-hood-equipped appliances attached to the common vent.

NA. Vent configuration is not allowed due to potential for condensate formation or pressurization of the venting system, or not applicable due to physical or geometric restraints.

NAT + NAT. The maximum combined appliance input rating of two or more Category I draft-hood-equipped appliances attached to the common vent.

504.2 Application of single-appliance vent Tables 504.2(1) through 504.2(6).

The application of Tables 504.2(1) through 504.2(6) shall be subject to the requirements of Sections 504.2.1 through 504.2.16.

Table 504.2(1)

Type B Double-Wall Gas Vent

**TABLE 504.2(1)
TYPE B DOUBLE-WALL GAS VENT**

Number of Appliances	Single
Appliance Type	Category I
Appliance Vent Connection	Connected directly to vent

HEIGHT (H) (feet)	LATERAL (L) (feet)	VENT DIAMETER—(D) Inches																					
		3		4		5		6		7		8		9									
		APPLIANCE INPUT RATING IN THOUSANDS OF BTU/H																					
		FAN		NAT	FAN		NAT	FAN		NAT	FAN		NAT	FAN		NAT	FAN		NAT	FAN		NAT	
Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max
6	0	0	78	46	0	152	86	0	251	141	0	375	205	0	524	285	0	698	370	0	897	470	
	2	13	51	36	18	97	67	27	157	105	32	232	157	44	321	217	53	425	285	63	543	370	
	4	21	49	34	30	94	64	39	153	103	50	227	153	66	316	211	79	419	279	93	536	362	
	6	25	46	32	36	91	61	47	149	100	59	223	149	78	310	205	93	413	273	110	530	354	
8	0	0	84	50	0	165	94	0	276	155	0	415	235	0	583	320	0	780	415	0	1,006	537	
	2	12	57	40	16	109	75	25	178	120	28	263	180	42	365	247	50	483	322	60	619	418	
	5	23	53	38	32	103	71	42	171	115	53	255	173	70	356	237	83	473	313	99	607	407	
	8	28	49	35	39	98	66	51	164	109	64	247	165	84	347	227	99	463	303	117	596	396	
10	0	0	88	53	0	175	100	0	295	166	0	447	255	0	631	345	0	847	450	0	1,096	585	
	2	12	61	42	17	118	81	23	194	129	26	289	195	40	402	273	48	533	355	57	684	457	
	5	23	57	40	32	113	77	41	187	124	52	280	188	68	392	263	81	522	346	95	671	446	
	10	30	51	36	41	104	70	54	176	115	67	267	175	88	376	245	104	504	330	122	651	427	
15	0	0	94	58	0	191	112	0	327	187	0	502	285	0	716	390	0	970	525	0	1,263	682	
	2	11	69	48	15	136	93	20	226	150	22	339	225	38	475	316	45	633	414	53	815	544	
	5	22	65	45	30	130	87	39	219	142	49	330	217	64	463	300	76	620	403	90	800	529	
	10	29	59	41	40	121	82	51	206	135	64	315	208	84	445	288	99	600	386	116	777	507	
20	15	35	53	37	48	112	76	61	195	128	76	301	198	98	429	275	115	580	373	134	755	491	
	0	0	97	61	0	202	119	0	349	202	0	540	307	0	776	430	0	1,057	575	0	1,384	752	
	2	10	75	51	14	149	100	18	250	166	20	377	249	33	531	346	41	711	470	50	917	612	
	5	21	71	48	29	143	96	38	242	160	47	367	241	62	519	337	73	697	460	86	902	599	
	10	28	64	44	38	133	89	50	229	150	62	351	228	81	499	321	95	675	443	112	877	576	
	15	34	58	40	46	124	84	59	217	142	73	337	217	94	481	308	111	654	427	129	853	557	
	20	48	52	35	55	116	78	69	206	134	84	322	206	107	464	295	125	634	410	145	830	537	

(continued)

TABLE 504.2(1)—continued
TYPE B DOUBLE-WALL GAS VENT

Number of Appliances	Single
Appliance Type	Category I
Appliance Vent Connection	Connected directly to vent

HEIGHT (H) (feet)	LATERAL (L) (feet)	VENT DIAMETER—(D) Inches																				
		3			4			5			6			7			8			9		
		APPLIANCE INPUT RATING IN THOUSANDS OF BTU/H																				
		FAN		NAT	FAN		NAT	FAN		NAT	FAN		NAT	FAN		NAT	FAN		NAT	FAN		NAT
Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max		
30	0	0	100	64	0	213	128	0	374	220	0	587	336	0	853	475	0	1,173	650	0	1,548	855
	2	9	81	56	13	166	112	14	283	185	18	432	280	27	613	394	33	826	535	42	1,072	700
	5	21	77	54	28	160	108	36	275	176	45	421	273	58	600	385	69	811	524	82	1,055	688
	10	27	70	50	37	150	102	48	262	171	59	405	261	77	580	371	91	788	507	107	1,028	668
	15	33	64	NA	44	141	96	57	249	163	70	389	249	90	560	357	105	765	490	124	1,002	648
	20	56	58	NA	53	132	90	66	237	154	80	374	237	102	542	343	119	743	473	139	977	628
	30	NA	NA	NA	73	113	NA	88	214	NA	104	346	219	131	507	321	149	702	444	171	929	594
50	0	0	101	67	0	216	134	0	397	232	0	633	363	0	932	518	0	1,297	708	0	1,730	952
	2	8	86	61	11	183	122	14	320	206	15	497	314	22	715	445	26	975	615	33	1,276	813
	5	20	82	NA	27	177	119	35	312	200	43	487	308	55	702	438	65	960	605	77	1,259	798
	10	26	76	NA	35	168	114	45	299	190	56	471	298	73	681	426	86	935	589	101	1,230	773
	15	59	70	NA	42	158	NA	54	287	180	66	455	288	85	662	413	100	911	572	117	1,203	747
	20	NA	NA	NA	50	149	NA	63	275	169	76	440	278	97	642	401	113	888	556	131	1,176	722
	30	NA	NA	NA	69	131	NA	84	250	NA	99	410	259	123	605	376	141	844	522	161	1,125	670
100	0	NA	NA	NA	0	218	NA	0	407	NA	0	665	400	0	997	560	0	1,411	770	0	1,908	1,040
	2	NA	NA	NA	10	194	NA	12	354	NA	13	566	375	18	831	510	21	1,155	700	25	1,536	935
	5	NA	NA	NA	26	189	NA	33	347	NA	40	557	369	52	820	504	60	1,141	692	71	1,519	926
	10	NA	NA	NA	33	182	NA	43	335	NA	53	542	361	68	801	493	80	1,118	679	94	1,492	910
	15	NA	NA	NA	40	174	NA	50	321	NA	62	528	353	80	782	482	93	1,095	666	109	1,465	895
	20	NA	NA	NA	47	166	NA	59	311	NA	71	513	344	90	763	471	105	1,073	653	122	1,438	880
	30	NA	NA	NA	NA	NA	NA	78	290	NA	92	483	NA	115	726	449	131	1,029	627	149	1,387	849
	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	147	428	NA	180	651	405	197	944	575	217	1,288	787

(continued)

TABLE 504.2(1)—continued
TYPE B DOUBLE-WALL GAS VENT

Number of Appliances	Single
Appliance Type	Category I
Appliance Vent Connection	Connected directly to vent

HEIGHT (H) (feet)	LATERAL (L) (feet)	VENT DIAMETER—(D) inches																							
		10		12		14		15		16		18		20		22		24							
		APPLIANCE INPUT RATING IN THOUSANDS OF BTU/H																							
		FAN		NAT		FAN		NAT		FAN		NAT		FAN		NAT		FAN		NAT		FAN		NAT	
Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max
6	0	0	1,121	570	0	1,645	850	0	2,267	1,170	0	2,983	1,530	0	3,802	1,960	0	4,721	2,430	0	5,737	2,950	0	6,853	3,520
	2	75	675	455	103	982	650	138	1,346	890	178	1,769	1,170	225	2,250	1,480	296	2,782	1,850	360	3,377	2,220	426	4,030	2,670
	4	110	668	445	147	975	640	191	1,338	880	242	1,761	1,160	300	2,242	1,475	390	2,774	1,835	469	3,370	2,215	555	4,023	2,660
	6	128	661	435	171	967	630	219	1,330	870	276	1,753	1,150	341	2,235	1,470	437	2,767	1,820	523	3,363	2,210	618	4,017	2,650
8	0	0	1,261	660	0	1,858	970	0	2,571	1,320	0	3,399	1,740	0	4,333	2,220	0	5,387	2,750	0	6,555	3,360	0	7,838	4,010
	2	71	770	515	98	1,124	745	130	1,543	1,020	168	2,030	1,340	212	2,584	1,700	278	3,196	2,110	336	3,882	2,560	401	4,634	3,050
	5	115	758	503	154	1,110	733	199	1,528	1,010	251	2,013	1,330	311	2,563	1,685	398	3,180	2,090	476	3,863	2,545	562	4,612	3,040
	8	137	746	490	180	1,097	720	231	1,514	1,000	289	2,000	1,320	354	2,552	1,670	450	3,163	2,070	537	3,850	2,530	630	4,602	3,030
10	0	0	1,377	720	0	2,036	1,060	0	2,825	1,450	0	3,742	1,925	0	4,782	2,450	0	5,955	3,050	0	7,254	3,710	0	8,682	4,450
	2	68	852	560	93	1,244	850	124	1,713	1,130	161	2,256	1,480	202	2,868	1,890	264	3,556	2,340	319	4,322	2,840	378	5,153	3,390
	5	112	839	547	149	1,229	829	192	1,696	1,105	243	2,238	1,461	300	2,849	1,871	382	3,536	2,318	458	4,301	2,818	540	5,132	3,371
	10	142	817	525	187	1,204	795	238	1,669	1,080	298	2,209	1,430	364	2,818	1,840	459	3,504	2,280	546	4,268	2,780	641	5,099	3,340
15	0	0	1,596	840	0	2,380	1,240	0	3,323	1,720	0	4,423	2,270	0	5,678	2,900	0	7,099	3,620	0	8,665	4,410	0	10,393	5,300
	2	63	1,019	675	86	1,495	985	114	2,062	1,350	147	2,719	1,770	186	3,467	2,260	239	4,304	2,800	290	5,232	3,410	346	6,251	4,080
	5	105	1,003	660	140	1,476	967	182	2,041	1,327	229	2,696	1,748	283	3,442	2,235	355	4,278	2,777	426	5,204	3,385	501	6,222	4,057
	10	135	977	635	177	1,446	936	227	2,009	1,289	283	2,659	1,712	346	3,402	2,193	432	4,234	2,739	510	5,159	3,343	599	6,175	4,019
20	15	155	953	610	202	1,418	905	257	1,976	1,250	318	2,623	1,675	385	3,363	2,150	479	4,192	2,700	564	5,115	3,300	665	6,129	3,980
	0	0	1,756	930	0	2,637	1,350	0	3,701	1,900	0	4,948	2,520	0	6,376	3,250	0	7,988	4,060	0	9,785	4,980	0	11,753	6,000
	2	59	1,150	755	81	1,694	1,100	107	2,343	1,520	139	3,097	2,000	175	3,955	2,570	220	4,916	3,200	269	5,983	3,910	321	7,154	4,700
	5	101	1,133	738	135	1,674	1,079	174	2,320	1,498	219	3,071	1,978	270	3,926	2,544	337	4,885	3,174	403	5,950	3,880	475	7,119	4,662
	10	130	1,105	710	172	1,641	1,045	220	2,282	1,460	273	3,029	1,940	334	3,880	2,500	413	4,835	3,130	489	5,896	3,830	573	7,063	4,600
	15	150	1,078	688	195	1,609	1,018	248	2,245	1,425	306	2,988	1,910	372	3,835	2,465	459	4,786	3,090	541	5,844	3,795	631	7,007	4,575
20	167	1,052	665	217	1,578	990	273	2,210	1,390	335	2,948	1,880	404	3,791	2,430	495	4,737	3,050	585	5,792	3,760	689	6,953	4,550	

(continued)

TABLE 504.2(1)—continued
TYPE B DOUBLE-WALL GAS VENT

Number of Appliances	Single
Appliance Type	Category I
Appliance Vent Connection	Connected directly to vent

HEIGHT (H) (feet)	LATERAL (L) (feet)	VENT DIAMETER—(D) inches																							
		10		12		14		16		18		20		22		24									
		APPLIANCE INPUT RATING IN THOUSANDS OF BTU/H																							
		FAN		NAT	FAN		NAT	FAN		NAT	FAN		NAT	FAN		NAT	FAN		NAT	FAN		NAT			
Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max				
30	0	0	1,977	1,060	0	3,004	1,550	0	4,252	2,170	0	5,725	2,920	0	7,420	3,770	0	9,341	4,750	0	11,483	5,850	0	13,848	7,060
	2	54	1,351	865	74	2,004	1,310	98	2,786	1,800	127	3,696	2,380	159	4,734	3,050	199	5,900	3,810	241	7,194	4,650	285	8,617	5,600
	5	96	1,332	851	127	1,981	1,289	164	2,759	1,775	206	3,666	2,350	252	4,701	3,020	312	5,863	3,783	373	7,155	4,622	439	8,574	5,552
	10	125	1,301	829	164	1,944	1,254	209	2,716	1,733	259	3,617	2,300	316	4,647	2,970	386	5,803	3,739	456	7,090	4,574	535	8,505	5,471
	15	143	1,272	807	187	1,908	1,220	237	2,674	1,692	292	3,570	2,250	354	4,594	2,920	431	5,744	3,695	507	7,026	4,527	590	8,437	5,391
	20	160	1,243	784	207	1,873	1,185	260	2,633	1,650	319	3,523	2,200	384	4,542	2,870	467	5,686	3,650	548	6,964	4,480	639	8,370	5,310
	30	195	1,189	745	246	1,807	1,130	305	2,555	1,585	369	3,433	2,130	440	4,442	2,785	540	5,574	3,565	635	6,842	4,375	739	8,239	5,225
50	0	0	2,231	1,195	0	3,441	1,825	0	4,934	2,550	0	6,711	3,440	0	8,774	4,460	0	11,129	5,635	0	13,767	6,940	0	16,694	8,430
	2	41	1,620	1,010	66	2,431	1,513	86	3,409	2,125	113	4,554	2,840	141	5,864	3,670	171	7,339	4,630	209	8,980	5,695	251	10,788	6,860
	5	90	1,600	996	118	2,406	1,495	151	3,380	2,102	191	4,520	2,813	234	5,826	3,639	283	7,295	4,597	336	8,933	5,654	394	10,737	6,818
	10	118	1,567	972	154	2,366	1,466	196	3,332	2,064	243	4,464	2,767	295	5,763	3,585	355	7,224	4,542	419	8,855	5,585	491	10,652	6,749
	15	136	1,536	948	177	2,327	1,437	222	3,285	2,026	274	4,409	2,721	330	5,701	3,534	396	7,155	4,511	465	8,779	5,546	542	10,570	6,710
	20	151	1,505	924	195	2,288	1,408	244	3,239	1,987	300	4,356	2,675	361	5,641	3,481	433	7,086	4,479	506	8,704	5,506	586	10,488	6,670
	30	183	1,446	876	232	2,214	1,349	287	3,150	1,910	347	4,253	2,631	412	5,523	3,431	494	6,953	4,421	577	8,557	5,444	672	10,328	6,603
100	0	0	2,491	1,310	0	3,925	2,050	0	5,729	2,950	0	7,914	4,050	0	10,485	5,300	0	13,454	6,700	0	16,817	8,600	0	20,578	10,300
	2	30	1,975	1,170	44	3,027	1,820	72	4,313	2,550	95	5,834	3,500	120	7,591	4,600	138	9,577	5,800	169	11,803	7,200	204	14,264	8,800
	5	82	1,955	1,159	107	3,002	1,803	136	4,282	2,531	172	5,797	3,475	208	7,548	4,566	245	9,528	5,769	293	11,748	7,162	34	14,204	8,756
	10	108	1,923	1,142	142	2,961	1,775	180	4,231	2,500	223	5,737	3,434	268	7,478	4,509	318	9,447	5,717	374	11,658	7,100	436	14,105	8,683
	15	126	1,892	1,124	163	2,920	1,747	206	4,182	2,469	252	5,678	3,392	304	7,404	4,451	358	9,267	5,665	418	11,569	7,037	487	14,007	8,610
	20	141	1,861	1,107	181	2,880	1,719	226	4,133	2,438	277	5,619	3,351	330	7,341	4,394	387	9,289	5,613	452	11,482	6,975	523	13,910	8,531
	30	170	1,802	1,071	215	2,803	1,663	265	4,037	2,375	319	5,505	3,267	378	7,209	4,279	446	9,136	5,509	514	11,310	6,850	592	13,720	8,397
50	241	1,688	1,000	292	2,657	1,550	350	3,856	2,250	415	5,289	3,100	486	6,956	4,050	572	8,841	5,300	659	10,979	6,600	752	13,354	8,100	

TABLE 504.2(2)
TYPE B DOUBLE-WALL GAS VENT

Number of Appliances	Single
Appliance Type	Category I
Appliance Vent Connection	Single-wall metal connector

HEIGHT (H) (feet)	LATERAL (L) (feet)	VENT DIAMETER—(D) inches																																			
		3				4				5				6				7				8				9				10				12			
		FAN		NAT		FAN		NAT		FAN		NAT		FAN		NAT		FAN		NAT		FAN		NAT		FAN		NAT		FAN		NAT					
		Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max			
6	0	38	77	45	59	151	85	85	249	140	126	373	204	165	522	284	211	695	369	267	894	469	371	1,118	569	537	1,639	849									
	2	39	51	36	60	96	66	85	156	104	123	231	156	159	320	213	201	423	284	251	541	368	347	673	453	498	979	648									
	4	NA	NA	33	74	92	63	102	152	102	146	225	152	187	313	208	237	416	277	295	533	360	409	664	443	584	971	638									
	6	NA	NA	31	83	89	60	114	147	99	163	220	148	207	307	203	263	409	271	327	526	352	449	656	433	638	962	627									
8	0	37	83	50	58	164	93	83	273	154	123	412	234	161	580	319	206	777	414	258	1,002	536	360	1,257	658	521	1,852	967									
	2	39	56	39	59	108	75	83	176	119	121	261	179	155	363	246	197	482	321	246	617	417	339	768	513	486	1,120	743									
	5	NA	NA	37	77	102	69	107	168	114	151	252	171	193	352	235	245	470	311	305	604	404	418	754	500	598	1,104	730									
	8	NA	NA	33	90	95	64	122	161	107	175	243	163	223	342	225	280	458	300	344	591	392	470	740	486	665	1,089	715									
10	0	37	87	53	57	174	99	82	293	165	120	444	254	158	628	344	202	844	449	253	1,093	584	351	1,373	718	507	2,031	1,057									
	2	39	61	41	59	117	80	82	193	128	119	287	194	153	400	272	193	531	354	242	681	456	332	849	559	475	1,242	848									
	5	52	56	39	76	111	76	105	185	122	148	277	186	190	388	261	241	518	344	299	667	443	409	834	544	584	1,224	825									
	10	NA	NA	34	97	100	68	132	171	112	188	261	171	237	369	241	296	497	325	363	643	423	492	808	520	688	1,194	788									
15	0	36	93	57	56	190	111	80	325	186	116	499	283	153	713	388	195	966	523	244	1,259	681	336	1,591	838	488	2,374	1,237									
	2	38	69	47	57	136	93	80	225	149	115	337	224	148	473	314	187	631	413	232	812	543	319	1,015	673	457	1,491	983									
	5	51	63	44	75	128	86	102	216	140	144	326	217	182	459	298	231	616	400	287	795	526	392	997	657	562	1,469	963									
	10	NA	NA	39	95	116	79	128	201	131	182	308	203	228	438	284	284	592	381	349	768	501	470	966	628	664	1,433	928									
20	0	35	96	60	54	200	118	78	346	201	114	537	306	149	772	428	190	1,053	573	238	1,379	750	326	1,751	927	473	2,631	1,346									
	2	37	74	50	56	148	99	78	248	165	113	375	248	144	528	344	182	708	468	227	914	611	309	1,146	754	443	1,689	1,098									
	5	50	68	47	73	140	94	100	239	158	141	363	239	178	514	334	224	692	457	279	896	596	381	1,126	734	547	1,665	1,074									
	10	NA	NA	41	93	129	86	125	223	146	177	344	224	222	491	316	277	666	437	339	866	570	457	1,092	702	646	1,626	1,037									
25	0	35	96	60	54	200	118	78	346	201	114	537	306	149	772	428	190	1,053	573	238	1,379	750	326	1,751	927	473	2,631	1,346									
	2	37	74	50	56	148	99	78	248	165	113	375	248	144	528	344	182	708	468	227	914	611	309	1,146	754	443	1,689	1,098									
	5	50	68	47	73	140	94	100	239	158	141	363	239	178	514	334	224	692	457	279	896	596	381	1,126	734	547	1,665	1,074									
	10	NA	NA	41	93	129	86	125	223	146	177	344	224	222	491	316	277	666	437	339	866	570	457	1,092	702	646	1,626	1,037									
30	0	35	96	60	54	200	118	78	346	201	114	537	306	149	772	428	190	1,053	573	238	1,379	750	326	1,751	927	473	2,631	1,346									
	2	37	74	50	56	148	99	78	248	165	113	375	248	144	528	344	182	708	468	227	914	611	309	1,146	754	443	1,689	1,098									
	5	50	68	47	73	140	94	100	239	158	141	363	239	178	514	334	224	692	457	279	896	596	381	1,126	734	547	1,665	1,074									
	10	NA	NA	41	93	129	86	125	223	146	177	344	224	222	491	316	277	666	437	339	866	570	457	1,092	702	646	1,626	1,037									
35	0	35	96	60	54	200	118	78	346	201	114	537	306	149	772	428	190	1,053	573	238	1,379	750	326	1,751	927	473	2,631	1,346									
	2	37	74	50	56	148	99	78	248	165	113	375	248	144	528	344	182	708	468	227	914	611	309	1,146	754	443	1,689	1,098									
	5	50	68	47	73	140	94	100	239	158	141	363	239	178	514	334	224	692	457	279	896	596	381	1,126	734	547	1,665	1,074									
	10	NA	NA	41	93	129	86	125	223	146	177	344	224	222	491	316	277	666	437	339	866	570	457	1,092	702	646	1,626	1,037									
40	0	35	96	60	54	200	118	78	346	201	114	537	306	149	772	428	190	1,053	573	238	1,379	750	326	1,751	927	473	2,631	1,346									
	2	37	74	50	56	148	99	78	248	165	113	375	248	144	528	344	182	708	468	227	914	611	309	1,146	754	443	1,689	1,098									
	5	50	68	47	73	140	94	100	239	158	141	363	239	178	514	334	224	692	457	279	896	596	381	1,126	734	547	1,665	1,074									
	10	NA	NA	41	93	129	86	125	223	146	177	344	224	222	491	316	277	666	437	339	866	570	457	1,092	702	646	1,626	1,037									
45	0	35	96	60	54	200	118	78	346	201	114	537	306	149	772	428	190	1,053	573	238	1,379	750	326	1,751	927	473	2,631	1,346									
	2	37	74	50	56	148	99	78	248	165	113	375	248	144	528	344	182	708	468	227	914	611	309	1,146	754	443	1,689	1,098									
	5	50	68	47	73	140	94	100	239	158	141	363	239	178	514	334	224	692	457	279	896	596	381	1,126	734	547	1,665	1,074									
	10	NA	NA	41	93	129	86	125	223	146	177	344	224	222	491	316	277	666	437	339	866	570	457	1,092	702	646	1,626	1,037									
50	0	35	96	60	54	200	118	78	346	201	114	537	306	149	772	428	190	1,053	573	238	1,379	750	326	1,751	927	473	2,631	1,346									
	2	37	74	50	56	148	99	78	248	165	113	375	248	144	528	344	182	708	468	227	914	611	309	1,146	754	443	1,689	1,098									
	5	50	68	47	73	140	94	100	239	158	141	363	239	178	514	334	224	692	457	279	896	596	381	1,126	734	547	1,665	1,074									
	10	NA	NA	41	93	129	86	125	223	146	177	344	224	222	491	316	277	666	437	339	866	570	457	1,092	702	646	1,626	1,037									
55	0	35	96	60	54	200	118	78	346	201	114	537	306	149	772	428	190	1,053	573	238	1,379	750	326	1,751	927	473	2,631	1,346									
	2	37	74	50	56	148	99	78	248	165	113	375	248	144	528	344	182	708	468	227	914	611	309	1,146	754	443	1,689	1,098									
	5	50	68	47	73	140	94	100	239	158	141	363	239	178	514	334	224	692	457	279	896	596	381	1,126	734	547	1,665	1,074									
	10	NA	NA	41	93	129	86	125	223	146	177	344	224	222	491	316	277	666	437	339	866	570	457	1,092	702	646	1,626	1,037									
60	0	35	96	60	54	200	118	78	346	201	114	537	306	149	772	428	190	1,053	573	238	1,379	750	326	1,751	927	473	2,631	1,346									
	2	37	74	50	56	148	99	78	248	165	113	375	248	144	528	344	182	708	468	227	914	611	309	1,146	754	443	1,689	1,098									
	5	50	68	47	73	140	94	100	239	158	141	363	239	178	514	334	224	692	457	279	896	596	381	1,126	734	547	1,665	1,074									
	10	NA	NA	41	93	129	86	125	223	146	177	344	224	222	491	316	277	666	437	339	866	570	457	1,092	702	646	1,626										

TABLE 504.2(3)
MASONRY CHIMNEY

Number of Appliances	Single
Appliance Type	Category I
Appliance Vent Connection	Type B double-wall connector

HEIGHT (H) (feet)	LATERAL (L) (feet)	TYPE B DOUBLE-WALL CONNECTOR DIAMETER—(D) inches to be used with chimney areas within the size limits at bottom																										
		3		4		5		6		7		8		9		10		12										
		APPLIANCE INPUT RATING IN THOUSANDS OF BTU/H																										
		FAN		NAT		FAN		NAT		FAN		NAT		FAN		NAT		FAN		NAT		FAN		NAT				
Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max		
6	2	NA	NA	28	NA	NA	52	NA	NA	86	NA	NA	130	NA	NA	180	NA	NA	247	NA	NA	320	NA	NA	401	NA	NA	581
	5	NA	NA	25	NA	NA	49	NA	NA	82	NA	NA	117	NA	NA	165	NA	NA	231	NA	NA	298	NA	NA	376	NA	NA	561
8	2	NA	NA	29	NA	NA	55	NA	NA	93	NA	NA	145	NA	NA	198	NA	NA	266	84	590	350	100	728	446	139	1,024	651
	5	NA	NA	26	NA	NA	52	NA	NA	88	NA	NA	134	NA	NA	183	NA	NA	247	NA	NA	328	149	711	423	201	1,007	640
	8	NA	NA	24	NA	NA	48	NA	NA	83	NA	NA	127	NA	NA	175	NA	NA	239	NA	NA	318	173	695	410	231	990	623
10	2	NA	NA	31	NA	NA	61	NA	NA	103	NA	NA	162	NA	NA	221	68	519	298	82	655	388	98	810	491	136	1,144	724
	5	NA	NA	28	NA	NA	57	NA	NA	96	NA	NA	148	NA	NA	204	NA	NA	277	124	638	365	146	791	466	196	1,124	712
	10	NA	NA	25	NA	NA	50	NA	NA	87	NA	NA	139	NA	NA	191	NA	NA	263	155	610	347	182	762	444	240	1,093	668
15	2	NA	NA	35	NA	NA	67	NA	NA	114	NA	NA	179	53	475	250	64	613	336	77	779	441	92	968	562	127	1,376	841
	5	NA	NA	35	NA	NA	62	NA	NA	107	NA	NA	164	NA	NA	231	99	594	313	118	759	416	139	946	533	186	1,352	828
	10	NA	NA	28	NA	NA	55	NA	NA	97	NA	NA	153	NA	NA	216	126	565	296	148	727	394	173	912	567	229	1,315	777
	15	NA	NA	NA	NA	NA	48	NA	NA	89	NA	NA	141	NA	NA	201	NA	NA	281	171	698	375	198	880	485	259	1,280	742
20	2	NA	NA	38	NA	NA	74	NA	NA	124	NA	NA	201	51	522	274	61	678	375	73	867	491	87	1,083	627	121	1,548	953
	5	NA	NA	36	NA	NA	68	NA	NA	116	NA	NA	184	80	503	254	95	658	350	113	845	463	133	1,059	597	179	1,523	933
	10	NA	NA	NA	NA	NA	60	NA	NA	107	NA	NA	172	NA	NA	237	122	627	332	143	811	440	167	1,022	566	221	1,482	879
	15	NA	NA	NA	NA	NA	NA	NA	NA	97	NA	NA	159	NA	NA	220	NA	NA	314	165	780	418	191	987	541	251	1,443	840
	20	NA	NA	NA	NA	NA	NA	NA	NA	83	NA	NA	148	NA	NA	206	NA	NA	296	186	750	397	214	955	513	277	1,406	807

(continued)

TABLE 504.2(3)—continued
MASONRY CHIMNEY

Number of Appliances	Single
Appliance Type	Category I
Appliance Vent Connection	Type B double-wall connector

HEIGHT (H) (feet)	LATERAL (L) (feet)	TYPE B DOUBLE-WALL CONNECTOR DIAMETER—(D) inches to be used with chimney areas within the size limits at bottom																											
		3			4			5			6			7			8			9			10			12			
		APPLIANCE INPUT RATING IN THOUSANDS OF BTU/H																											
		FAN		NAT		FAN		NAT		FAN		NAT		FAN		NAT		FAN		NAT		FAN		NAT		FAN		NAT	
Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max
30	2	NA	NA	41	NA	NA	82	NA	NA	137	NA	NA	216	47	581	303	57	762	421	68	985	558	81	1,240	717	111	1,793	1,112	
	5	NA	NA	NA	NA	NA	76	NA	NA	128	NA	NA	198	75	561	281	90	741	393	106	962	526	125	1,216	683	169	1,766	1,094	
	10	NA	NA	NA	NA	NA	67	NA	NA	115	NA	NA	184	NA	NA	263	115	709	373	135	927	500	158	1,176	648	210	1,721	1,025	
	15	NA	NA	NA	NA	NA	NA	NA	NA	107	NA	NA	171	NA	NA	243	NA	NA	353	156	893	476	181	1,139	621	239	1,679	981	
	20	NA	NA	NA	NA	NA	NA	NA	NA	91	NA	NA	159	NA	NA	227	NA	NA	332	176	860	450	203	1,103	592	264	1,638	940	
	30	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	188	NA	NA	288	NA	NA	416	249	1,035	555	318	1,560	877	
50	2	NA	NA	NA	NA	NA	92	NA	NA	161	NA	NA	251	NA	NA	351	51	840	477	61	1,106	633	72	1,413	812	99	2,080	1,243	
	5	NA	NA	NA	NA	NA	NA	NA	NA	151	NA	NA	230	NA	NA	323	83	819	445	98	1,083	596	116	1,387	774	155	2,052	1,225	
	10	NA	NA	NA	NA	NA	NA	NA	NA	138	NA	NA	215	NA	NA	304	NA	NA	424	126	1,047	567	147	1,347	733	195	2,006	1,147	
	15	NA	NA	NA	NA	NA	NA	NA	NA	127	NA	NA	199	NA	NA	282	NA	NA	400	146	1,010	539	170	1,307	702	222	1,961	1,099	
	20	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	185	NA	NA	264	NA	NA	376	165	977	511	190	1,269	669	246	1,916	1,050	
	30	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	327	NA	NA	468	233	1,196	623	295	1,832	984	
Minimum Internal Area of Chimney (square inches)		12			19			28			38			50			63			78			95			132			
Maximum Internal Area of Chimney (square inches)		Seven times the listed appliance categorized vent area, flue collar area or draft hood outlet area.																											

For SI: 1 inch = 25.4 mm, 1 square inch = 645.16 mm², 1 foot = 304.8 mm, 1 British thermal unit per hour = 0.2931 W.

TABLE 504.2(4)
MASONRY CHIMNEY

Number of Appliances	Single
Appliance Type	Category I
Appliance Vent Connection	Single-wall metal connector

HEIGHT (H) (feet)	LATERAL (L) (feet)	SINGLE-WALL METAL CONNECTOR DIAMETER—(D) inches to be used with chimney areas within the size limits at bottom																													
		3		4		5		6		7		8		9		10		12													
		APPLIANCE INPUT RATING IN THOUSANDS OF BTU/H																													
		FAN		NAT		FAN		NAT		FAN		NAT		FAN		NAT		FAN		NAT		FAN		NAT		FAN		NAT			
		Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max
6	2	NA	NA	28	NA	NA	52	NA	NA	86	NA	NA	130	NA	NA	180	NA	NA	247	NA	NA	319	NA	NA	400	NA	NA	580			
	5	NA	NA	25	NA	NA	48	NA	NA	81	NA	NA	116	NA	NA	164	NA	NA	230	NA	NA	297	NA	NA	375	NA	NA	560			
8	2	NA	NA	29	NA	NA	55	NA	NA	93	NA	NA	145	NA	NA	197	NA	NA	265	NA	NA	349	382	725	445	549	1,021	650			
	5	NA	NA	26	NA	NA	51	NA	NA	87	NA	NA	133	NA	NA	182	NA	NA	246	NA	NA	327	NA	NA	422	673	1,003	638			
10	8	NA	NA	23	NA	NA	47	NA	NA	82	NA	NA	126	NA	NA	174	NA	NA	237	NA	NA	317	NA	NA	408	747	985	621			
	2	NA	NA	31	NA	NA	61	NA	NA	102	NA	NA	161	NA	NA	220	216	518	297	271	654	387	373	808	490	536	1,142	722			
	5	NA	NA	28	NA	NA	56	NA	NA	95	NA	NA	147	NA	NA	203	NA	NA	276	334	635	364	459	789	465	657	1,121	710			
15	10	NA	NA	24	NA	NA	49	NA	NA	86	NA	NA	137	NA	NA	189	NA	NA	261	NA	NA	345	547	758	441	771	1,088	665			
	2	NA	NA	35	NA	NA	67	NA	NA	113	NA	NA	178	166	473	249	211	611	335	264	776	440	362	965	560	520	1,373	840			
	5	NA	NA	32	NA	NA	61	NA	NA	106	NA	NA	163	NA	NA	230	261	591	312	325	775	414	444	942	531	637	1,348	825			
	10	NA	NA	27	NA	NA	54	NA	NA	96	NA	NA	151	NA	NA	214	NA	NA	294	392	722	392	531	907	504	749	1,309	774			
20	15	NA	NA	NA	NA	NA	46	NA	NA	87	NA	NA	138	NA	NA	198	NA	NA	278	452	692	372	606	873	481	841	1,272	738			
	2	NA	NA	38	NA	NA	73	NA	NA	123	NA	NA	200	163	520	273	206	675	374	258	864	490	252	1,079	625	508	1,544	950			
	5	NA	NA	35	NA	NA	67	NA	NA	115	NA	NA	183	80	NA	252	255	655	348	317	842	461	433	1,055	594	623	1,518	930			
	10	NA	NA	NA	NA	NA	59	NA	NA	105	NA	NA	170	NA	NA	235	312	622	330	382	806	437	517	1,016	562	733	1,475	875			
	15	NA	NA	NA	NA	NA	NA	NA	NA	95	NA	NA	156	NA	NA	217	NA	NA	311	442	773	414	591	979	539	823	1,434	835			
	20	NA	NA	NA	NA	NA	NA	NA	NA	80	NA	NA	144	NA	NA	202	NA	NA	292	NA	NA	392	663	944	510	911	1,394	800			

(continued)

TABLE 504.2(4)—continued
MASONRY CHIMNEY

Number of Appliances	Single
Appliance Type	Category I
Appliance Vent Connection	Single-wall metal connector

HEIGHT (H) (feet)	LATERAL (L) (feet)	SINGLE-WALL METAL CONNECTOR DIAMETER—(D) inches to be used with chimney areas within the size limits at bottom																											
		3		4		5		6		7		8		9		10		12											
		APPLIANCE INPUT RATING IN THOUSANDS OF BTU/H																											
		FAN		NAT	FAN		NAT	FAN		NAT	FAN		NAT	FAN		NAT	FAN		NAT	FAN		NAT	FAN		NAT	FAN		NAT	
Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max		
30	2	NA	NA	41	NA	NA	81	NA	NA	136	NA	NA	215	158	578	302	200	759	420	249	982	556	340	1,237	715	489	1,789	1,110	
	5	NA	NA	NA	NA	NA	75	NA	NA	127	NA	NA	196	NA	NA	279	245	737	391	306	958	524	417	1,210	680	600	1,760	1,090	
	10	NA	NA	NA	NA	NA	66	NA	NA	113	NA	NA	182	NA	NA	260	300	703	370	370	920	496	500	1,168	644	708	1,713	1,020	
	15	NA	NA	NA	NA	NA	NA	NA	NA	105	NA	NA	168	NA	NA	240	NA	NA	349	428	884	471	572	1,128	615	798	1,668	975	
	20	NA	NA	NA	NA	NA	NA	NA	NA	88	NA	NA	155	NA	NA	223	NA	NA	327	NA	NA	445	643	1,089	585	883	1,624	932	
50	30	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	182	NA	NA	281	NA	NA	408	NA	NA	544	1,055	1,539	865		
	2	NA	NA	NA	NA	NA	91	NA	NA	160	NA	NA	250	NA	NA	350	191	837	475	238	1,103	631	323	1,408	810	463	2,076	1,240	
	5	NA	NA	NA	NA	NA	NA	NA	NA	149	NA	NA	228	NA	NA	321	NA	NA	442	293	1,078	593	398	1,381	770	571	2,044	1,220	
	10	NA	NA	NA	NA	NA	NA	NA	NA	136	NA	NA	212	NA	NA	301	NA	NA	420	355	1,038	562	447	1,337	728	674	1,994	1,140	
	15	NA	NA	NA	NA	NA	NA	NA	NA	124	NA	NA	195	NA	NA	278	NA	NA	395	NA	NA	533	546	1,294	695	761	1,945	1,090	
50	20	NA	NA	NA	NA	NA	NA	NA	NA	180	NA	NA	258	NA	NA	370	NA	NA	504	616	1,251	660	844	1,898	1,040				
	30	NA	NA	NA	NA	NA	48	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	318	NA	NA	458	NA	NA	610	1,009	1,805	970		
Minimum Internal Area of Chimney (square inches)		12		19		28		38		50		63		78		95		132											
Maximum Internal Area of Chimney (square inches)		Seven times the listed appliance categorized vent area, flue collar area or draft hood outlet area.																											

For SI: 1 inch = 25.4 mm, 1 square inch = 645.16 mm², 1 foot = 304.8 mm, 1 British thermal unit per hour = 0.2931 W.

Table 504.2(5)

Single-Wall Metal Pipe or Type B Asbestos Cement Vent

TABLE 504.2(5)
SINGLE-WALL METAL PIPE OR TYPE B
ASBESTOS CEMENT VENT

Number of Appliances	Single
Appliance Type	Draft hood equipped
Appliance Vent Connection	Connected directly to pipe or vent

HEIGHT (H) (feet)	LATERAL (L) (feet)	VENT DIAMETER—(D) inches							
		3	4	5	6	7	8	10	12
		MAXIMUM APPLIANCE INPUT RATING IN THOUSANDS OF BTU/H							
6	0	39	70	116	170	232	312	500	750
	2	31	55	94	141	194	260	415	620
	5	28	51	88	128	177	242	390	600
8	0	42	76	126	185	252	340	542	815
	2	32	61	102	154	210	284	451	680
	5	29	56	95	141	194	264	430	648
	10	24	49	86	131	180	250	406	625
	0	45	84	138	202	279	372	606	912
	2	35	67	111	168	233	311	505	760
10	5	32	61	104	153	215	289	480	724
	10	27	54	94	143	200	274	455	700
	15	NA	46	84	130	186	258	432	666
	0	49	91	151	223	312	420	684	1,040
	2	39	72	122	186	260	350	570	865
	5	35	67	110	170	240	325	540	825
15	10	30	58	103	158	223	308	514	795
	15	NA	50	93	144	207	291	488	760
	20	NA	NA	82	132	195	273	466	726
	0	53	101	163	252	342	470	770	1,190
	2	42	80	136	210	286	392	641	990
	5	38	74	123	192	264	364	610	945
20	10	32	65	115	178	246	345	571	910
	15	NA	55	104	163	228	326	550	870
	20	NA	NA	91	149	214	306	525	832
	0	56	108	183	276	384	529	878	1,370
	2	44	84	148	230	320	441	730	1,140
	5	NA	78	137	210	296	410	694	1,080
30	10	NA	68	125	196	274	388	656	1,050
	15	NA	NA	113	177	258	366	625	1,000
	20	NA	NA	99	163	240	344	596	960
	30	NA	NA	NA	NA	192	295	540	890
	0	NA	120	210	310	443	590	980	1,550
	2	NA	95	171	260	370	492	820	1,290
50	5	NA	NA	159	234	342	474	780	1,230
	10	NA	NA	146	221	318	456	730	1,190
	15	NA	NA	NA	200	292	407	705	1,130
	20	NA	NA	NA	185	276	384	670	1,080
	30	NA	NA	NA	NA	222	330	605	1,010

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 British thermal unit per hour = 0.2931 W

Table 504.2(6)

Exterior Masonry Chimney

**TABLE 504.2(6)
EXTERIOR MASONRY CHIMNEY**

Number of Appliances	Single
Appliance Type	NAT
Appliance Vent Connection	Type B double-wall connector

MINIMUM ALLOWABLE INPUT RATING OF SPACE HEATING APPLIANCE IN THOUSANDS OF BTU PER HOUR									
VENT HEIGHT (feet)	Internal area of chimney (square inches)								
	12	19	28	38	50	63	78	113	
37°F or Greater	Local 99% Winter Design Temperature: 37°F or Greater								
6	0	0	0	0	0	0	0	0	
8	0	0	0	0	0	0	0	0	
10	0	0	0	0	0	0	0	0	
15	NA	0	0	0	0	0	0	0	
20	NA	NA	123	190	249	184	0	0	
30	NA	NA	NA	NA	NA	393	334	0	
50	NA	NA	NA	NA	NA	NA	NA	579	
27 to 36°F	Local 99% Winter Design Temperature: 27 to 36°F								
6	0	0	68	116	156	180	212	266	
8	0	0	82	127	167	187	214	263	
10	0	51	97	141	183	201	225	265	
15	NA	NA	NA	NA	233	253	274	305	
20	NA	NA	NA	NA	NA	307	330	362	
30	NA	NA	NA	NA	NA	419	445	485	
50	NA	NA	NA	NA	NA	NA	NA	763	
17 to 26°F	Local 99% Winter Design Temperature: 17 to 26°F								
6	NA	NA	NA	NA	NA	215	259	349	
8	NA	NA	NA	NA	197	226	264	352	
10	NA	NA	NA	NA	214	245	278	358	
15	NA	NA	NA	NA	NA	296	331	398	
20	NA	NA	NA	NA	NA	352	387	457	
30	NA	NA	NA	NA	NA	NA	507	581	
50	NA	NA	NA	NA	NA	NA	NA	NA	
5 to 16°F	Local 99% Winter Design Temperature: 5 to 16°F								
6	NA	NA	NA	NA	NA	NA	NA	416	
8	NA	NA	NA	NA	NA	NA	312	423	
10	NA	NA	NA	NA	NA	289	331	430	
15	NA	NA	NA	NA	NA	NA	393	485	
20	NA	NA	NA	NA	NA	NA	450	547	
30	NA	NA	NA	NA	NA	NA	NA	682	
50	NA	NA	NA	NA	NA	NA	NA	972	
-10 to 4°F	Local 99% Winter Design Temperature: -10 to 4°F								
6	NA	NA	NA	NA	NA	NA	NA	484	
8	NA	NA	NA	NA	NA	NA	NA	494	
10	NA	NA	NA	NA	NA	NA	NA	513	
15	NA	NA	NA	NA	NA	NA	NA	586	
20	NA	NA	NA	NA	NA	NA	NA	650	
30	NA	NA	NA	NA	NA	NA	NA	805	
50	NA	NA	NA	NA	NA	NA	NA	1,003	
-11°F or Lower	Local 99% Winter Design Temperature: -11°F or Lower Not recommended for any vent configurations								

504.2.1 Vent obstructions.

These venting tables shall not be used where obstructions, as described in Section 503.15, are installed in the venting system. The installation of vents serving listed appliances with vent dampers shall be in accordance with the appliance manufacturer's instructions or in accordance with the following:

1. The maximum capacity of the vent system shall be determined using the "NAT Max" column.
2. The minimum capacity shall be determined as if the appliance were a fan-assisted appliance, using the "FAN Min" column to determine the minimum capacity of the vent system. Where the corresponding "FAN Min" is "NA," the vent configuration shall not be permitted and an alternative venting configuration shall be utilized.

504.2.2 Minimum size.

Where the vent size determined from the tables is smaller than the appliance draft hood outlet or flue collar, the smaller size shall be permitted to be used provided that all of the following requirements are met:

1. The total vent height (H) is at least 10 feet (3048 mm).
2. Vents for appliance draft hood outlets or flue collars 12 inches (305 mm) in diameter or smaller are not reduced more than one table size.
3. Vents for appliance draft hood outlets or flue collars larger than 12 inches (305 mm) in diameter are not reduced more than two table sizes.
4. The maximum capacity listed in the tables for a fan-assisted appliance is reduced by 10 percent ($0.90 \times$ maximum table capacity).
5. The draft hood outlet is greater than 4 inches (102 mm) in diameter. Do not connect a 3-inch-diameter (76 mm) vent to a 4-inch-diameter (102 mm) draft hood outlet. This provision shall not apply to fan-assisted appliances.

504.2.3 Vent offsets.

Single-appliance venting configurations with zero (0) lateral lengths in Tables 504.2(1), 504.2(2) and 504.2(5) shall not have elbows in the venting system. Single-appliance venting configurations with lateral lengths include two 90-degree (1.57 rad) elbows. For each additional elbow up to and including 45 degrees (0.79 rad), the maximum capacity listed in the venting tables shall be reduced by 5 percent. For each additional elbow greater than 45 degrees (0.79 rad) up to and including 90 degrees (1.57 rad), the maximum capacity listed in the venting tables shall be reduced by 10 percent. Where multiple offsets occur in a vent, the total lateral length of all offsets combined shall not exceed that specified in Tables 504.2(1) through 504.2(5).

504.2.4 Zero lateral.

Zero (0) lateral (L) shall apply only to a straight vertical vent attached to a top outlet draft hood or flue collar.

504.2.5 [Reserved.]

504.2.6 Multiple input rate appliances.

For appliances with more than one input rate, the minimum vent capacity (FAN Min) determined from the tables shall be less than the lowest appliance input rating, and the maximum vent capacity (FAN Max/NAT Max) determined from the tables shall be greater than the highest appliance rating input.

504.2.7 Liner system sizing.

Listed corrugated metallic chimney liner systems in masonry chimneys shall be sized by using Table 504.2(1) or 504.2(2) for Type B vents with the maximum capacity reduced by 20 percent ($0.80 \times$ maximum capacity) and the minimum capacity as shown in Table 504.2(1) or 504.2(2). Corrugated metallic liner systems installed with bends or offsets shall have their maximum capacity further reduced in accordance with Section 504.2.3. The 20-percent reduction for corrugated metallic chimney liner systems includes an allowance for one long-radius 90-degree (157 rad) turn at the bottom of the liner.

504.2.8 Vent area and diameter.

Where the vertical vent has a larger diameter than the vent connector, the vertical vent diameter shall be used to determine the minimum vent capacity, and the connector diameter shall be used to determine the maximum vent capacity. The flow area of the vertical vent shall not exceed seven times the flow area of the listed appliance categorized vent area, flue collar area, or draft hood outlet area unless designed in accordance with approved engineering methods.

504.2.9 Chimney and vent locations.

Tables 504.2(1), 504.2(2), 504.2(3), 504.2(4) and 504.2(5) shall be used only for chimneys and vents not exposed to the outdoors below the roof line. A Type B vent or listed chimney lining system passing through an unused masonry chimney flue shall not be considered to be exposed to the outdoors. A Type B vent shall not be considered to be exposed to the outdoors where it passes through an unventilated enclosure or chase insulated to a value of not less than R8. Table 504.2(3) in combination with Table 504.2(6) shall be used for clay-tile-lined exterior masonry chimneys, provided that all of the following are met:

1. Vent connector is a Type B double-wall.
2. Vent connector length is limited to 1 1/2 feet for each inch (18 mm per mm) of vent connector diameter.
3. The appliance is draft hood equipped.
4. The input rating is less than the maximum capacity given by Table 504.2(3).
5. For a water heater, the outdoor design temperature is not less than 5°F (-15°C).
6. For a space-heating appliance, the input rating is greater than the minimum capacity given by Table 504.2(6).

Where these conditions cannot be met, an alternative venting design shall be used, such as a listed chimney lining system.

Exception: The installation of vents serving listed appliances shall be permitted to be in accordance with the appliance manufacturer's instructions and the terms of the listing.

504.2.10 Corrugated vent connector size.

Corrugated vent connectors shall be not smaller than the listed appliance categorized vent diameter, flue collar diameter, or draft hood outlet diameter.

504.2.11 Vent connector size limitation.

Vent connectors shall not be increased in size more than two sizes greater than the listed appliance categorized vent diameter, flue collar diameter, or draft hood outlet diameter.

504.2.12 Component commingling.

In a single run of vent or vent connector, different diameters and types of vent and connector components shall be permitted to be used, provided that all such sizes and types are permitted by the tables.

504.2.13 Draft hood conversion accessories.

Draft hood conversion accessories for use with masonry chimneys venting listed Category I fan-assisted appliances shall be listed and installed in accordance with the manufacturer's installation instructions for such listed accessories.

504.2.14 Table interpolation.

Interpolation shall be permitted in calculating capacities for vent dimensions that fall between the table entries.

504.2.15 Extrapolation prohibited.

Extrapolation beyond the table entries shall not be permitted.

504.2.16 Engineering calculations.

For vent heights less than 6 feet (1829mm) and greater than shown in the tables, engineering methods shall be used to calculate vent capacities. Signed and sealed calculations shall be submitted with filing application.

504.3 Application of multiple appliance vent Tables 504.3(1) through 504.3(7).

The application of Tables 504.3(1) through 504.3(7) shall be subject to the requirements of Sections 504.3.1 through 504.3.27.

Table 504.3(1)

Type B Double-Wall Vent

TABLE 504.3(1)
TYPE B DOUBLE-WALL VENT

Number of Appliances	Two or more
Appliance Type	Category I
Appliance Vent Connection	Type B double-wall connector

VENT CONNECTOR CAPACITY

VENT HEIGHT (ft)		CONNECTOR RISE (ft)	TYPE B DOUBLE-WALL VENT AND CONNECTOR DIAMETER—(D) inches																							
			3		4		5		6		7		8		9		10									
			APPLIANCE INPUT RATING LIMITS IN THOUSANDS OF BTU/H																							
			FAN		NAT		FAN		NAT		FAN		NAT		FAN		NAT		FAN		NAT		FAN		NAT	
Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max
6	1	22	37	26	35	66	46	46	106	72	58	164	104	77	225	142	92	296	185	109	376	237	128	466	289	
	2	23	41	31	37	75	55	48	121	86	60	183	124	79	253	168	95	333	220	112	424	282	131	526	345	
	3	24	44	35	38	81	62	49	132	96	62	199	139	82	275	189	97	363	248	114	463	317	134	575	386	
8	1	22	40	27	35	72	48	49	114	76	64	176	109	84	243	148	100	320	194	118	408	248	138	507	303	
	2	23	44	32	36	80	57	51	128	90	66	195	129	86	269	175	103	356	230	121	454	294	141	564	358	
	3	24	47	36	37	87	64	53	139	101	67	210	145	88	290	198	105	384	258	123	492	330	143	612	402	
10	1	22	43	28	34	78	50	49	123	78	65	189	113	89	257	154	106	341	200	125	436	257	146	542	314	
	2	23	47	33	36	86	59	51	136	93	67	206	134	91	282	182	109	374	238	128	479	305	149	596	372	
	3	24	50	37	37	92	67	52	146	104	69	220	150	94	303	205	111	402	268	131	515	342	152	642	417	
15	1	21	50	30	33	89	53	47	142	83	64	220	120	88	298	163	110	389	214	134	493	273	162	609	333	
	2	22	53	35	35	96	63	49	153	99	66	235	142	91	320	193	112	419	253	137	532	323	165	658	394	
	3	24	55	40	36	102	71	51	163	111	68	248	160	93	339	218	115	445	286	140	565	365	167	700	444	
20	1	21	54	31	33	99	56	46	157	87	62	246	125	86	334	171	107	436	224	131	552	285	158	681	347	
	2	22	57	37	34	105	66	48	167	104	64	259	149	89	354	202	110	463	265	134	587	339	161	725	414	
	3	23	60	42	35	110	74	50	176	116	66	271	168	91	371	228	113	486	300	137	618	383	164	764	466	
30	1	20	62	33	31	113	59	45	181	93	60	288	134	83	391	182	103	512	238	125	649	305	151	802	372	
	2	21	64	39	33	118	70	47	190	110	62	299	158	85	408	215	105	535	282	129	679	360	155	840	439	
	3	22	66	44	34	123	79	48	198	124	64	309	178	88	423	242	108	555	317	132	706	405	158	874	494	
50	1	19	71	36	30	133	64	43	216	101	57	349	145	78	477	197	97	627	257	120	797	330	144	984	403	
	2	21	73	43	32	137	76	45	223	119	59	358	172	81	490	234	100	645	306	123	820	392	148	1,014	478	
	3	22	75	48	33	141	86	46	229	134	61	366	194	83	502	263	103	661	343	126	842	441	151	1,043	538	
100	1	18	82	37	28	158	66	40	262	104	53	442	150	73	611	204	91	810	266	112	1,038	341	135	1,285	417	
	2	19	83	44	30	161	79	42	267	123	55	447	178	75	619	242	94	822	316	115	1,054	405	139	1,306	494	
	3	20	84	50	31	163	89	44	272	138	57	452	199	78	627	272	97	834	355	118	1,069	455	142	1,327	555	

COMMON VENT CAPACITY

VENT HEIGHT (ft)		TYPE B DOUBLE-WALL COMMON VENT DIAMETER—(D) inches																							
		4			5			6			7			8			9			10					
		COMBINED APPLIANCE INPUT RATING IN THOUSANDS OF BTU/H																							
		FAN +FAN	FAN +NAT	NAT +NAT	FAN +FAN	FAN +NAT	NAT +NAT	FAN +FAN	FAN +NAT	NAT +NAT	FAN +FAN	FAN +NAT	NAT +NAT	FAN +FAN	FAN +NAT	NAT +NAT	FAN +FAN	FAN +NAT	NAT +NAT	FAN +FAN	FAN +NAT	NAT +NAT			
6	92	81	65	140	116	103	204	161	147	309	248	200	404	314	260	547	434	335	672	520	410				
8	101	90	73	155	129	114	224	178	163	339	275	223	444	348	290	602	480	378	740	577	465				
10	110	97	79	169	141	124	243	194	178	367	299	242	477	377	315	649	522	405	800	627	495				
15	125	112	91	195	164	144	283	228	206	427	352	280	556	444	365	753	612	465	924	733	565				
20	136	123	102	215	183	160	314	255	229	475	394	310	621	499	405	842	688	523	1,035	826	640				
30	152	138	118	244	210	185	361	297	266	547	459	360	720	585	470	979	808	605	1,209	975	740				
50	167	153	134	279	244	214	421	353	310	641	547	423	854	706	550	1,164	977	705	1,451	1,188	860				
100	175	163	NA	311	277	NA	489	421	NA	751	658	479	1,025	873	625	1,408	1,215	800	1,784	1,502	975				

(continued)

TABLE 504.3(1)—continued
TYPE B DOUBLE-WALL VENT

Number of Appliances	Two or more
Appliance Type	Category I
Appliance Vent Connection	Type B double-wall connector

VENT CONNECTOR CAPACITY

VENT HEIGHT (ft) (m)	CONNECTOR RISE (ft) (m)	TYPE B DOUBLE-WALL VENT AND DIAMETER—(2) inches																																									
		12						14						16						18						20						22						24					
		APPLIANCE INPUT RATING LIMITS IN THOUSANDS OF BTU/H																																									
		FAN			NAT			FAN			NAT			FAN			NAT			FAN			NAT			FAN			NAT			FAN			NAT								
Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max											
6	2	174	764	496	223	1,046	653	281	1,371	853	346	1,772	1,080	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA											
	4	180	897	616	230	1,231	827	287	1,617	1,081	352	2,069	1,370	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA											
	6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA											
8	2	186	822	516	238	1,126	696	298	1,478	910	365	1,920	1,150	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA											
	4	192	952	644	244	1,307	884	305	1,719	1,150	372	2,211	1,460	471	2,737	1,800	560	3,519	2,180	662	3,937	2,590	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA											
	6	198	1,050	772	252	1,445	1,072	313	1,902	1,390	380	2,434	1,770	478	3,018	2,180	568	3,665	2,640	669	4,373	3,130	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA											
10	2	196	870	536	249	1,195	730	311	1,570	955	379	2,049	1,205	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA											
	4	201	997	664	256	1,371	924	318	1,804	1,205	387	2,332	1,535	486	2,887	1,890	581	3,502	2,280	686	4,175	2,710	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA											
	6	207	1,095	792	263	1,509	1,118	325	1,989	1,455	395	2,556	1,865	494	3,169	2,290	589	3,849	2,760	694	4,593	3,220	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA											
15	2	214	967	568	272	1,354	790	336	1,760	1,030	408	2,317	1,305	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA											
	4	221	1,085	712	279	1,499	1,006	344	1,978	1,320	416	2,579	1,665	523	3,197	2,060	624	3,881	2,490	734	4,631	2,960	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA											
	6	228	1,181	856	286	1,632	1,222	351	2,157	1,610	424	2,796	2,025	533	3,470	2,510	634	4,216	3,090	743	5,035	3,600	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA											
20	2	225	1,051	596	291	1,443	840	357	1,911	1,095	430	2,533	1,385	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA											
	4	230	1,162	748	298	1,597	1,064	365	2,116	1,395	438	2,778	1,765	554	3,447	2,180	661	4,190	2,630	772	5,005	3,130	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA											
	6	237	1,253	900	307	1,726	1,288	373	2,287	1,695	450	2,984	2,145	567	3,708	2,650	671	4,511	3,190	785	5,392	3,790	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA											
30	2	216	1,217	632	286	1,664	910	367	2,183	1,190	461	2,891	1,540	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA											
	4	223	1,316	792	294	1,802	1,160	376	2,366	1,510	474	3,110	1,920	619	3,890	2,365	728	4,861	2,860	847	5,606	3,410	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA											
	6	231	1,400	952	303	1,920	1,410	384	2,524	1,830	485	3,299	2,340	632	4,080	2,875	741	4,976	3,480	860	5,961	4,130	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA											
50	2	206	1,479	689	273	2,023	1,007	350	2,659	1,315	435	3,548	1,665	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA											
	4	213	1,561	850	281	2,139	1,291	359	2,814	1,685	447	3,730	2,135	580	4,601	2,633	709	5,569	3,185	851	6,633	3,790	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA											
	6	221	1,631	1,031	290	2,242	1,575	369	2,951	2,055	461	3,893	2,605	594	4,808	3,208	724	5,826	3,885	867	6,943	4,620	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA											
100	2	192	1,923	712	254	2,664	1,030	336	3,490	1,370	402	4,797	1,740	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA											
	4	200	1,984	888	263	2,731	1,346	336	3,606	1,760	414	4,842	2,220	523	5,982	2,750	639	7,254	3,330	769	8,630	3,950	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA											
	6	208	2,035	1,064	272	2,811	1,642	346	3,714	2,150	426	4,968	2,700	539	6,143	3,350	654	7,453	4,070	786	8,892	4,830	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA											

COMMON VENT CAPACITY

COMMON VENT CAPACITY																					
VENT HEIGHT (ft) (m)	TYPE B DOUBLE-WALL COMMON VENT DIAMETER—(2) inches																				
	12			14			16			18			20			22			24		
	COMBINED APPLIANCE INPUT RATING IN THOUSANDS OF BTU/H																				
	FAN +FAN	FAN +NAT	NAT +NAT	FAN +FAN	FAN +NAT	NAT +NAT	FAN +FAN	FAN +NAT	NAT +NAT	FAN +FAN	FAN +NAT	NAT +NAT	FAN +FAN	FAN +NAT	NAT +NAT	FAN +FAN	FAN +NAT	NAT +NAT	FAN +FAN	FAN +NAT	NAT +NAT
6	900	696	588	1,284	990	815	1,735	1,336	1,065	2,253	1,732	1,345	2,838	2,180	1,660	3,488	2,677	1,970	4,206	3,226	2,390
8	994	773	652	1,421	1,103	912	1,927	1,491	1,190	2,507	1,936	1,510	3,162	2,439	1,860	3,890	2,998	2,300	4,695	3,616	2,680
10	1,076	841	712	1,542	1,200	995	2,093	1,625	1,300	2,727	2,113	1,645	3,444	2,665	2,090	4,241	3,278	2,400	5,133	3,957	2,920
15	1,247	986	825	1,794	1,410	1,158	2,440	1,910	1,510	3,184	2,484	1,910	4,026	3,133	2,360	4,971	3,862	2,790	6,016	4,670	3,400
20	1,405	1,116	916	2,006	1,588	1,290	2,722	2,147	1,690	3,561	2,798	2,140	4,548	3,552	2,640	5,573	4,352	3,120	6,749	5,261	3,800
30	1,658	1,327	1,025	2,373	1,892	1,525	3,220	2,538	1,990	4,197	3,326	2,530	5,363	4,193	3,110	6,539	5,157	3,680	7,940	6,247	4,480
50	2,024	1,649	1,280	2,911	2,347	1,863	3,964	3,183	2,430	5,184	4,149	3,075	6,567	5,240	3,800	8,116	6,458	4,500	9,837	7,813	5,475
100	2,569	2,131	1,670	3,732	3,076	2,450	5,125	4,202	3,200	6,749	5,509	4,050	8,597	6,986	5,000	10,681	8,648	5,920	13,004	10,449	7,200

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 British thermal unit per hour = 0.2931 W

Table 504.3(2)

Type B Double-Wall Vent

TABLE 504.3(2)
TYPE B DOUBLE-WALL VENT

Number of Appliances	Two or more
Appliance Type	Category I
Appliance Vent Connection	Single-wall metal connector

VENT CONNECTOR CAPACITY

VENT HEIGHT (ft) (feet)		CONNECTOR RISE (ft) (feet)		SINGLE-WALL METAL VENT CONNECTOR DIAMETER—(D) inches																							
				3		4		5		6		7		8		9		10									
				APPLIANCE INPUT RATING LIMITS IN THOUSANDS OF BTUH																							
				FAN		NAT		FAN		NAT		FAN		NAT		FAN		NAT		FAN		NAT		FAN		NAT	
Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max		
6	1	NA	NA	26	NA	NA	46	NA	NA	71	NA	NA	102	207	223	140	262	293	183	325	373	234	447	463	286		
	2	NA	NA	31	NA	NA	55	NA	NA	85	168	182	123	215	251	167	271	331	219	334	422	281	458	524	344		
	3	NA	NA	34	NA	NA	62	121	131	95	175	198	138	222	273	188	279	361	247	244	462	316	468	574	385		
8	1	NA	NA	27	NA	NA	48	NA	NA	75	NA	NA	106	226	240	145	285	316	191	352	403	244	481	502	299		
	2	NA	NA	32	NA	NA	57	125	126	89	184	193	127	234	266	173	293	353	228	360	450	292	492	560	355		
	3	NA	NA	35	NA	NA	64	130	138	100	191	208	144	241	287	197	302	381	256	370	489	328	501	600	400		
10	1	NA	NA	28	NA	NA	50	119	121	77	182	186	110	260	253	150	302	335	196	372	429	252	506	534	308		
	2	NA	NA	33	84	85	59	124	134	91	189	203	132	248	278	183	311	369	235	381	473	302	517	589	368		
	3	NA	NA	36	89	91	67	129	144	102	197	217	148	257	299	203	320	398	265	391	511	339	528	637	413		
15	1	NA	NA	29	79	87	52	116	138	81	177	214	116	238	291	158	312	380	208	397	482	266	556	596	324		
	2	NA	NA	34	85	94	62	121	150	97	185	230	138	246	314	189	321	411	248	407	522	317	568	646	387		
	3	NA	NA	39	87	100	70	127	160	109	193	243	157	255	333	215	331	438	281	418	557	360	579	690	437		
20	1	49	56	30	78	97	54	115	152	84	175	238	120	233	325	165	306	425	217	390	538	276	546	664	336		
	2	52	59	36	82	100	64	120	163	101	182	252	144	243	346	197	317	453	259	400	574	331	558	709	403		
	3	55	62	40	87	107	72	125	172	113	190	264	164	252	363	223	326	476	294	412	607	375	570	750	434		
30	1	47	60	31	77	110	57	112	175	89	169	278	129	226	380	175	296	497	230	378	600	294	528	779	358		
	2	51	62	37	81	115	67	117	185	106	177	290	152	236	397	208	307	521	274	389	662	349	541	819	425		
	3	54	64	42	85	119	76	122	193	120	185	300	172	244	412	235	316	542	309	480	690	394	555	855	482		
50	1	46	69	34	75	128	60	109	207	96	162	336	137	217	460	188	284	604	245	364	768	314	507	951	384		
	2	49	71	40	79	132	72	114	215	113	170	345	164	226	473	223	294	623	293	376	793	375	520	983	458		
	3	53	72	45	83	136	82	119	221	123	178	353	186	235	486	252	304	640	331	387	816	423	535	1,013	518		
100	1	45	79	34	71	150	61	104	249	98	153	424	140	205	585	192	269	734	249	345	993	321	476	1,256	393		
	2	48	80	41	75	153	73	110	253	115	160	428	167	212	593	228	279	788	299	358	1,011	383	460	1,259	466		
	3	51	81	46	79	157	85	114	260	129	168	433	190	222	603	256	289	801	339	368	1,027	431	506	1,280	555		

COMMON VENT CAPACITY

VENT HEIGHT (ft) (feet)	TYPE B DOUBLE-WALL COMMON VENT DIAMETER—(D) inches																				
	4			5			6			7			8			9			10		
	COMBINED APPLIANCE INPUT RATING IN THOUSANDS OF BTUH																				
	FAN +FAN	FAN +NAT	NAT +NAT	FAN +FAN	FAN +NAT	NAT +NAT	FAN +FAN	FAN +NAT	NAT +NAT	FAN +FAN	FAN +NAT	NAT +NAT	FAN +FAN	FAN +NAT	NAT +NAT	FAN +FAN	FAN +NAT	NAT +NAT	FAN +FAN	FAN +NAT	NAT +NAT
6	NA	78	64	NA	113	99	200	158	144	304	244	196	398	310	257	541	429	332	665	515	407
8	NA	87	71	NA	126	111	218	173	159	331	269	218	436	342	285	592	473	373	730	569	460
10	NA	94	76	103	137	120	237	189	174	357	292	236	467	369	309	638	512	398	787	617	487
15	121	108	88	189	159	140	275	221	200	416	343	274	544	434	357	738	599	456	905	718	553
20	131	118	98	208	177	156	305	247	223	463	383	302	606	487	395	824	673	512	1,013	808	626
30	145	132	113	236	202	180	350	286	257	533	446	349	703	570	459	958	790	593	1,183	952	723
50	159	145	128	268	233	208	406	337	296	622	529	410	833	686	535	1,139	954	689	1,418	1,157	838
100	166	153	NA	297	263	NA	469	398	NA	726	635	464	999	846	606	1,378	1,185	780	1,741	1,459	948

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 British thermal unit per hour = 0.2931 W.

Table 504.3(3)
Masonry Chimney

TABLE 504.3(3)
MASONRY CHIMNEY

Number of Appliances	Two or more
Appliance Type	Category I
Appliance Vent Connection	Type B double-wall connector

VENT CONNECTOR CAPACITY

		TYPE B DOUBLE-WALL VENT CONNECTOR DIAMETER—(D) inches																							
		3		4		5		6		7		8		9		10									
VENT HEIGHT (ft)	CONNECTOR RISE (ft)	APPLIANCE INPUT RATING LIMITS IN THOUSANDS OF BTUH																							
		FAN		NAT	FAN		NAT	FAN		NAT	FAN		NAT	FAN		NAT	FAN		NAT						
		Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max						
6	1	24	33	21	39	62	90	52	106	67	65	194	101	87	274	141	104	370	201	124	479	253	145	599	319
	2	26	43	28	41	79	52	53	135	85	67	230	124	89	324	173	107	436	232	127	562	300	148	604	378
	3	27	49	34	42	92	61	55	155	97	69	262	143	91	369	203	109	491	270	129	633	349	151	795	439
8	1	24	39	22	39	72	41	55	117	69	71	213	105	94	304	148	113	414	210	134	539	267	156	682	335
	2	26	47	29	40	87	53	57	140	86	73	246	127	97	330	179	116	473	240	137	615	311	160	776	394
	3	27	52	34	42	97	62	59	159	98	75	269	145	99	383	206	119	517	276	139	672	358	163	848	452
10	1	24	42	22	38	80	42	55	130	71	74	232	108	101	324	153	120	444	216	142	582	277	165	739	348
	2	26	50	29	40	93	54	57	153	87	76	261	129	103	366	184	123	498	247	145	652	321	168	825	407
	3	27	55	35	41	105	63	58	170	100	78	284	148	106	397	209	126	540	281	147	655	366	171	893	463
15	1	24	48	23	38	93	44	54	154	74	72	277	114	100	384	164	125	511	229	153	658	297	184	824	375
	2	25	55	31	39	105	55	56	174	89	74	299	134	103	419	192	128	558	260	156	718	339	187	900	432
	3	26	59	35	41	115	64	57	189	102	76	319	153	105	448	215	131	597	292	159	760	382	190	960	486
20	1	24	52	24	37	102	46	53	172	77	71	313	119	98	437	173	123	584	239	150	752	312	180	943	397
	2	25	58	31	39	114	56	55	190	91	73	335	138	101	467	199	126	625	270	153	805	354	184	1,011	452
	3	26	63	35	40	123	65	57	204	104	75	353	157	104	493	222	129	661	301	156	851	396	187	1,067	505
30	1	24	54	25	37	111	48	52	192	82	69	357	127	96	504	187	110	680	255	145	883	337	175	1,115	432
	2	25	60	32	38	122	58	54	208	95	72	376	145	99	531	209	122	715	287	149	928	378	179	1,171	484
	3	26	64	36	40	131	66	56	221	107	74	392	163	101	554	233	125	746	317	152	968	418	182	1,220	535
50	1	23	51	25	36	116	51	51	209	89	67	405	143	92	532	213	115	798	294	140	1,069	392	168	1,334	506
	2	24	59	32	37	127	61	53	225	102	70	421	161	95	604	235	118	827	326	143	1,085	433	172	1,379	558
	3	26	64	36	39	135	69	55	237	115	72	435	180	98	624	260	121	854	357	147	1,118	474	176	1,421	611
100	1	23	46	24	35	108	59	49	208	92	65	428	155	88	640	237	109	907	334	134	1,222	454	161	1,589	596
	2	24	53	31	37	120	69	51	224	105	67	444	174	92	660	260	113	933	368	138	1,253	497	165	1,626	651
	3	25	59	35	38	130	68	53	237	118	69	458	193	94	679	285	116	956	399	141	1,282	540	169	1,661	703

COMMON VENT CAPACITY

VENT HEIGHT (ft)		MINIMUM INTERNAL AREA OF MASONRY CHIMNEY FLUE (square inches)																							
		12		18		24		36		50		63		75		113									
		COMBINED APPLIANCE INPUT RATING IN THOUSANDS OF BTUH																							
		FAN +FAN	FAN +NAT	NAT +NAT	FAN +FAN	FAN +NAT	NAT +NAT	FAN +FAN	FAN +NAT	NAT +NAT	FAN +FAN	FAN +NAT	NAT +NAT	FAN +FAN	FAN +NAT	NAT +NAT	FAN +FAN	FAN +NAT	NAT +NAT	FAN +FAN	FAN +NAT	NAT +NAT	FAN +FAN	FAN +NAT	NAT +NAT
6	NA	74	25	NA	119	46	NA	178	71	NA	257	103	NA	351	143	NA	455	188	NA	582	246	1,041	853	NA	
8	NA	80	28	NA	130	53	NA	193	82	NA	279	119	NA	384	163	NA	501	218	724	636	278	1,144	937	408	
10	NA	84	31	NA	138	56	NA	207	90	NA	299	131	NA	409	177	606	538	226	776	686	302	1,226	1,010	454	
15	NA	NA	36	NA	152	67	NA	233	106	NA	334	152	523	467	212	683	611	283	874	781	365	1,374	1,156	546	
20	NA	NA	41	NA	NA	75	NA	250	122	NA	368	172	565	508	243	742	668	325	955	858	419	1,513	1,286	648	
30	NA	NA	NA	NA	NA	NA	NA	270	137	NA	404	198	615	564	278	816	747	381	1,062	969	496	1,702	1,473	749	
50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	620	528	879	831	461	1,165	1,089	606	1,905	1,692	922		
100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	669	2,053	1,921	1,050	

For SI: 1 inch = 25.4 mm, 1 square inch = 645.16 mm², 1 foot = 304.8 mm, 1 British thermal unit per hour = 0.2931 W

Table 504.3(4)
Masonry Chimney

TABLE 504.3(4)
MASONRY CHIMNEY

Number of Appliances	Two or more
Appliance Type	Category I
Appliance Vent Connection	Single-wall metal connector

VENT CONNECTOR CAPACITY

		SINGLE-WALL METAL VENT CONNECTOR DIAMETER—(ft) inches																								
		3		4		5		6		7		8		9		10										
VENT HEIGHT (ft) (feet)	CONNECTOR RISE (ft) (feet)	APPLIANCE INPUT RATING LIMITS IN THOUSANDS OF BTU/H																								
		FAN		NAT		FAN		NAT		FAN		NAT		FAN		NAT										
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max									
6	1	NA	NA	21	NA	NA	39	NA	NA	66	179	191	100	231	271	140	392	366	200	362	474	252	499	594		
	2	NA	NA	28	NA	NA	52	NA	NA	84	186	227	123	239	321	172	301	432	231	373	557	309	608	696	376	
	3	NA	NA	34	NA	NA	61	134	153	97	193	258	142	247	365	202	309	401	269	581	634	346	519	793	435	
8	1	NA	NA	21	NA	NA	40	NA	NA	68	195	208	103	230	298	146	313	407	207	387	530	265	523	672	733	331
	2	NA	NA	28	NA	NA	52	137	139	85	202	240	125	238	343	177	323	465	218	397	607	309	640	766	391	
	3	NA	NA	34	NA	NA	62	143	156	98	210	264	145	266	376	205	332	509	274	407	663	356	551	838	458	
10	1	NA	NA	22	NA	NA	41	130	151	70	202	225	106	267	316	151	333	434	213	410	571	275	538	727	343	
	2	NA	NA	29	NA	NA	53	136	150	86	210	255	128	276	338	181	343	489	244	420	640	317	569	813	405	
	3	NA	NA	34	97	102	62	143	166	99	217	277	147	284	389	207	352	530	279	430	694	363	580	880	459	
15	1	NA	NA	23	NA	NA	43	129	151	73	199	271	112	268	376	161	349	502	225	445	666	391	623	808	366	
	2	NA	NA	30	92	103	54	135	170	88	207	295	132	277	411	189	359	548	256	436	706	334	634	884	425	
	3	NA	NA	34	96	112	63	141	185	101	215	315	151	286	439	213	368	586	289	466	755	378	666	945	475	
20	1	NA	NA	23	87	99	45	128	187	76	197	303	117	265	425	169	345	569	235	439	734	306	614	921	347	
	2	NA	NA	30	91	111	55	134	185	90	205	325	136	274	455	195	355	610	266	450	787	348	627	986	443	
	3	NA	NA	35	96	119	64	140	199	103	215	343	154	282	481	219	365	644	298	461	831	391	639	1,042	496	
30	1	NA	NA	24	86	108	47	126	187	80	193	347	124	259	492	183	338	665	250	430	864	330	600	1,089	421	
	2	NA	NA	31	91	119	57	132	203	93	201	366	142	269	518	205	348	699	282	442	908	372	613	1,145	475	
	3	NA	NA	35	95	129	65	138	216	105	209	381	160	277	540	229	358	729	312	452	946	412	626	1,193	529	
50	1	NA	NA	24	83	113	50	124	204	87	188	392	139	252	567	208	328	778	287	417	1,023	383	582	1,302	495	
	2	NA	NA	31	89	123	60	130	218	100	196	408	158	262	588	230	339	806	320	429	1,058	425	596	1,346	545	
	3	NA	NA	35	94	131	68	136	231	112	205	422	176	271	607	255	349	831	351	440	1,099	466	601	1,386	599	
100	1	NA	NA	23	84	104	49	122	200	89	182	410	151	243	617	232	315	875	328	402	1,181	414	560	1,537	581	
	2	NA	NA	30	88	115	59	127	215	102	190	425	169	253	636	254	326	895	361	415	1,210	448	575	1,570	639	
	3	NA	NA	34	93	124	67	133	228	115	199	438	188	262	654	279	337	921	392	427	1,238	529	589	1,604	685	

COMMON VENT CAPACITY

VENT HEIGHT (ft) (ft)		MINIMUM INTERNAL AREA OF MASONRY CHIMNEY FLUE (square inches)																															
		12				19				26				38				50				63				78				113			
		COMBINED APPLIANCE INPUT RATING IN THOUSANDS OF BTU/H																															
		FAN +FAN	FAN +NAT	NAT +FAN	NAT +NAT	FAN +FAN	FAN +NAT	NAT +FAN	NAT +NAT	FAN +FAN	FAN +NAT	NAT +FAN	NAT +NAT	FAN +FAN	FAN +NAT	NAT +FAN	NAT +NAT	FAN +FAN	FAN +NAT	NAT +FAN	NAT +NAT	FAN +FAN	FAN +NAT	NAT +FAN	NAT +NAT	FAN +FAN	FAN +NAT	NAT +FAN	NAT +NAT				
6	NA	NA	25	NA	118	45	NA	176	71	NA	255	102	NA	348	142	NA	455	187	NA	579	245	NA	846	NA	NA	NA	NA	NA					
8	NA	NA	28	NA	128	52	NA	190	81	NA	276	118	NA	380	162	NA	497	317	NA	633	277	1,136	928	405	NA	NA	NA	NA					
10	NA	NA	31	NA	136	56	NA	205	89	NA	295	129	NA	405	175	NA	532	334	171	680	300	1,216	1,000	450	NA	NA	NA	NA					
15	NA	NA	36	NA	161	66	NA	230	103	NA	335	150	NA	460	210	677	680	866	772	660	1,359	1,139	1,464	NA	NA	NA	NA	NA					
20	NA	NA	NA	NA	NA	74	NA	247	120	NA	362	170	NA	503	240	765	661	321	947	849	1,415	1,264	1,661	NA	NA	NA	NA	NA					
30	NA	NA	NA	NA	NA	NA	NA	NA	135	NA	398	195	NA	558	275	808	739	377	1,052	957	1,490	1,682	1,447	740	NA	NA	NA	NA					
50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	612	325	NA	821	458	1,152	1,076	600	1,879	1,672	1,910	NA	NA	NA	NA					
100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	663	2,006	1,855	1,041	NA	NA	NA	NA					

For SI: 1 inch = 25.4 mm, 1 square inch = 645.16 mm², 1 foot = 304.8 mm, 1 British thermal unit per hour = 0.2931 W

Table 504.3(5)

Single-Wall Metal Pipe or Type Asbestos Cement Vent

TABLE 504.3(5)
SINGLE-WALL METAL PIPE OR TYPE ASBESTOS CEMENT VENT

Number of Appliances	Two or more
Appliance Type	Draft hood-equipped
Appliance Vent Connection	Direct to pipe or vent

VENT CONNECTOR CAPACITY

TOTAL VENT HEIGHT (H) (feet)	CONNECTOR RISE (R) (feet)	VENT CONNECTOR DIAMETER—(D) inches					
		3	4	5	6	7	8
		MAXIMUM APPLIANCE INPUT RATING IN THOUSANDS OF BTU/H					
6-8	1	21	40	68	102	146	205
	2	28	53	86	124	178	235
	3	34	61	98	147	204	275
15	1	23	44	77	117	179	240
	2	30	56	92	134	194	265
	3	35	64	102	155	216	298
30 and up	1	25	49	84	129	190	270
	2	31	58	97	145	211	295
	3	36	68	107	164	232	321

COMMON VENT CAPACITY

TOTAL VENT HEIGHT (H) (feet)	COMMON VENT DIAMETER—(D) inches						
	4	5	6	7	8	10	12
	COMBINED APPLIANCE INPUT RATING IN THOUSANDS OF BTU/H						
6	48	78	111	155	205	320	NA
8	55	89	128	175	234	365	505
10	59	95	136	190	250	395	560
15	71	115	168	228	305	480	690
20	80	129	186	260	340	550	790
30	NA	147	215	300	400	650	940
50	NA	NA	NA	360	490	810	1,190

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 British thermal unit per hour = 0.2931 W

Table 504.3(6)

Exterior Masonry Chimney

TABLE 504.3(6a)
EXTERIOR MASONRY CHIMNEY

Number of Appliances	Two or more
Appliance Type	NAT + NAT
Appliance Vent Connection	Type B double-wall connector

Combined Appliance Maximum
Input Rating in Thousands of Btu per Hour

VENT HEIGHT (feet)	INTERNAL AREA OF CHIMNEY (square inches)							
	12	19	28	38	50	63	78	113
6	25	46	71	103	143	188	246	NA
8	28	53	82	119	163	218	278	408
10	31	56	90	131	177	236	302	454
15	NA	67	106	152	212	283	365	546
20	NA	NA	NA	NA	NA	325	419	648
30	NA	NA	NA	NA	NA	NA	496	749
50	NA	NA	NA	NA	NA	NA	NA	922
100	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 504.3(6b)
EXTERIOR MASONRY CHIMNEY

Number of Appliances	Two or more
Appliance Type	NAT + NAT
Appliance Vent Connection	Type B double-wall connector

Minimum Allowable Input Rating of
Space-heating Appliance in Thousands of Btu per Hour

VENT HEIGHT (feet)	INTERNAL AREA OF CHIMNEY (square inches)							
	12	19	28	38	50	63	78	113
37°F or Greater								
Local 99% Winter Design Temperature: 37°F or Greater								
6	0	0	0	0	0	0	0	NA
8	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0
15	NA	0	0	0	0	0	0	0
20	NA	NA	NA	NA	NA	184	0	0
30	NA	NA	NA	NA	NA	393	334	0
50	NA	NA	NA	NA	NA	NA	NA	579
100	NA	NA	NA	NA	NA	NA	NA	NA
27 to 36°F								
Local 99% Winter Design Temperature: 27 to 36°F								
6	0	0	68	NA	NA	180	212	NA
8	0	0	82	NA	NA	187	214	263
10	0	51	NA	NA	NA	201	225	265
15	NA	NA	NA	NA	NA	253	274	305
20	NA	NA	NA	NA	NA	307	330	362
30	NA	NA	NA	NA	NA	NA	445	485
50	NA	NA	NA	NA	NA	NA	NA	763
100	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 504.3(6b)
EXTERIOR MASONRY CHIMNEY—continued

Minimum Allowable Input Rating of
Space-heating Appliance in Thousands of Btu per Hour

VENT HEIGHT (feet)	INTERNAL AREA OF CHIMNEY (square inches)							
	12	19	28	38	50	63	78	113
17 to 26°F								
Local 99% Winter Design Temperature: 17 to 26°F								
6	NA	NA	NA	NA	NA	NA	NA	NA
8	NA	NA	NA	NA	NA	NA	264	352
10	NA	NA	NA	NA	NA	NA	278	358
15	NA	NA	NA	NA	NA	NA	331	398
20	NA	NA	NA	NA	NA	NA	387	457
30	NA	NA	NA	NA	NA	NA	NA	581
50	NA	NA	NA	NA	NA	NA	NA	862
100	NA	NA	NA	NA	NA	NA	NA	NA
5 to 16°F								
Local 99% Winter Design Temperature: 5 to 16°F								
6	NA	NA	NA	NA	NA	NA	NA	NA
8	NA	NA	NA	NA	NA	NA	NA	NA
10	NA	NA	NA	NA	NA	NA	NA	430
15	NA	NA	NA	NA	NA	NA	NA	485
20	NA	NA	NA	NA	NA	NA	NA	547
30	NA	NA	NA	NA	NA	NA	NA	682
50	NA	NA	NA	NA	NA	NA	NA	NA
100	NA	NA	NA	NA	NA	NA	NA	NA
4°F or Lower								
Local 99% Winter Design Temperature: 4°F or Lower								
Not recommended for any vent configurations								

For SI: °C = (°F - 32) / 1.8, 1 inch = 25.4 mm, 1 square inch = 645.16 mm², 1 foot = 304.8 mm, 1 British thermal unit per hour = 0.2931 W.

Table 504.3(7)

Exterior Masonry Chimney

**TABLE 504.3(7a)
EXTERIOR MASONRY CHIMNEY**

Number of Appliances	Two or more
Appliance Type	FAN + NAT
Appliance Vent Connection	Type B double-wall connector

Combined Appliance Maximum Input Rating in Thousands of Btu per Hour									
VENT HEIGHT (feet)	INTERNAL AREA OF CHIMNEY (square inches)								
	12	19	28	38	50	63	78	113	
6	74	119	178	257	351	458	582	853	
8	80	130	193	279	384	501	636	937	
10	84	138	207	299	409	538	686	1,010	
15	NA	152	233	334	467	611	781	1,156	
20	NA	NA	250	368	508	668	858	1,286	
30	NA	NA	NA	404	564	747	969	1,473	
50	NA	NA	NA	NA	NA	831	1,089	1,692	
100	NA	NA	NA	NA	NA	NA	NA	1,921	

**TABLE 504.3(7b)
EXTERIOR MASONRY CHIMNEY**

Number of Appliances	Two or more
Appliance Type	FAN + NAT
Appliance Vent Connection	Type B double-wall connector

Minimum Allowable Input Rating of Space-heating Appliance in Thousands of Btu per Hour									
VENT HEIGHT (feet)	INTERNAL AREA OF CHIMNEY (square inches)								
	12	19	28	38	50	63	78	113	
37°F or Greater Local 99% Winter Design Temperature: 37°F or Greater									
6	0	0	0	0	0	0	0	0	
8	0	0	0	0	0	0	0	0	
10	0	0	0	0	0	0	0	0	
15	NA	0	0	0	0	0	0	0	
20	NA	NA	123	190	249	184	0	0	
30	NA	NA	NA	334	398	393	334	0	
50	NA	NA	NA	NA	NA	714	707	579	
100	NA	NA	NA	NA	NA	NA	NA	1,600	
27 to 36°F Local 99% Winter Design Temperature: 27 to 36°F									
6	0	0	68	116	156	180	212	266	
8	0	0	82	127	167	187	214	263	
10	0	51	97	141	183	210	225	265	
15	NA	111	142	183	233	253	274	305	
20	NA	NA	187	230	284	307	330	362	
30	NA	NA	NA	330	319	419	445	485	
50	NA	NA	NA	NA	NA	672	705	763	
100	NA	NA	NA	NA	NA	NA	NA	1,554	

**TABLE 504.3(7b)
EXTERIOR MASONRY CHIMNEY—continued**

Minimum Allowable Input Rating of Space-heating Appliance in Thousands of Btu per Hour									
VENT HEIGHT (feet)	INTERNAL AREA OF CHIMNEY (square inches)								
	12	19	28	38	50	63	78	113	
17 to 26°F	Local 99% Winter Design Temperature: 17 to 26°F								
6	0	55	99	141	182	215	259	349	
8	52	74	111	154	197	226	264	352	
10	NA	90	125	169	214	245	278	358	
15	NA	NA	167	212	263	296	331	398	
20	NA	NA	212	258	316	352	387	457	
30	NA	NA	NA	362	429	470	507	581	
50	NA	NA	NA	NA	NA	723	766	862	
100	NA	NA	NA	NA	NA	NA	NA	1,669	
5 to 16°F	Local 99% Winter Design Temperature: 5 to 16°F								
6	NA	78	121	166	214	252	301	416	
8	NA	94	135	182	230	269	312	423	
10	NA	111	149	198	250	289	331	430	
15	NA	NA	193	247	305	346	393	485	
20	NA	NA	NA	293	360	408	450	547	
30	NA	NA	NA	377	450	531	580	682	
50	NA	NA	NA	NA	NA	797	853	972	
100	NA	NA	NA	NA	NA	NA	NA	1,833	
-10 to 4°F	Local 99% Winter Design Temperature: -10 to 4°F								
6	NA	NA	145	196	249	296	349	484	
8	NA	NA	159	213	269	320	371	494	
10	NA	NA	175	231	292	339	397	513	
15	NA	NA	NA	283	351	404	457	586	
20	NA	NA	NA	333	408	468	528	650	
30	NA	NA	NA	NA	NA	603	667	805	
50	NA	NA	NA	NA	NA	NA	955	1,003	
100	NA	NA	NA	NA	NA	NA	NA	NA	
-11°F or Lower	Local 99% Winter Design Temperature: -11°F or Lower								
Not recommended for any vent configurations									

For SI: °C = (°F - 32) / 1.8; 1 inch = 25.4 mm, 1 square inch = 645.16 mm²,
1 foot = 304.8 mm, 1 British thermal unit per hour = 0.2931 W.

For SI: °C = (°F - 32)/1.8, 1 inch = 25.4 mm, 1 square inch = 645.16 mm², 1 foot = 304.8 mm, 1 British thermal unit per hour = 0.2931 W.

504.3.1 Vent obstructions.

These venting tables shall not be used where obstructions, as described in Section 503.15, are installed in the venting system. The installation of vents serving listed appliances with vent dampers shall be in accordance with the appliance manufacturer's instructions or in accordance with the following:

1. The maximum capacity of the vent connector shall be determined using the NAT Max column.
2. The maximum capacity of the vertical vent or chimney shall be determined using the FAN + NAT column when the second appliance is a fan-assisted appliance, or the NAT + NAT column when the second appliance is equipped with a draft hood.
3. The minimum capacity shall be determined as if the appliance were a fan-assisted appliance.
 - 3.1. The minimum capacity of the vent connector shall be determined using the FAN Min column.
 - 3.2. The FAN + FAN column shall be used where the second appliance is a fan-assisted appliance, and the FAN + NAT column shall be used where the second appliance is equipped with a draft hood, to determine whether the vertical vent or chimney configuration is not permitted (NA). Where the vent configuration is NA, the vent configuration shall not be permitted and an alternative venting configuration shall be utilized.

504.3.2 Connector length limit.

The vent connector shall be routed to the vent utilizing the shortest possible route. Except as provided in Section 504.3.3, the maximum vent connector horizontal length shall be 1 1/2 feet for each inch (18 mm per mm) of connector diameter as shown in Table 504.3.2.

Table 504.3.2

Maximum Vent Connector Length

Connector Diameter Maximum (inches)	Connector Horizontal Length (feet)
3	4 1/2
4	6
5	7 1/2
6	9
7	10 1/2
8	12
9	13 1/2
10	15
12	18
14	21
16	24

18	27
20	30
22	33
24	36

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

504.3.3 Connectors with longer lengths.

Connectors with longer horizontal lengths than those listed in Section 504.3.2 are permitted under the following conditions:

1. The maximum capacity (FAN Max or NAT Max) of the vent connector shall be reduced 10 percent for each additional multiple of the length allowed by Section 504.3.2. For example, the maximum length listed in Table 504.3.2 for a 4-inch (102 mm) connector is 6 feet (1829 mm). With a connector length greater than 6 feet (1829 mm) but not exceeding 12 feet (3658 mm), the maximum capacity must be reduced by 10 percent (0.90 × maximum vent connector capacity). With a connector length greater than 12 feet (3658 mm) but not exceeding 18 feet (5486 mm), the maximum capacity must be reduced by 20 percent (0.80 maximum vent capacity).
2. For a connector serving a fan-assisted appliance, the minimum capacity (FAN Min) of the connector shall be determined by referring to the corresponding single appliance table. For Type B double-wall connectors, Table 504.2(1) shall be used. For single-wall connectors, Table 504.2(2) shall be used. The height (H) and lateral (L) shall be measured according to the procedures for a single-appliance vent, as if the other appliances were not present.

504.3.4 Vent connector manifold.

Where the vent connectors are combined prior to entering the vertical portion of the common vent to form a common vent manifold, the size of the common vent manifold and the common vent shall be determined by applying a 10-percent reduction (0.90 × maximum common vent capacity) to the common vent capacity part of the common vent tables. The length of the common vent connector manifold (LM) shall not exceed 1 1/2 feet for each inch (457 mm for each 25.4 mm) of common vent connector manifold diameter (D) (see Figure 504.3.4).

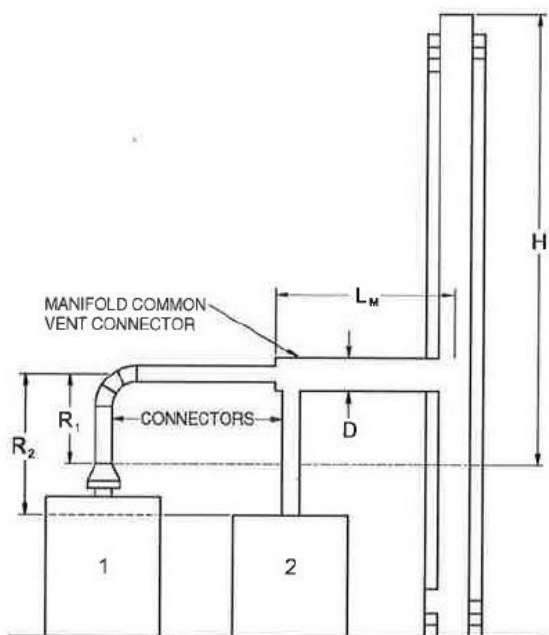


Figure 504.3.4

Use of a Manifold Common Vent Connector

Example: Manifolded Common Vent Connector L_M shall be no greater than 18 times the common vent connector manifold inside diameter; i.e., a 4-inch (102 mm) inside diameter common vent connector manifold shall not exceed 72 inches (1829 mm) in length (see Section 504.3.4).

Note: This is an illustration of a typical manifolded vent connector. Different appliance, vent connector, or common vent types are possible. Consult Section 502.3.

504.3.5 Common vertical vent offset.

Where the common vertical vent is offset, the maximum capacity of the common vent shall be reduced in accordance with Section 504.3.6. The horizontal length of the common vent offset (L_O) shall not exceed 1 1/2 feet for each inch (18 mm per mm) of common vent diameter (D). Where multiple offsets occur in a common vent, the total horizontal length of all offsets combined shall not exceed 1 1/2 feet for each inch (18 mm per mm) of common vent diameter (D).

504.3.6 Elbows in vents.

For each elbow up to and including 45 degrees (0.79 rad) in the common vent, the maximum common vent capacity listed in the venting tables shall be reduced by 5 percent. For each elbow greater than 45 degrees (0.79 rad) up to and including 90 degrees (1.57 rad), the maximum common vent capacity listed in the venting tables shall be reduced by 10 percent.

504.3.7 Elbows in connectors.

The vent connector capacities listed in the common vent sizing tables include allowance for two 90-degree (1.57 rad) elbows. For each additional elbow up to and including 45 degrees (0.79 rad), the maximum vent connector capacity listed in the venting tables shall be reduced by 5 percent. For each elbow greater than 45 degrees (0.79 rad) up to and including 90 degrees (1.57 rad), the maximum vent connector capacity listed in the venting tables shall be reduced by 10 percent.

504.3.8 Common vent minimum size.

The cross-sectional area of the common vent shall be equal to or greater than the cross-sectional area of the largest connector.

504.3.9 Common vent fittings.

At the point where tee or wye fittings connect to a common vent, the opening size of the fitting shall be equal to the size of the common vent. Such fittings shall not be prohibited from having reduced size openings at the point of connection of appliance vent connectors.

504.3.9.1 Tee and wye fittings.

Tee and wye fittings connected to a common gas vent shall be considered as part of the common gas vent and shall be constructed of materials consistent with that of the common gas vent.

504.3.10 [Reserved.]

504.3.11 Connector rise measurement.

Connector rise (R) for each appliance connector shall be measured from the draft hood outlet or flue collar to the centerline where the vent gas streams come together.

504.3.12 Vent height measurement.

For multiple units of appliances all located on one floor, available total height (H) shall be measured from the highest draft hood outlet or flue collar up to the level of the outlet of the common vent.

504.3.13 Multistory height measurement.

For multistory installations, available total height (H) for each segment of the system shall be the vertical distance between the highest draft hood outlet or flue collar entering that segment and the centerline of the next higher interconnection tee.

504.3.14 Multistory lowest portion sizing.

The size of the lowest connector and of the vertical vent leading to the lowest interconnection of a multistory system shall be in accordance with Table 504.2(1) or 504.2(2) for available total height (H) up to the lowest interconnection.

504.3.15 Multistory common vents.

Where used in multistory systems, vertical common vents shall be Type B double wall and shall be installed with a listed vent cap.

504.3.16 Multistory common vents offsets‡.

Offsets in multistory common vent systems shall be limited to a single offset in each system, and systems with an offset shall comply with all of the following:

1. The offset angle shall not exceed 45 degrees (0.79 rad) from vertical.
2. The horizontal length of the offset shall not exceed 1 1/2 feet for each inch (18 mm for each 25.4 mm) of common vent diameter of the segment in which the offset is located.
3. For the segment of the common vertical vent containing the offset, the common vent capacity listed in the common venting tables shall be reduced by 20 percent ($0.80 \times$ maximum common vent capacity).
4. A multistory common vent shall not be reduced in size above the offset.

504.3.17 Vertical vent maximum size.

Where two or more appliances are connected to a vertical vent or chimney, the flow area of the largest section of vertical vent or chimney shall not exceed seven times the smallest listed appliance categorized vent areas, flue collar area, or draft hood outlet area unless designed in accordance with approved engineering methods.

504.3.18 Multiple input rate appliances.

For appliances with more than one input rate, the minimum vent connector capacity (FAN Min) determined from the tables shall be less than the lowest appliance input rating, and the maximum vent connector capacity (FAN Max or NAT Max) determined from the tables shall be greater than the highest appliance input rating.

504.3.19 Liner system sizing and connections.

Listed, corrugated metallic chimney liner systems in masonry chimneys shall be sized by using Table 504.3(1) or 504.3(2) for Type B vents, with the maximum capacity reduced by 20 percent ($0.80 \times$ maximum capacity) and the minimum capacity as shown in Table 504.3(1) or 504.3(2). Corrugated metallic liner systems installed with bends or offsets shall have their maximum capacity further reduced in accordance with Sections 504.3.5 and 504.3.6. The 20-percent reduction for corrugated metallic chimney liner systems includes an allowance for one long-radius 90-degree (1.57 rad) turn at the bottom of the liner. Where double-wall connectors are required, tee and wye fittings used to connect to the common vent chimney liner shall be listed double-wall fittings. Connections between chimney liners and listed double-wall fittings shall be made with listed adapter fittings designed for such purpose.

504.3.20 Chimney and vent location.

Tables 504.3(1), 504.3(2), 504.3(3), 504.3(4), and 504.3(5) shall be used only for chimneys and vents not exposed to the outdoors below the roof line. A Type B vent or listed chimney lining system passing through an unused masonry chimney flue shall not be considered to be exposed to the outdoors. A Type B vent shall not be considered to be exposed to the outdoors where it passes through an unventilated enclosure or chase insulated to a value of not less than R8. Tables 504.3(6) and 504.3(7) shall be used for clay-tile-lined exterior masonry chimneys, provided all of the following conditions are met:

1. The vent connector is Type B double-wall.
2. At least one appliance is draft hood equipped.
3. The combined appliance input rating is less than the maximum capacity given by Table 504.3(6a) for NAT + NAT or Table 504.3(7a) for FAN + NAT.
4. The input rating of each space-heating appliance is greater than the minimum input rating given by Table 504.3(6b) for NAT + NAT or Table 504.3(7b) for FAN + NAT.
5. The vent connector sizing is in accordance with Table 504.3(3).

504.3.21 Connector maximum and minimum size.

Vent connectors shall not be increased in size more than two sizes greater than the listed appliance categorized vent diameter, flue collar diameter, or draft hood outlet diameter. Vent connectors for draft hood-equipped appliances shall not be smaller than the draft hood outlet diameter. Where a vent connector size(s) determined from the tables for a fan-assisted appliance(s) is smaller than the flue collar diameter, the use of the smaller size(s) shall be permitted provided that the installation complies with all of the following conditions:

1. Vent connectors for fan-assisted appliance flue collars 12 inches (305 mm) in diameter or smaller are not reduced by more than one table size (e.g., 12 inches to 10 inches (305 mm to 254 mm) is a one-size reduction) and those larger than 12 inches (305 mm) in diameter are not reduced more than two table sizes (e.g., 24 inches to 20 inches (610 mm to 508 mm) is a two-size reduction).
2. The fan-assisted appliance(s) is common vented with a draft-hood-equipped appliances(s).
3. The vent connector has a smooth interior wall.

504.3.22 Component commingling.

All combinations of pipe sizes, single-wall, and double-wall metal pipe shall be allowed within any connector run(s) or within the common vent, provided all of the appropriate tables permit all of the desired sizes and types of pipe, as if they were used for the entire length of the subject connector or vent. Where single-wall and Type B double-wall metal pipes are used for vent connectors within the same venting system, the common vent must be sized using Table 504.3(2) or 504.3(4), as appropriate.

504.3.23 Draft hood conversion accessories.

Draft hood conversion accessories for use with masonry chimneys venting listed Category I fan-assisted appliances shall be listed and installed in accordance with the manufacturer's installation instructions for such listed accessories.

504.3.24 Multiple sizes permitted.

Where a table permits more than one diameter of pipe to be used for a connector or vent, all the permitted sizes shall be permitted to be used.

504.3.25 Table interpolation.

Interpolation shall be permitted in calculating capacities for vent dimensions that fall between table entries.

504.3.26 Extrapolation prohibited.

Extrapolation beyond the table entries shall not be permitted.

504.3.27 Engineering calculations.

For vent heights less than 6 feet (1829 mm) and greater than shown in the tables, engineering methods shall be used to calculate vent capacities.

Section FGC 505: Direct-vent, Integral Vent, Mechanical Vent and Ventilation/exhaust Hood Venting

505.1 General.

The installation of direct-vent and integral vent appliances shall be in accordance with Section 503. Mechanical venting systems and exhaust hood venting systems shall be designed and installed in accordance with Section 503.

505.1.1 Commercial cooking appliances vented by exhaust hoods.

Refer to Chapter 5 of the *New York City Mechanical Code*.

505.1.2 Interlock requirements.

Where commercial cooking appliances are vented by means of the Type I or Type II kitchen exhaust hood system that serves such appliances, the exhaust system shall be fan powered and the appliances shall be interlocked with the exhaust hood system to prevent appliance operation when the exhaust hood system is not operating. The method of interlock between the exhaust hood system and the appliances equipped with standing pilot burner ignition systems shall not cause such pilots to be extinguished. Where a solenoid valve is installed in the gas piping as part of an interlock system, gas piping shall not be installed to bypass such valve. Dampers shall not be installed in the exhaust system.

Exception: An interlock between the cooking appliances and the exhaust hood system shall not be required where heat sensors or other approved methods automatically activate the exhaust hood system when cooking operations occur.

Section FGC 506: Factory-built Chimneys

506.1 Building heating appliances.

Factory-built chimneys for building heating appliances producing flue gases having a temperature not greater than 1,000°F (538°C), measured at the entrance to the chimney, shall be listed and labeled in accordance with UL 103 and shall be installed and terminated in accordance with the manufacturer's installation instructions and this code.

506.2 Support.

Where factory-built chimneys are supported by structural members, such as joists and rafters, such members shall be designed to support the additional load.

506.3 Medium-heat appliances.

Factory-built chimneys for medium-heat appliances producing flue gases having a temperature above 1,000°F (538°C), measured at the entrance to the chimney, shall be listed and labeled in accordance with UL 959 and shall be installed and terminated in accordance with the manufacturer's installation instructions and this code.

Section FGC 507: Changes In Appliance Fuels

507.1 Changes in appliance fuels.

Conversion of appliances from solid or liquid fuel to natural gas or the addition of natural gas, shall be made in accordance with this code. Conversion from natural gas to, or the addition of, #2 fuel oil for a heating appliance shall be made only if:

1. The chimney design meets the requirements of this chapter for the conversion fuel and the chimney is test run and smoke tested in accordance with Section 503.5.6.4 and 503.5.6.5.
2. The chimney is sized to provide adequate draft and to vent the combustion products for the new fuel.
3. The chimney is thoroughly cleaned prior to the conversion to remove collected flue deposits.

Section FGC 508: Exhaust Gases from Internal Combustion Engines and Turbines

508.1 Exhaust pipe construction.

The exhaust pipe from internal combustion engines shall be constructed in accordance with NFPA 211, NFPA 37, and based on the temperature of the gases entering the exhaust pipe, and in accordance with the following:

1. The exhaust pipe, if factory fabricated, shall be installed in accordance with its listing and the manufacturer's instructions.
2. The exhaust pipe, if field fabricated, shall be constructed of at least 3/16-inch (5 mm) steel, or of other equivalent metal of similar strength and resistance to the temperature and corrosive action of the exhaust gases. No lining shall be required.
3. Where the exhaust pipe runs inside a building, it shall be insulated with insulation adequate for the temperature of the pipe, so that the surface temperature shall be not more than 200°F (93°C).
4. Where the exhaust pipe runs inside a building outside of the generator room, it shall be enclosed in fire-rated construction equal to the construction of the generator room.
5. All joints shall be constructed so as to be gas tight under all operating conditions and tested in accordance with Section 503.5.6.4 and Section 503.5.6.5.

Chapter 6: Specific Appliances

Section FGC 601: General

601.1 Scope.

This chapter shall govern the approval, design, installation, construction, maintenance, alteration and repair of the appliances and equipment specifically identified herein. The approval, design, installation, construction, maintenance, alteration and repair of non gas-fired appliances shall be regulated by the *New York City Mechanical Code*.

601.2 Fireplaces.

Fireplaces (solid fuel type or ANSI Z21.50) shall be installed with tight fitting noncombustible fireplace doors to control infiltration losses in construction type listed here:

1. Masonry or factory-built fireplaces designed to allow an open burn.
2. Whenever a decorative appliance (ANSI Standard Z21.60 gas-log style unit) is installed in a vented solid fuel fireplace.
3. Vented decorative gas fireplace appliances (ANSI Standard Z21.50 units). Fireplaces shall be provided with a source of combustion air as required by the fireplace construction provisions of the *New York City Building Code*.

601.3 Flame safeguard device.

All fuel gas space heating appliances installed or used in a building occupied as a residence shall be equipped with an automatic flame safeguard device that shall shut off the fuel supply to the main burner or group of burners when the flame or pilot light thereof is extinguished.

Section FGC 602: Decorative Gas Fired Appliances for Installation In Fireplaces

602.1 General.

Decorative appliances for installation in approved solid fuel-burning fireplaces shall be tested in accordance with ANSI Z21.60 and shall be installed in accordance with the manufacturer's installation instructions. Manually lighted natural gas decorative appliances shall be tested in accordance with ANSI Z21.84.

602.2 Flame safeguard device.

Decorative appliances for installation in approved solid fuel-burning fireplaces, with the exception of those tested in accordance with ANSI Z21.84, shall utilize a direct ignition device, an ignitor or a pilot flame to ignite the fuel at the main burner, and shall be equipped with a flame safeguard device. The flame safeguard device shall automatically shut off the fuel supply to a main burner or group of burners when the means of ignition of such burners becomes inoperative.

602.3 Prohibited installations.

Decorative appliances for installation in fireplaces shall not be installed where prohibited by Section 303.3.

Section FGC 603: Log Lighters

603.1 General.

Log lighters shall be tested in accordance with CSA 8 and installed in accordance with the manufacturer's installation instructions.

603.2 Automatic Valves.

Automatic valves or semi-automatic valves shall be provided and shall comply with the applicable provisions of ANSI Z21.21.

Section FGC 604: Vented Gas Fireplaces (decorative Appliances)

604.1 General.

Vented gas fireplaces shall be tested in accordance with ANSI Z21.50, shall be installed in accordance with the manufacturer's installation instructions and shall be designed and equipped as specified in Section 602.2.

604.2 Access.

Panels, grilles and access doors that are required to be removed for normal servicing operations shall not be attached to the building.

Section FGC 605: Vented Gas Fireplace Heaters

605.1 General.

Vented gas fireplace heaters shall be installed in accordance with the manufacturer's installation instructions, shall be tested in accordance with ANSI Z21.88 and shall be designed and equipped as specified in Section 602.2. The installation of unvented gas fired space heaters, gas stoves, gas logs, gas fireplaces and gas fireplace inserts is prohibited.

605.2 Separate flues.

Separate flues shall be provided for every fireplace and fireplace stove.

605.3 Combustion Air Supply.

The requirements of the *New York City Energy Conservation Code* concerning combustion air supply shall be followed.

Section FGC 607: Commercial-industrial Incinerators and Crematories

607.1 Incinerators and crematories, commercial-industrial.

Commercial-industrial-type incinerators and crematories shall be constructed and installed in accordance with NFPA 82.

607.2 Compliance.

All new and existing refuse disposal systems shall be installed, altered and maintained in buildings in conformity with the applicable provisions of the *Administrative Code* and the *New York City Air Pollution Control Code*.

Section FGC 608: Vented Wall Furnaces

608.1 General.

Vented wall furnaces shall be tested in accordance with ANSI Z21.86/CSA 2.32 and shall be installed in accordance with the manufacturer's installation instructions.

608.2 Venting.

Vented wall furnaces shall be vented in accordance with Section 503.

608.3 Location.

Vented wall furnaces shall be located so as not to cause a fire hazard to walls, floors, combustible furnishings or doors. Vented wall furnaces installed between bathrooms and adjoining rooms shall not circulate air from bathrooms to other parts of the building.

608.4 Door swing.

Vented wall furnaces shall be located so that a door cannot swing within 12 inches (305 mm) of an air inlet or air outlet of such furnace measured at right angles to the opening. Doorstops or door closers shall not be installed to obtain this clearance.

608.5 Ducts prohibited.

Ducts shall not be attached to wall furnaces. Casing extension boots shall not be installed unless listed as part of the appliance.

608.6 Access.

Vented wall furnaces shall be provided with access for cleaning of heating surfaces, removal of burners, replacement of sections, motors, controls, filters and other working parts, and for adjustments and lubrication of parts requiring such attention. Panels, grilles and access doors that are required to be removed for normal servicing operations shall not be attached to the building construction.

Section FGC 609: Floor Furnaces

609.1 General.

Floor furnaces shall be tested in accordance with ANSI Z21.86/CSA 2.32 and shall be installed in accordance with the manufacturer's installation instructions.

609.2 Placement.

The following provisions apply to floor furnaces.

1. **Floors.** Floor furnaces shall not be installed in the floor of any doorway, stairway landing, aisle or passageway of any enclosure, public or private, or in an exit way from any such room or space.
2. **Walls and corners.** The register of a floor furnace with a horizontal warm-air outlet shall not be placed closer than 6 inches (152 mm) to the nearest wall. A distance of at least 18 inches (457 mm) from two adjoining sides of the floor furnace register to walls shall be provided to eliminate the necessity of occupants walking over the warm-air discharge. The remaining sides shall be permitted to be placed not closer than 6 inches (152 mm) to a wall. Wall register models shall not be placed closer than 6 inches (152 mm) to a corner.
3. **Draperies.** The furnace shall be placed so that a door, drapery or similar object cannot be nearer than 12 inches (305 mm) to any portion of the register of the furnace.
4. **Floor construction.** Floor furnaces shall be located so as to be readily accessible. Means shall be provided for supporting the furnace when the grille is removed. Floor furnaces shall be installed only on floors of noncombustible construction having at least a two-hour fire rating, except that floor furnace enclosures in one-and two- family dwellings shall be constructed of non-combustible materials with a fire-resistance rating of at least one hour.
5. **Thermostat.** The controlling thermostat for a floor furnace shall be located within the same room or space as the floor furnace or shall be located in an adjacent room or space that is permanently open to the room or space containing the floor furnace.

609.3 Bracing.

The floor around the furnace shall be braced and headed with a support framework designed in accordance with the *New York City Building Code*.

609.4 Clearance.

The lowest portion of the floor furnace shall have not less than a 6-inch (152 mm) clearance from the grade level; except where the lower 6-inch (152 mm) portion of the floor furnace is sealed by the manufacturer to prevent entrance of water, the minimum clearance shall be not less than 2 inches (51 mm). Where such clearances cannot be provided,

the ground below and to the sides shall be excavated to form a pit under the furnace so that the required clearance is provided beneath the lowest portion of the furnace. A 12-inch (305 mm) minimum clearance shall be provided on all sides except the control side, which shall have an 18-inch (457 mm) minimum clearance.

609.5 [Reserved.]

609.6 [Reserved.]

609.7 Enclosures.

Enclosures of floor furnaces shall be constructed entirely of noncombustible materials with a fire-resistance rating of at least 1-hour and the enclosure shall be provided with adequate outdoor air to ensure proper combustion. The enclosure shall be provided with adequate means of access for servicing the furnace.

609.8 Duct temperature.

The outlet duct temperature of warm air heating furnaces shall not be greater than 250°F (121°C).

609.9 One- and two-family dwellings.

Floor furnace enclosures shall be constructed of non-combustible materials with a fire-resistance rating of at least one-hour. Means shall be provided for supporting the furnace when the grille is removed. Clearances shall be provided as per NFPA 54.

Section FGC 610: Duct Furnaces

610.1 General.

Duct furnaces shall be tested in accordance with ANSI Z83.8 or UL 795 and shall be installed in accordance with the manufacturer's installation instructions.

610.2 Access panels.

Ducts connected to duct furnaces shall have removable access panels on both the upstream and downstream sides of the furnace.

610.3 Location of draft hood and controls.

The controls, combustion air inlets and draft hoods for duct furnaces shall be located outside of the ducts. The draft hood shall be located in the same enclosure from which combustion air is taken.

610.4 Circulating air.

Where a duct furnace is installed so that supply ducts convey air to areas outside the space containing the furnace, the return air shall also be conveyed by a duct(s) sealed to the furnace casing and terminating outside the space containing the furnace. The duct furnace shall be installed on the positive pressure side of the circulating air blower.

610.5 Unvented duct furnaces.

Unvented duct furnaces are prohibited.

Section FGC 611: Nonrecirculating Direct-fired Industrial Air Heaters

611.1 General.

Nonrecirculating direct-fired industrial air heaters shall be listed to ANSI Z83.4/CSA 3.7 and shall be installed in accordance with the manufacturer's instructions.

611.2 Installation.

Nonrecirculating direct-fired industrial air heaters shall not be used to supply any area containing sleeping quarters. Nonrecirculating direct-fired industrial air heaters shall be installed only in industrial or commercial occupancies. Nonrecirculating direct-fired industrial air heaters shall be permitted to provide ventilation air.

611.3 Clearance from combustible materials.

Nonrecirculating direct-fired industrial air heaters shall be installed with a clearance from combustible materials of not less than that shown on the rating plate and in the manufacturer's instructions.

611.4 Supply air.

All air handled by a nonrecirculating direct-fired industrial air heater, including combustion air, shall be ducted directly from the outdoors.

611.5 Outdoor air louvers.

If outdoor air louvers of either the manual or automatic type are used, such devices shall be proven to be in the open position prior to allowing the main burners to operate.

611.6 Atmospheric vents and gas reliefs or bleeds.

Nonrecirculating direct-fired industrial air heaters with valve train components equipped with atmospheric vents or gas reliefs or bleeds shall have their atmospheric vent lines or gas reliefs or bleeds lead to the outdoors. Means shall be employed on these lines to prevent water from entering and to prevent blockage by insects and foreign matter. An atmospheric vent line shall not be required to be provided on a valve train component equipped with a listed vent limiter.

611.7 Relief opening.

The design of the installation shall include provisions to permit nonrecirculating direct-fired industrial air heaters to operate at rated capacity without overpressurizing the space served by the heaters by taking into account the structure's designed infiltration rate, providing properly designed relief openings or an interlocked power exhaust system, or a combination of these methods. The structure's designed infiltration rate and the size of relief openings shall be determined by approved engineering methods. Relief openings shall be permitted to be louvers or counterbalanced gravity dampers. Motorized dampers or closable louvers shall be permitted to be used, provided they are verified to be in their full open position prior to main burner operation.

611.8 Access.

Nonrecirculating direct-fired industrial air heaters shall be provided with access for removal of burners; replacement of motors, controls, filters and other working parts; and for adjustment and lubrication of parts requiring maintenance.

611.9 Purging.

Inlet ducting, where used, shall be purged by not less than four air changes prior to an ignition attempt.

611.10 Controls.

Direct-fired make-up air heaters shall be equipped with airflow-sensing devices, safety shutoff devices, operating temperature controls and thermally actuated temperature limit controls in accordance with the terms of their listing.

Section FGC 612: Recirculating Direct-fired Industrial Air Heaters

612.1 General.

Recirculating direct-fired industrial air heaters shall be listed to ANSI Z83.18 and shall be installed in accordance with the manufacturer's installation instructions.

612.2 Location.

Recirculating direct-fired industrial air heaters shall be installed only in industrial and commercial occupancies. Recirculating direct-fired air heaters shall not serve any area containing sleeping quarters. Recirculating direct-fired industrial air heaters shall not be installed in hazardous locations or in buildings that contain flammable solids, liquids or gases, explosive materials or substances that can become toxic when exposed to flame or heat.

612.3 Installation.

Direct-fired industrial air heaters shall be permitted to be installed in accordance with their listing and the manufacturer's instructions. Direct-fired industrial air heaters shall be installed only in industrial or commercial occupancies. Direct-fired industrial air heaters shall be permitted to provide fresh air ventilation.

612.4 Clearance from combustible materials.

Direct-fired industrial air heaters shall be installed with a clearance from combustible material of not less than that shown on the label and in the manufacturer's instructions.

612.5 Air supply.

Air to direct-fired industrial air heaters shall be taken from the building, ducted directly from outdoors, or a combination of both. Direct-fired industrial air heaters shall incorporate a means to supply outside ventilation air to the space at a rate of not less than 4 cubic feet per minute per 1,000 Btu per hour (0.38 m³ per min per kW) of rated input of the heater. If a separate means is used to supply ventilation air, an interlock shall be provided so as to lock out the main burner operation until the mechanical means is verified. Where outside air dampers or closing louvers are used, they shall be verified to be in the open position prior to main burner operation.

612.6 Atmospheric vents, gas reliefs or bleeds.

Direct-fired industrial air heaters with valve train components equipped with atmospheric vents, gas reliefs or bleeds shall have their atmospheric vent lines and gas reliefs or bleeds lead to the outdoors. Means shall be employed on these lines to prevent water from entering and to prevent blockage by insects and foreign matter. An atmospheric vent line shall not be required to be provided on a valve train component equipped with a listed vent limiter.

612.7 Relief opening.

The design of the installation shall include adequate provision to permit direct-fired industrial air heaters to operate at rated capacity by taking into account the structure's designed infiltration rate, providing properly designed relief openings or an interlocked power exhaust system, or a combination of these methods. The structure's designed infiltration rate and the size of relief openings shall be determined by a registered design professional. Relief openings shall be permitted to be louvers or counterbalanced gravity dampers. Motorized dampers or closable louvers shall be permitted to be used, provided they are verified to be in their full open position prior to main burner operation.

612.8 Controls.

Recirculating direct-fired air heaters shall be equipped with airflow-sensing devices, safety shutoff devices, operating temperature controls and thermally actuated temperature limit controls in accordance with the terms of their listing.

Section FGC 613: Clothes Dryers

613.1 General.

Clothes dryers shall be tested in accordance with ANSI Z21.5.1 or ANSI Z21.5.2 and shall be installed in accordance with the manufacturer's installation instructions.

Section FGC 614: Clothes Dryer Exhaust

614.1 Installation.

Clothes dryers shall be exhausted in accordance with the manufacturer's instructions. Dryer exhaust systems shall be independent of all other systems and shall convey the moisture and any products of combustion to the outside of the building.

Exception: This section shall not apply to listed and labeled condensing (ductless) clothes dryers.

614.2 Duct penetrations.

Ducts that exhaust clothes dryers shall not penetrate or be located within any fireblocking, draftstopping or any wall, floor/ceiling or other assembly required by the *New York City Building Code* to be fire-resistance rated, unless such duct is constructed of galvanized steel or aluminum of the thickness specified in Table 603.4 of the *New York City Mechanical Code* and the fire-resistance rating is maintained in accordance with the *New York City Building Code*. Fire dampers shall not be installed in clothes dryer exhaust duct systems.

614.3 Cleaning access.

Each vertical duct riser or dryers listed to ANSI Z21.5.2 shall be provided with a cleanout or other means for cleaning the interior of the duct.

614.4 Exhaust installation.

Exhaust ducts for clothes dryers shall terminate on the outside of the building and shall be equipped with a backdraft damper. Screens shall not be installed at the duct termination. Ducts shall not be connected or installed with sheet metal screws or other fasteners that will obstruct the flow. Clothes dryer exhaust ducts shall not be connected to a vent connector, vent or chimney. Clothes dryer exhaust ducts shall not extend into or through ducts or plenums.

614.5 Makeup air.

Installations exhausting more than 200 cfm (0.09 m³ /s) shall be provided with makeup air. Where a closet is designed for the installation of a clothes dryer, an opening having an area of not less than 100 square inches (645 mm²) for makeup air shall be provided in the closet enclosure, or makeup air shall be provided by other approved means.

614.6 Domestic clothes dryer exhaust ducts.

Exhaust ducts for domestic clothes dryers shall conform to the requirements of Sections 614.6.1 through 614.6.7.

614.6.1 Material and size.

Exhaust ducts shall have a smooth interior finish and shall be constructed of metal that is a minimum of 0.016 inches (0.4 mm) thick. The exhaust duct size shall be 4 inches minimum (102 mm) nominal diameter, unless a larger duct size is specifically required by the dryer manufacturer.

614.6.2 Duct installation.

Exhaust ducts shall be supported at 4-foot (1219 mm) intervals and secured in place. The inserted end of the duct shall extend into the adjoining duct or fitting in the direction of airflow. Ducts shall not be joined with screws or similar fasteners that protrude into the inside of the duct.

614.6.3 Protection required.

Protective shield plates shall be placed where nails or screws from finish or other work are likely to penetrate the clothes dryer exhaust duct. Shield plates shall be placed on the finished face of all framing members where there is less than 1 1/4 inches (32 mm) between the duct and the finished face of the framing member. Protective shield plates shall be constructed of steel, shall have a minimum thickness of 0.062 inch (1.6mm) and shall extend a minimum of 2 inches (51 mm) above sole plates and below top plates.

614.6.4 Transition ducts.

Transition ducts used to connect the dryer to the exhaust duct system shall be a single length that is listed and labeled in accordance with UL 2158A. Transition ducts shall be a maximum of 8 feet (2438 mm) in length, and shall not be concealed within construction.

614.6.5 Duct length.

The maximum allowable exhaust duct length shall be determined by one of the methods specified in Section 614.6.5.1 or 614.6.5.2.

614.6.5.1 Specified length.

The maximum length of the exhaust duct shall be 35 feet (10 668 mm) from the connection to the transition duct from the dryer to the outlet terminal. Where fittings are utilized, the maximum length of the exhaust duct shall be reduced in accordance with Table 614.6.5.1.

Table 614.6.5.1

Dryer Exhaust Duct Fitting Equivalent Length

Dryer Exhaust Duct Fitting Type	Equivalent Length
4 inch radius mitered 45-degree elbow	2 feet, 6 inches
4 inch radius mitered 90-degree elbow	5 feet

6 inch radius smooth 45-degree elbow	1 foot
6 inch radius smooth 90-degree elbow	1 foot, 9 inches
8 inch radius smooth 45-degree elbow	1 foot
8 inch radius smooth 90-degree elbow	1 foot, 7 inches
10 inch radius smooth 45-degree elbow	9 inches
10 inch radius smooth 90-degree elbow	1 foot, 6 inches

For SI:: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 degree = 0.01745 rad.

The equivalent length column of the table indicates how much length must be added to the exhaust duct total length for each fitting used.

614.6.5.2 Manufacturer's instructions.

The maximum length of the exhaust duct shall be determined by the dryer manufacturer's installation instructions. The special inspector shall be provided with a copy of the installation instructions for the make and model of the dryer. Where the exhaust duct is to be concealed, the installation instructions shall be provided to the special inspector prior to the concealment inspection. In the absence of fitting equivalent length calculations from the clothes dryer manufacturer, Table 614.6.5.1 shall be utilized.

614.6.6 Length identification.

Where the exhaust duct is concealed within the building construction, the equivalent length of the exhaust duct shall be identified on a permanent label or tag. The label or tag shall be located within 6 feet (1829 mm) of the exhaust duct connection.

614.6.7 Exhaust duct required.

Where space for a clothes dryer is provided, an exhaust duct system shall be installed. Where the clothes dryer is not installed at the time of occupancy, the exhaust duct shall be capped at the location of the future dryer.

Exception: Where a listed condensing clothes dryer is installed prior to occupancy of the structure.

614.7 Commercial clothes dryers.

The installation of dryer exhaust ducts serving Type 2 clothes dryers shall comply with the appliance manufacturer's installation instructions. Exhaust fan motors installed in exhaust systems shall be located outside of the airstream. In multiple installations, the fan shall operate continuously or be interlocked to operate when any individual unit is operating. Ducts shall have a minimum clearance of 6 inches (152 mm) to combustible materials.

614.8 Common exhaust systems for clothes dryers located in multistory structures.

Where a common multistory duct system is designed and installed to convey exhaust from multiple clothes dryers, the construction of such system shall be in accordance with all of the following:

1. The shaft in which the duct is installed shall be constructed and fire-resistant rated as required by the *New York City Building Code*.
2. Dampers shall be prohibited in the exhaust duct.
3. Rigid metal ductwork shall be installed within the shaft to convey the exhaust. The ductwork shall be constructed of sheet steel having a minimum thickness of 0.0187 inch (0.471 mm) (No. 26 gage) and in accordance with SMACNA *Duct Construction Standards*.
4. Exhaust ducts 20 square inches or less connected into dryer exhaust shaft shall not require fire dampers when the exhaust fan runs continuously.
5. The exhaust fan motor design shall be in accordance with Section 503.2 of the *New York City Mechanical Code*.
6. The exhaust fan motor shall be located outside of the airstream.
7. The exhaust fan shall run continuously, and shall be connected to a standby power source, where a building emergency or standby power source is required by the *New York City Building Code*.
8. The exhaust fan operation shall be monitored in an approved location and shall initiate an audible or visual signal when the fan is not in operation.
9. Makeup air shall be provided for the exhaust system.
10. Cleanout openings shall be located at the base of the shaft and the bases of all offsets to provide access to the duct to allow for cleaning and inspection. The finished opening shall be not less than 12 inches by 12 inches (305 mm by 305 mm).
11. Screens shall not be installed at the termination.

Section FGC 615: Sauna Heaters

615.1 General.

Sauna heaters shall be installed in accordance with the manufacturer's installation instructions.

615.2 Location and protection.

Sauna heaters shall be located so as to minimize the possibility of accidental contact by a person in the room.

615.2.1 Guards.

Sauna heaters shall be protected from accidental contact by an approved guard or barrier of material having a low coefficient of thermal conductivity. The guard shall not substantially affect the transfer of heat from the heater to the room.

615.3 Access.

Panels, grilles and access doors that are required to be removed for normal servicing operations shall not be attached to the building.

615.4 Combustion and dilution air intakes.

Sauna heaters of other than the direct-vent type shall be installed with the draft hood and combustion air intake located outside the sauna room. Where the combustion air inlet and the draft hood are in a dressing room adjacent to the sauna room, there shall be provisions to prevent physically blocking the combustion air inlet and the draft hood inlet, and to prevent physical contact with the draft hood and vent assembly, or warning notices shall be posted to avoid such contact. Any warning notice shall be easily readable, shall contrast with its background and the wording shall be in letters not less than 1/4 inch (6.4 mm) high.

615.5 Combustion and ventilation air.

Combustion air shall not be taken from inside the sauna room. Combustion and ventilation air for a sauna heater not of the direct-vent type shall be provided to the area in which the combustion air inlet and draft hood are located in accordance with Section 304.

615.6 Heat and time controls.

Sauna heaters shall be equipped with a thermostat which will limit room temperature to 194°F (90°C). If the thermostat is not an integral part of the sauna heater, the heat-sensing element shall be located within 6 inches (152 mm) of the ceiling. If the heat-sensing element is a capillary tube and bulb, the assembly shall be attached to the wall or other support, and shall be protected against physical damage.

615.6.1 Timers.

A timer, if provided to control main burner operation, shall have a maximum operating time of 1 hour. The control for the timer shall be located outside the sauna room.

615.7 Sauna room.

A ventilation opening into the sauna room shall be provided. The opening shall be not less than 4 inches by 8 inches (102 mm by 203 mm) located near the top of the door into the sauna room.

615.7.1 Warning notice.

The following permanent notice, constructed of approved material, shall be mechanically attached to the sauna room on the outside:

WARNING: DO NOT EXCEED 30 MINUTES IN SAUNA. EXCESSIVE EXPOSURE CAN BE HARMFUL TO HEALTH. ANY PERSON WITH POOR HEALTH SHOULD CONSULT A PHYSICIAN BEFORE USING SAUNA.

The words shall contrast with the background and the wording shall be in letters not less than 1/4 inch (6.4 mm) high.

Exception: This section shall not apply to one- and two-family dwellings.

Section FGC 616: Engine and Gas Turbine-powered Equipment And appliances

616.1 Powered equipment.

Permanently installed equipment powered by internal combustion engines and turbines shall be installed in accordance with the manufacturer's installation instructions and NFPA 37. Stationary engine generator assemblies shall meet the requirements of UL 2200.

616.2 Gas supply connection.

Equipment powered by internal combustion engines and turbines shall not be rigidly connected to the gas supply piping.

Section FGC 617: Pool and Spa Heaters

617.1 General.

Pool and spa heaters shall be tested in accordance with ANSI Z21.56 and shall be installed in accordance with the manufacturer's installation instructions.

Section FGC 618: Forced-air Warm-air Furnaces

618.1 General.

Forced-air warm-air furnaces shall be tested in accordance with ANSI Z21.47 or UL 795 and shall be installed in accordance with the manufacturer's installation instructions.

618.2 Forced-air furnaces.

The minimum unobstructed total area of the outside and return air ducts or openings to a forced-air warm-air furnace shall be not less than 2 square inches for each 1,000 Btu/h (4402 mm² /W) output rating capacity of the furnace and not less than that specified in the furnace manufacturer's installation instructions. The minimum unobstructed total area of supply ducts from a forced-air warm-air furnace shall be not less than 2 square inches for each 1,000 Btu/h (4402 mm² /W) output rating capacity of the furnace and not less than that specified in the furnace manufacturer's installation instructions.

Exception: The total area of the supply air ducts and outside and return air ducts shall not be required to be larger than the minimum size required by the furnace manufacturer's installation instructions.

618.3 Dampers.

Volume dampers shall not be placed in the air inlet to a furnace in a manner that will reduce the required air to the furnace.

618.4 Circulating air ducts for forced-air warm-air furnaces.

Circulating air for fuel-burning, forced-air-type, warm-air furnaces shall be conducted into the blower housing from outside the furnace enclosure by continuous air-tight ducts.

618.5 Prohibited sources.

Outdoor or return air for a forced-air heating system shall not be taken from the following locations:

1. Less than 10 feet (3048 mm) from an appliance vent outlet, a vent opening from a plumbing drainage system or the discharge outlet of an exhaust fan, unless the outlet is 3 feet (914 mm) above the outdoor air inlet.

2. Where there is the presence of objectionable odors, fumes or flammable vapors; or where located less than 10 feet (3048 mm) above the surface of any abutting public way or driveway; or where located at grade level by a sidewalk, street, alley or driveway.

3. A hazardous or insanitary location or a refrigeration machinery room as defined in the *New York City Mechanical Code*.

4. A room or space, the volume of which is less than 25 percent of the entire volume served by such system. Where connected by a permanent opening having an area sized in accordance with Section 618.2, adjoining rooms or spaces shall be considered as a single room or space for the purpose of determining the volume of such rooms or spaces.

Exception: The minimum volume requirement shall not apply where the amount of return air taken from a room or space is less than or equal to the amount of supply air delivered to such room or space.

5. A room or space containing an appliance where such a room or space serves as the sole source of return air.

Exception: This shall not apply where:

1. The appliance is a direct-vent appliance or an appliance not requiring a vent in accordance with Section 501.8.

2. The room or space complies with the following requirements:

2.1. The return air shall be taken from a room or space having a volume exceeding 1 cubic foot for each 10 Btu/h (9.6 L/W) of combined input rating of all fuel-burning appliances therein.

2.2. The volume of supply air discharged back into the same space shall be approximately equal to the volume of return air taken from the space.

2.3. Return-air inlets shall not be located within 10 feet (3048 mm) of any appliance firebox or draft hood in the same room or space.

3. Rooms or spaces containing solid fuel-burning appliances, provided that return-air inlets are located not less than 10 feet (3048 mm) from the firebox of such appliances.

6. A closet, bathroom, toilet room, kitchen, garage, mechanical room, boiler room, furnace room or attic.

Exception: Where return air intakes are located not less than 10 feet (3048 mm) from cooking appliances and serve only the kitchen area, taking return air from a kitchen area shall not be prohibited.

7. A crawl space by means of direct connection to the return side of a forced air system. Transfer openings in the crawl space enclosure shall not be prohibited.

618.6 Screen.

Required outdoor air inlets for residential portions of a building shall be covered with a screen having 1/4-inch (6.4 mm) openings. Required outdoor air inlets serving a nonresidential portion of a building shall be covered with screen having openings larger than 1/4 inch (6.4 mm) and not larger than 1 inch (25 mm).

618.7 Return-air limitation.

Return air from one dwelling unit shall not be discharged into another dwelling unit.

618.8 Furnace plenums and air ducts.

Where a furnace is installed so that supply ducts carry air circulated by the furnace to areas outside of the space containing the furnace, the return air shall also be handled by a duct(s) sealed to the furnace casing and terminating outside of the space containing the furnace.

Section FGC 619: Conversion Burners

619.1 Conversion burners.

The installation of conversion burners shall conform to ANSI Z21.8 and ASME CSD-1, including Appendix C.

Section FGC 620: Unit Heaters

620.1 General.

Unit heaters shall be tested in accordance with ANSI Z83.8 and shall be installed in accordance with the manufacturer's installation instructions.

620.2 Support.

Suspended-type unit heaters shall be supported by elements that are designed and constructed to accommodate the weight and dynamic loads. Hangers and brackets shall be of noncombustible material.

620.3 Ductwork.

Ducts shall not be connected to a unit heater unless the heater is listed for such installation.

620.4 Clearance.

Suspended-type unit heaters shall be installed with clearances to combustible materials of not less than 18 inches (457 mm) at the sides, 12 inches (305 mm) at the bottom and 6 inches (152 mm) above the top where the unit heater has an internal draft hood or 1 inch (25mm) above the top of the sloping side of the vertical draft hood. Floor-mounted-type unit heaters shall be installed with clearances to combustible materials at the back and one side only of not less than 6 inches (152 mm). Where the flue gases are vented horizontally, the 6-inch (152 mm) clearance shall be measured from the draft hood or vent instead of the rear wall of the unit heater. Floor-mounted-type unit heaters shall not be installed on combustible floors unless listed for such installation. Clearances for servicing all unit heaters shall be in accordance with the manufacturer's installation instructions.

Exception: Unit heaters listed for reduced clearance shall be permitted to be installed with such clearances in accordance with their listing and the manufacturer's instructions and as approved by the department.

620.5 Installation in commercial garages and aircraft hangars.

Unit heaters installed in garages for more than three motor vehicles or in aircraft hangars shall be installed in accordance with Sections 305.9, 305.10 and 305.11.

Section FGC 621: Unvented Room Heaters

621.1 General.

The installation of unvented room heaters is prohibited.

621.2 [Reserved.]

621.3 [Reserved.]

621.4 [Reserved.]

621.5 [Reserved.]

621.6 [Reserved.]

621.7 [Reserved.]

Section FGC 622: Vented Room Heaters

622.1 General.

Vented room heaters shall be tested in accordance with ANSI Z21.86/CSA 2.32, shall be designed and equipped as specified in Section 602.2 and shall be installed in accordance with the manufacturer's installation instructions.

Section FGC 623: Cooking Appliances

623.1 Cooking appliances.

Cooking appliances that are designed for permanent installation, including ranges, ovens, stoves, broilers, grills, fryers, griddles, hot plates and barbecues, shall be tested in accordance with ANSI Z21.1, ANSI Z21.58 or ANSI Z83.11 and shall be installed in accordance with the manufacturer's installation instructions.

623.1.1 LPG.

Except as may be permitted by the *New York City Fire Code*, cooking appliances using LPG are prohibited.

623.2 Prohibited location.

Cooking appliances designed, tested, listed and labeled for use in commercial occupancies shall not be installed within dwelling units or within any area where domestic cooking operations occur.

623.2.1 Barbecue grills.

Barbecue grills piped to natural gas shall not be installed or operated within 10 feet (3048 mm) of any combustible waste or combustible material including combustible building surfaces, balconies and decks.

623.3 Domestic appliances.

Cooking appliances installed within dwelling units and within areas where domestic cooking operations occur shall be listed and labeled as household-type appliances for domestic use.

623.4 Domestic range installation.

Domestic ranges installed on combustible floors shall be set on their own bases or legs and shall be installed with clearances of not less than that shown on the label.

623.5 Open-top broiler unit hoods.

A ventilating hood shall be provided above a domestic open-top broiler unit, unless otherwise listed for forced down draft ventilation.

623.5.1 Clearances.

A minimum clearance of 24 inches (610 mm) shall be maintained between the cooking top and combustible material above the hood. The hood shall be at least as wide as the open-top broiler unit and be centered over the unit.

623.6 Commercial cooking appliance venting.

Commercial cooking appliances, other than those exempted by Section 501.8, shall be vented by connecting the appliance to a vent or chimney in accordance with this code and the appliance manufacturer's instructions or the appliance shall be vented in accordance with Section 505.1.1.

623.7 Domestic ventilation.

When a hood is provided for a domestic cooking appliance, the exhaust and make-up air systems shall be properly engineered and designed in accordance with Chapter 5 of this code and the *New York City Mechanical Code*. Household cooking appliances shall have a vertical clearance above the cooking top of not less than 30 inches (760mm) to combustible material and metal cabinets. A minimum clearance of 24 inches (610 mm) is permitted where one of the following is installed:

1. The underside of the combustible material or metal cabinet above the cooking top is protected with not less than 1/4-inch (6 mm) insulating millboard covered with sheet metal not less than 0.0122 inch (0.3 mm) thick.
2. A metal ventilating hood constructed of sheet metal not less than 0.0122 inch (0.3 mm) thick is installed above the cooking top with a clearance of not less than 1/4 inch (6.4 mm) between the hood and the underside of the combustible material or metal cabinet. The hood shall have a width not less than the width of the appliance and shall be centered over the appliance.
3. A listed cooking appliance or microwave oven is installed over a listed cooking appliance and in compliance with the terms of the manufacturer's installation instructions for the upper appliance.

Section FGC 624: Water Heaters

624.1 General.

Water heaters shall be tested in accordance with ANSI Z 21.10.1 and ANSI Z 21.10.3 and shall be installed in accordance with the manufacturer's installation instructions. Water heaters utilizing fuels other than fuel gas shall be regulated by the *New York City Mechanical Code*. Approval for water heaters 350,000Btu/h input (1025kW) and above shall be obtained from the New York City Department of Environmental Protection.

624.1.1 Installation requirements.

The requirements for water heaters relative to sizing, relief valves, drain pans and scald protection shall be in accordance with the *New York City Plumbing Code* and the following:

1. No person shall install or maintain in any dwelling unit a gas fuel fired water heater unless the heater obtains combustion air directly from the outside of the building.
2. No person shall install or maintain a gas fueled water heater in a room occupied for sleeping purposes, or cause or permit to be occupied for sleeping purposes any room in which a gas-fueled heater is installed.
3. Each heater shall be connected to a flue or outlet pipe.

624.2 Water heaters utilized for space heating.

Water heaters utilized both to supply potable hot water and provide hot water for space-heating applications shall be listed and labeled for such applications by the manufacturer, and shall be built in accordance with Section IV of the ASME *Boiler and Pressure Vessel Code* with an "H" code stamp. They shall be installed in accordance with the manufacturer's installation instructions, the ASME *Boiler and Pressure Vessel Code* and the *New York City Plumbing Code*.

Section FGC 625: Refrigerators

625.1 General.

Refrigerators shall be tested in accordance with ANSI Z21.19 and shall be installed in accordance with the manufacturer's installation instructions. Refrigerators shall be provided with adequate clearances for ventilation at the top and back, and shall be installed in accordance with the manufacturer's instructions. If such instructions are not available, at least 2 inches (51 mm) shall be provided between the back of the refrigerator and the wall and at least 12 inches (305 mm) above the top.

Section FGC 626: Gas-fired Toilets

626.1 General.

Gas-fired toilets are not approved for use in New York City.

626.2 [Reserved.]

Section FGC 627: Air Conditioning Appliances

627.1 General.

Gas-fired air-conditioning appliances shall be tested in accordance with ANSI Z21.40.1 or ANSI Z21.40.2 and shall be installed in accordance with the manufacturer's installation instructions.

627.2 Independent piping.

Gas piping serving heating appliances shall be permitted to also serve cooling appliances where such heating and cooling appliances cannot be operated simultaneously (see Section 402).

627.3 Connection of gas engine-powered air conditioners.

To protect against the effects of normal vibration in service, gas engines shall not be rigidly connected to the gas supply piping. Where units are powered by internal combustion engines and turbines, installation shall comply with Section 616.1.

627.4 Clearances for indoor installation.

Air-conditioning appliances installed in rooms other than alcoves and closets shall be installed with clearances not less than those specified in Section 308.3 except that air-conditioning appliances listed for installation at lesser clearances than those specified in Section 308.3 shall be permitted to be installed in accordance with such listing and the manufacturer's instructions and air-conditioning appliances listed for installation at greater clearances than those specified in Section 308.3 shall be installed in accordance with such listing and the manufacturer's instructions. Air-conditioning appliances installed in rooms other than alcoves and closets shall be permitted to be installed with reduced clearances to combustible material, provided that the combustible material is protected in accordance with Table 308.2.

627.5 Alcove and closet installation.

Air-conditioning appliances installed in spaces such as alcoves and closets shall be specifically listed for such installation and installed in accordance with the terms of such listing. The installation clearances for air-conditioning appliances in alcoves and closets shall not be reduced by the protection methods described in Table 308.2.

627.6 Installation.

Air-conditioning appliances shall be installed in accordance with the manufacturer's instructions. Unless the appliance is listed for installation on a combustible surface such as a floor or roof, or unless the surface is protected in an approved manner, appliances shall be installed on a surface of noncombustible construction with noncombustible material and surface finish and with no combustible material against the underside thereof.

627.7 Plenums and air ducts.

A plenum supplied as a part of the air-conditioning appliance shall be installed in accordance with the appliance manufacturer's instructions. Where a plenum is not supplied with the appliance, such plenum shall be installed in accordance with the fabrication and installation instructions provided by the plenum and appliance manufacturer. The method of connecting supply and return ducts shall facilitate proper circulation of air. Where an air-conditioning appliance is installed within a space separated from the spaces served by the appliance, the air circulated by the appliance shall be conveyed by ducts that are sealed to the casing of the appliance and that separate the circulating air from the combustion and ventilation air.

627.8 Refrigeration coils.

A refrigeration coil shall not be installed in conjunction with a forced-air furnace where circulation of cooled air is provided by the furnace blower, unless the blower has sufficient capacity to overcome the external static resistance imposed by the duct system and cooling coil at the air throughput necessary for heating or cooling, whichever is greater. Furnaces shall not be located upstream from cooling units, unless the cooling unit is designed or equipped so as not to develop excessive temperature or pressure. Refrigeration coils shall be installed in parallel with or on the downstream side of central furnaces to avoid condensation in the heating element, unless the furnace has been specifically listed for downstream installation. With a parallel flow arrangement, the dampers or other means used to control flow of air shall be sufficiently tight to prevent any circulation of cooled air through the furnace. Means shall be provided for disposal of condensate and to prevent dripping of condensate onto the heating element.

627.9 Cooling units used with heating boilers.

Boilers, where used in conjunction with refrigeration systems, shall be installed so that the chilled medium is piped in parallel with the heating boiler with appropriate valves to prevent the chilled medium from entering the heating boiler. Where hot water heating boilers are connected to heating coils located in air-handling units where they might be exposed to refrigerated air circulation, such boiler piping systems shall be equipped with flow control valves or other automatic means to prevent gravity circulation of the boiler water during the cooling cycle.

627.10 Switches in electrical supply line.

Means for interrupting the electrical supply to the air-conditioning appliance and to its associated cooling tower (if supplied and installed in a location remote from the air conditioner) shall be provided within sight of and not over 50 feet (15 240 mm) from the air conditioner and cooling tower.

Section FGC 628: Illuminating Appliances

628.1 General.

Illuminating appliances shall be tested in accordance with ANSI Z21.42 and shall be installed in accordance with the manufacturer's installation instructions.

628.2 Mounting on buildings.

Illuminating appliances designed for wall or ceiling mounting shall be securely attached to substantial structures in such a manner that they are not dependent on the gas piping for support.

628.3 Mounting on posts.

Illuminating appliances designed for post mounting shall be securely and rigidly attached to a post. Posts shall be rigidly mounted in accordance with the requirements of the *New York City Building Code*. Drain openings shall be provided near the base of posts where there is a possibility of water collecting inside them.

628.4 Appliance pressure regulators.

Where an appliance pressure regulator is not supplied with an illuminating appliance and the service line is not equipped with a service pressure regulator, an appliance pressure regulator shall be installed in the line to the illuminating appliance. For multiple installations, one regulator of adequate capacity shall be permitted to serve more than one illuminating appliance.

Section FGC 629: Small Ceramic Kilns

629.1 General.

Ceramic kilns with a maximum interior volume of 20 cubic feet (0.566 m³) and used for hobby and noncommercial purposes shall be installed in accordance with the manufacturer's installation instructions and the provisions of this code.

Section FGC 630: Infrared Radiant Heaters

630.1 General.

Infrared radiant heaters shall be tested in accordance with ANSI Z83.6 and shall be installed in accordance with the manufacturer's installation instructions.

630.2 Support.

Infrared radiant heaters shall be safely and adequately fixed in an approved position independent of gas and electric supply lines. Hanger and brackets shall be of noncombustible material.

630.3 Combustion and ventilation air.

Where unvented infrared heaters are installed, natural or mechanical means shall provide outdoor ventilation air at a rate of not less than 4 cfm per 1,000 Btu/h (0.38 m³/min/kW) of the aggregate input rating of all such heaters installed in the space. Exhaust openings for removing flue products shall be above the level of the heaters.

630.4 Installation in commercial garages and air-craft hangars.

Overhead infrared heaters installed in garages for more than three motor vehicles or in aircraft hangars shall be installed in accordance with Sections 305.9, 305.10 and 305.11.

Section FGC 631: Boilers

631.1 Standards.

Boilers shall be listed in accordance with the requirements of ANSI Z21.13 or UL 795. If applicable, the boiler shall be designed and constructed in accordance with the requirements of ASME CSD-1 and as applicable, the *ASME Boiler and Pressure Vessel Code*, Sections I, II, IV, V, VI and IX, NFPA 8501, NFPA 8502 and NFPA 8504. Low pressure boilers shall conform to the requirements of 12 NYCRR Part 4 and high pressure boilers shall conform to the requirements of 12 NYCRR Part 14.

631.2 Installation.

In addition to the requirements of this code, the installation of boilers shall be in accordance with the manufacturer's instructions and the *New York City Mechanical Code*. Operating instructions of a permanent type shall be attached to the boiler. Spill switches must be installed on all flue gas draft openings and interlocked with all vented appliances. Boilers shall have all controls set, adjusted and tested by the installer. A complete control diagram together with complete boiler operating instructions shall be furnished by the installer. The manufacturer's rating data and the nameplate shall be attached to the boiler.

631.3 Clearance to combustible materials.

Clearances to combustible materials shall be in accordance with Section 308.4.

Section FGC 632: Equipment Installed In Existing Unlisted Boilers

632.1 General.

Gas equipment installed in existing unlisted boilers shall comply with Section 631.1 and shall be installed in accordance with the manufacturer's instructions and the *New York City Mechanical Code*.

Section FGC 633: Fuel Cell Power Systems

633.1 General.

Stationary fuel-cell power systems having a power output not exceeding 1 MW shall be tested in accordance with CSA America FC 1 and shall be installed in accordance with the manufacturer's installation instructions, NFPA 853, the *New York City Building Code*, the *New York City Fire Code*, and comply with National Electric Code Article 692 *Fuel Cell Systems*.

Section FGC 634: Chimney Damper Opening Area

634.1 Free opening area of chimney dampers.

Where an unlisted decorative appliance for installation in a vented fireplace is installed, the fireplace damper shall have a permanent free opening equal to or greater than specified in Table 634.1.

Table 634.1

Free Opening Area of Chimney Damper for Venting Flue Gasses from Unlisted Decorative Appliances for Installation in Vented Fireplaces

Chimney Height (Feet)	Minimum Permanent Free Opening (Square Inches) ^a						
	8	13	20	29	39	51	64
Appliance Input Rating (BTU Per Hour)							
Chimney Height (Feet)	Minimum Permanent Free Opening (Square Inches) ^a						
	8	13	20	29	39	51	64
Appliance Input Rating (BTU Per Hour)							
6	7,800	14,000	23,200	34,000	46,400	62,400	8,000

8	8,400	15,200	25,200	37,000	50,400	68,000	86,000
10	9,000	16,800	27,600	40,400	55,800	74,400	96,400
15	9,800	18,200	30,200	44,600	62,400	84,000	108,800
20	10,600	20,200	32,600	50,400	68,400	94,000	122,200
30	11,200	21,600	36,600	55,200	76,800	105,800	138,600

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 square inch = 645.16 m², 1 British thermal unit per hour = 0.2931 W.

a. The first six minimum permanent free openings (8 to 51 square inches) correspond approximately to the cross-sectional areas of chimneys having diameters of 3 through 8 inches, respectively. The 64-square-inch opening corresponds to the cross-sectional area of standard 8-inch by 8-inch chimney tile.

Section FGC 635: Gaseous Hydrogen Systems

635.1 Installation.

The installation of gaseous hydrogen systems shall be in accordance with the applicable requirements of the *New York City Fire Code*, the *New York City Building Code*, and Chapter 7 of this code.

Chapter 7: Gaseous Hydrogen Systems

Section FGC 701: General

701.1 Scope.

The installation of gaseous hydrogen systems shall comply with this chapter and Chapters 30 and 35 of the *New York City Fire Code*. Compressed gases shall also comply with Chapter 27 of the *New York City Fire Code* for general requirements.

701.2 Permits.

Permits shall be required as set forth in Section 105 of this code and as required by the *New York City Fire Code*.

Chapter 8: Referenced Standards

Section FGC 801: General

801.1 General.

This chapter lists the standards that are referenced in various sections of this document. The standards are listed herein by the promulgating agency of the standard, the standard identification, the effective date and title and the section or sections of this document that reference the standard.

801.2 Subsequent additions, modifications, or deletions.

Refer to the rules of the department for any subsequent additions, modifications or deletions that may have been made to these standards in accordance with Section 28-103.19 of the *Administrative Code*.

801.3 Applicability.

The application of the referenced standards shall be as specified in Section 102.8 of this code.

Section FGC 802: Standards

ANSI	American National Standards Institute 25 West 43rd Street Fourth Floor New York, NY 10036	
Standard reference number	Title	Referenced in code section number
NSF/ANSI 169—09	Special Purpose Food Equipment and Devices	411.1.1
Z21.1—03	Household Cooking Gas Appliances with Addenda Z21a-2003 and Z21.1b-2003	623.1
Z21.5.1—02	Gas Clothes Dryers - Volume I -Type 1 Clothes Dryers	613.1
Z21.5.2—01	Gas Clothes Dryers - Volume II- Type 2 Clothes Dryers with Addenda Z21.5.2a-03 and Z21.5.2b-03	613.1, 614.3
Z21.8—94 (R2002)	Installation of Domestic Gas Conversion Burners	619.1
Z21.10.1—04	Gas Water Heaters - Volume I - Storage, Water Heaters with Input Ratings of 75,000 Btu per Hour or Less	624.1
Z21.10.3—01	Gas Water Heaters - Volume III - Storage, Water Heaters with Input Ratings Above 75,000 Btu per hour, Circulating and Instantaneous - with Addenda Z21.10.3a-2003 and Z21.10.3b-2004	624.1
Z21.13—04	Gas-fired Low-pressure Steam and Hot Water Boilers	631.1
Z21.19—02	Refrigerators Using Gas (R 1999) Fuel	625.1
Z21.21—05	Automatic Valves for Gas Appliances	603.2
Z21.24—97	Connectors for Gas Appliances	411.1, 411.3
Z21.40.1—96 (R2002)	Gas-fired Heat Activated Air Conditioning and Heat Pump Appliances—with Addendum Z21.40.1a- 97(R2002)	627.1
Z21.40.2—96 (R2002)	Gas-fired Work Activated Air Conditioning and Heat Pump Appliances (Internal Combustion)—with Addendum Z21.40.2a-97 (R2002)	627.1
Z21.42—93 (R2002)	Gas-fired Illuminating Appliances	628.1
Z21.47—03	Gas-fired Central Furnaces	618.1
Z21.50—03	Vented Gas Fireplaces-with Addenda Z21.50a-2003	601.2, 604.1
Z21.56—01	Gas-fired Pool Heaters—with Addenda Z21.56a-2004 and Z21.56b-2004	617.1
Z21.58—95 (R2002)	Outdoor Cooking Gas Appliances—with Addendum Z21.58a-1998 (R2002) and Z21.58b-2002	623.1

Z21.60—03	Decorative Gas Appliances for Installation in Solid-fuel Burning Fireplaces —with Addenda Z21.60a-2003	601.2, 602.1
Z21.69—02	Connectors for Movable Gas Appliances—with Addenda Z21.69a-2003	411.1.1
Z21.75/CSA 6.27—01	Connectors for Outdoor Gas Appliances and Manufactured Homes	411.1, 411.2
Z21.80—03	Line Pressure Regulators	410.1
Z21.84—02	Manually-lighted, Natural Gas Decorative Gas Appliances for Installation in Solid Fuel Burning Fireplaces with Addenda Z21.84a-2003	602.1, 602.2
Z21.86—04/CSA 2.32	Gas-fired Vented Space Heating Appliances	608.1, 609.1, 622.1
Z21.88—02	Vented Gas Fireplace Heaters-with Addenda Z21.88a- 2003 and Z21.88b- 2004	605.1
Z83.4—03/CSA 3.7-03	Nonrecirculating Direct-gas-fired Industrial Air Heaters	611.1
Z83.6—90 (R 1998)	Gas-fired Infrared Heaters	630.1
Z83.8—02	Gas Unit Heaters and Gas-fired Duct Furnaces	610.1, 620.1
Z83.11—02	Gas Food Service Equipment- with Addenda Z83.11a- 2004	623.1
Z83.18—00	Recirculating Direct Gas-fired Industrial Air Heaters- with Addenda Z83.18a-2001 and Z83.18b-2003	612.1

ASME	American Society of Mechanical Engineers Three Park Avenue New York, NY 10016-5990	
Standard reference number	Title	Referenced in code section number
A13.1—07	Scheme for the Identification of Piping Systems	401.5, G.5.3
B1.20.1—83 (R2006)	Pipe Threads, General Purpose (inch)	403.9
B16.1—05 (R2004)	Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125 and 250	403.12
B16.20—98	Metallic Gaskets for Pipe Flanges Ring-Joint, Spiral-Wound, and Jacketed	403.12
B31.1—12	Power Piping Code	G.5.1
B36.10M—04	Welded and Seamless Wrought-Steel Pipe	403.4.2
B40.100—05	Pressure Gauges and Gauge Attachments	406.4.1
BPVC—10	ASME Boiler & Pressure Vessel Code	406.1.1.1, 406.1.1.2, 624.2, 631.1
CSD-1—04	Controls and Safety Devices for Automatically Fired Boilers	619.1, 631.1

ASNT	American Society for Nondestructive Testing 3200 Riverside Drive Columbus, OH 43221	
Standard reference number	Title	Referenced in code section number
SNT-TC-1A—11	Recommended Practice	406.1.1.1

ASTM	ASTM International 100 Barr Harbor Drive West Conshohocken, PA 19428-2959	
Standard reference number	Title	Referenced in code section number
A53/A 53M—06a	Specification for Pipe, Steel, Black and Hot Dipped Zinc-coated Welded and Seamless	403.4.2
A106/A 106M—06a	Specification for Seamless Carbon Steel Pipe for High-temperature Service	403.4.2
C64—72 (1977)	Withdrawn No Replacement (Specification for Fireclay Brick Refractories for Heavy Duty Stationary Boiler Service)	503.10.2.5
C315—07	Specification for Clay Flue Liners and Chimney Pots	501.12

CAN/ULC	Standards Council of Canada 270 Albert Street, Suite 200 Ottawa, ON K1P 6N7 Canada	
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Standard reference number	Title	Referenced in code section number
S635—00	Standard for Lining Systems for Existing Masonry or Factory-built Chimneys and Vents	501.12, 501.15.4
S640—91	Standard for Lining Systems for New Masonry Chimneys	501.12

CSA	CSA America Inc. 8501 E. Pleasant Valley Rd. Cleveland, OH USA 44131-5575	
Standard reference number	Title	Referenced in code section number
CSA America FC 1-12	Fuel Cell Power Systems	633.1
CSA 8—93	Requirements for Gas-fired Log Lighters for Wood Burning Fireplaces – with Revisions through January 1999	603.1

MSS	Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. 127 Park Street, Northeast Vienna, Virginia 22180-4602	
Standard reference number	Title	Referenced in code section number
SP-6—01	Standard Finishes for Contact Faces of Pipe Flanges and Connecting-end Flanges of Valves and Fittings	403.12
SP-58—93	Pipe Hangers and Supports—Materials, Design and Manufacture	407.2

NEC	National Fire Protection Association 1 Batterymarch Park Quincy, MA 02269-9101	
Standard reference number	Title	Referenced in code section number
NEC Article 692—11	National Electric Code (Fuel Cell Systems)	633.1

NFPA	National Fire Protection Association 1 Batterymarch Park Quincy, MA 02269-9101	
Standard reference number	Title	Referenced in code section number
30A—03	Code for Motor Fuel Dispensing Facilities and Repair Garages	305.4, 305.10
37—10	Installation and Use of Stationary Combustion Engines and Gas Turbines	508.1, 616.1, G.3.1.1
54—06	National Fuel Gas Code	501.2.2, 609.9
56PS—12	Standard for Fire and Explosion Prevention During Cleaning and Purging of Flammable Gas Piping Systems	G.7
68—07	Standard for Explosion Protection by Deflagration Venting	E.2.1, G.3.1
69—08	Standard on Explosion Prevention Systems	E.2.1, G.2.5.1, G.3.2
72—10	National Fire Alarm and Signaling Code	G.2.4.3
82—04	Incinerators, Waste and Linen Handling Systems and Equipment	607.1
88A—02	Parking Structures	305.9
211—10	Chimneys, Fireplaces, Vents, and Solid Fuel- burning Appliances	502.1, 503.5.2, 503.5.3, 503.5.6.1, 503.5.6.3, 508.1
409—01	Aircraft Hangars	305.11
853—07	Installation of Stationary Fuel Cell Power Systems	633.1
8501—97	Standard for Single Burner Boiler Operations	631.1
8502—99	Standard for the Prevention of Furnace Explosions/Implosions in Multiple Burner Boilers	631.1
8504—96	Standard on Atmospheric Fluidized-bed Boiler Operations	631.1

SMACNA	Sheet Metal & Air Conditioning Contractors National Association, Inc. 4021 Lafayette Center Road Chantilly, VA 22021	
Standard reference number	Title	Referenced in code section number
SMACNA —95	HVAC Duct Construction Standards-Metal and Flexible	614.8

UL	Underwriters Laboratories Inc. 333 Pfingsten Road Northbrook, IL 60062	
Standard reference number	Title	Referenced in code section number
103—01	Factory-built Chimneys, Residential Type and Building Heating Appliances— with Revisions through June 2006	506.1
441—96	Gas Vents—with Revisions through August 2006	502.1
536—03	Flexible Metallic Hose	405.5
641—95	Type L Low-temperature Venting Systems—with Revisions through April 1999	502.1
795—06	Commercial-industrial Gas Heating Equipment	610.1, 618.1, 631.1
959—01	Medium Heat Appliance Factory-built Chimneys	506.3
1738—06	Venting Systems for Gas Burning Appliances, Categories II, III and IV	502.1
1777—04	Standard for Chimney Liners	501.12, 501.15.4
2158A—06	Clothes Dryer Transition Duct	614.6.4
2200—04	Stationary Engine Generator Assemblies	616.1

Appendix A: [Reserved]

Appendix B: [Reserved]

Appendix C: [Reserved]

Appendix D: [Reserved]

Appendix E: Meters and Gas Service Piping

E.1 General.

This appendix addresses the requirements for meters and service piping, underground or aboveground, as the piping enters the building. Service piping includes fuel gas piping, valves, and fittings upstream of the point of delivery. Service piping may include piping supplied by the gas service utility.

E.2 Gas regulator and gas regulator vent outlets.

Gas meter piping supplying gas to a building at a pressure in excess of 1/2 psig (3.4 kPa gauge) shall be provided with a regulator that will reduce the pressure of the gas to 1/2 psig (3.4 kPa gauge) or less prior to entering the gas distribution piping in the building, except where the use of higher pressure is permitted. Where gas distribution pressure in excess of 1/2 psig (3.4 kPa gauge) is permitted, it shall be regulated not to exceed the maximum pressure level as permitted by the code or the commissioner.

E.2.1 Inside gas meter piping operating at a pressure in excess of 15 psig (103 kPa gauge) shall comply with the following:

- Where such piping is greater than 4 inches (102 mm) in diameter, the meter piping shall be installed in a properly ventilated meter room of 3-hour fire rated construction.
- The maximum distance from the service line valve to the regulator shall be limited as follows:

Service Line Valve Size	Maximum Distance (Linear Feet of Pipe)
Up through 2 inch (51 mm) pipe size	4 feet (1219 mm)
Over 2 inch (51 mm) through 4 inch (102 mm) pipe size	8 feet (2438 mm)
Over 4 inch (102 mm) through 8 inch (203 mm) pipe size	15 feet (4572 mm)
10 inch (254 mm) pipe size and larger	20 feet (6096 mm)

- Where these maximum distances cannot be met, the following shall be required:

Footage (Linear Feet of Pipe) In Excess of Above Requirements	Additional Requirements
Up to 5 feet (1534 mm)	The meter room shall have 3 hour fire-rating construction and adequate ventilation
Over 5 feet (1524 mm) through 10 feet (3048 mm)	Above requirements plus a combus-tible gas-detection alarm system
Over 10 (3048 mm) feet through 15 feet (4572 mm)	Above requirements plus special inspection by the customer or his representative as required by the <i>New York City Building Code</i> .
Over 15 feet (4572 mm) through 20 feet (6096 mm)	Above requirements plus explosion venting per NFPA 68 and NFPA 69 or alternative ventilation acceptable to the commissioner and automatic gas shutoff devices

Over 20 feet (6096 mm)	Above requirements plus suitable fire protection approved by the commissioner
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For new gas installations made in existing structures, the above requirements shall be used to the extent feasible. Alternate designs may be considered by the commissioner.

E.2.2 When located inside the building, each regulator shall be provided with a vent pipe that leads directly to the outdoor air. The vent pipe shall be sized according to local utility requirements. The vent outlet shall not be located under a window or any opening leading back into the premises or located below any overhang or projection. No gas regulator vent outlet shall be covered over, plugged up, or otherwise obstructed, and all gas vents shall be identified by suitable marking on the outlet on the outside of the building.

E.2.3 Gas appliance pressure regulators requiring access to the atmosphere for successful operation shall be equipped with vent leading to the outdoors, unless constructed or equipped with a vent limiting means to limit the escape of gas from the vent opening in the event of diaphragm failure.

E.3 Gas meter location.

Gas meter location shall comply with the following:

1. When located inside the building, meters shall be located as near as practicable to the point of entrance of the service and, where possible, the meters shall be located in the cellar or basement unless otherwise permitted by the commissioner. The meter location shall be clean, dry, and free of refuse, steam or chemical fumes and located not less than 3 feet (914 mm) from any source of ignition or any source of heat which might cause damage to the meter. Meters shall be adequately protected against extreme cold or heat and shall be readily accessible for reading and inspection. The area in which the meter is located shall be properly ventilated as per Section E.4. Notwithstanding the foregoing, outside meter installation shall be permitted in areas where the utility company certifies that dry gas is being distributed.

2. No gas meter, other than the replacement of an existing meter shall be located in any boiler room or other room or space containing a heating boiler, in any stair hall, nor in any public hall above the cellar or above the lowest story if there is no cellar. However, where there is an existing gas meter located in any boiler room or other room or space containing a heating boiler, one additional gas meter may be installed in such room or space, provided such additional gas meter is installed adjacent to the existing gas meter and is used in conjunction with the supply of gas for a gas-fired heating boiler or a gas-fired water heater used as a central source of supply of heat or hot water for the tenants. Such additional gas meter may be installed only upon the condition that space heaters or hot water appliances in the tenant spaces are eliminated.

3. Gas meter rooms, when provided, shall at all times be kept clear of all rubbish; and shall not be used in any way for storage purposes, including material or equipment of any kind. A legible sign reading "Gas meter room-No storage permitted" shall be permanently and conspicuously posted on the exterior of the meter room door, except that the sign may be posted on the interior of the meter room door in occupancy group R-3. The lettering of such signs shall be of bold type at least one inch in height and shall be properly spaced to provide good legibility. The lettering and background shall be of contrasting colors. Where gas meters and related equipment are not located in a separate room but are located in an open floor area, no combustible material shall be stored or kept within five feet of such equipment; nor shall the gas meter be within 3 feet (914 mm) of any heating boiler or sources of ignition and, except occupancy group R-3, there shall be a physical barrier required if the room is also used for storage purposes or the like.

4. The installation of gas meter piping shall be made in accordance with the requirements of this code and the local utility company.

5. Piping containing gas with a pressure exceeding 1/2 psig (3.4 kPa gauge) and the gas service pressure regulator which may be subjected to accidental vehicular impact shall be suitably protected.

E.4 Gas meter room ventilation.

Any one of the following methods shall be considered sufficient to provide proper ventilation to a room or space in which a gas meter(s) is installed:

1. An opening to the outside air in the wall of such room or space, provided the free area of the opening is not less than 30 square inches (19 321 mm²).

2. A duct having a cross-section area of at least 50 square inches (32 522 mm²) of free area and a maximum length of 15 feet (4572 mm) leading to the outside air. If a longer duct is required due to the building construction, the area of the duct should be increased accordingly, subject to the approval of the commissioner. However, under no circumstances shall the means of ventilation for the gas meter room or space be from an adjoining room or space within the building. The above requirement is not applicable to one- and two-family dwellings, since the gas meter is available for continuous supervision.

E.5 Gas service piping connections.

Gas service piping connections shall comply with the following:

1. Gas service piping shall be fitted with a gas service line valve, the valve located on the supply side of the meter and service regulator, if a service regulator is required. If a plug type valve is used, it shall be constructed so as to prevent the core from being blown out by the pressure of the gas. In addition, it shall be of a type capable of being locked in the off position by the local gas utility. When the gas service line valve is inside the building, it shall be in an accessible location within 2 feet (610 mm) of the point where the gas service connection enters the building or at such other location as may be permitted by the commissioner. Where the gas service connection is installed through a building wall below ground, it shall be protected with a wall sleeve extending at least 4 inches (102 mm) beyond the outer side of the wall and at least 1 inch (25 mm) beyond the inner side of the wall. The sleeve shall be sealed at both ends to prevent the entry of water and gas. Gas service connections, installed through ground slab construction, shall be protected with a floor sleeve sealed at both ends to prevent the entry of water and gas. The sleeve shall extend at least 4 inches (102 mm) above the floor, and shall be installed as specified by the utility company providing the service. It shall terminate at least 4 inches (102 mm) outside the building.

2. In all high-pressure areas, the utility company providing the service may inspect the gas service line valve and regulator in accordance with the provisions of 16 NYCRR Part 255 in addition to the department in accordance with Section 406 of this code.

3. No gas service shall enter a structure at a horizontal distance of less than 10 feet (3048 mm) from the cellar termination of a stairway, nor shall any gas meters or gas regulators be located less than 10 feet (3048 mm) from such stairway termination. Where such services, meters and regulators are separated from the stairway termination by a permanent partition or wall having a fire-resistance rating of at least 1 hour, the foregoing shall not apply. Unless forbidden by other provisions of this code, locations under a stairway are exempt from this requirement.

4. When the structure is erected on fill or on piles, provision shall be made to preclude possible damage to the gas service piping caused by settlement.

5. The installation of gas service piping shall be made in accordance with the requirements of the utility corporation providing the service as regulated by the provisions of 16 NYCRR Part 255. Further, such installation shall meet the requirements of the department.

6. Gas service piping outside a structure shall be installed not less than 24 inches (610 mm) below grade, except that a lesser distance of not less than 18 inches (457 mm) may be permitted, provided the piping is adequately protected in accordance with the requirements of this code and the utility corporation supplying service, and the piping is not located below a driveway. Any piping that is exposed to outdoor temperatures or installed underground with a cover of less than 2 feet (610 mm) shall be protected against frost, except that frost protection may be omitted in areas where the utility company certifies that dry gas is being distributed.

E.6 Outside gas cut-off.

Outside gas cut-off shall comply with the following:

1. An outside gas service line valve or other outside emergency shut-off device or other means acceptable to the commissioner and the Fire Commissioner shall be installed in every gas service pipe outside the building. If buried, such valve, device or method shall be readily accessible from grade. Every existing service which is being replaced or refurbished shall be provided with such valve, device or means, but in any event, all existing gas services shall be provided with such valve, device or method by January 1, 2010. However, in R-3 occupancy the completion date shall be January 1, 2020. The utility company shall provide the Fire Department with suitable tools for operation of such emergency shut-off valves, devices or means. The number of such tools required for supplying Fire Department units shall be determined by the Fire Department. On or before January 31, of each year, the utility company shall report to the department and the Fire Department the actual number of emergency shut-off valves installed for the preceding year.

2. If the outside gas service line valve, emergency shut-off device or means is located below ground, it shall be installed in a protective housing, and a cover, easily identifiable shall be provided for the housing. The cover shall be flush with the surface of the ground and kept clear at all times so as to be accessible for immediate use.

3. The valve or emergency shut-off device shall be capable of being readily operated by removing the cover of the housing and inserting a portable key or other device over the operating end of the valve or emergency shut-off device.

4. If the outside gas service line valve is located above ground, it shall be suitably protected to prevent accidental vehicular impact and must be installed in accordance with provisions of 16 NYCRR Part 255.

5. Where a gas-fired generator provides required emergency power in accordance with the *New York City Building Code* such generator shall have an outside gas cut-off valve that is separate from other gas services to the buildings. Such valves shall be identified by signage.

Appendix F: [Repealed]

Appendix G: High Pressure Natural Gas Installations

G.1 General.

This Appendix addresses natural gas distribution piping requirements for systems where the gas pressure is at or above 15 psig (103 kPa gauge). Installations of gas piping at pressures at or above 15 psig (103 kPa gauge) and equipment and appliances using gas with an inlet pressure at or above 15 psig (103 kPa gauge) shall be considered as high pressure natural gas installations.

G.1.1 Fire Department approval.

High pressure natural gas installations shall be approved by the Fire Department. All design documents associated with the installation shall be submitted to the Fire Department for approval. The Fire Department shall witness and approve final testing of the installation.

G.1.2 Certificate of fitness.

High pressure natural gas installations shall be operated under the supervision of a person holding a Certificate of Fitness issued by the Fire Department when required by the *New York City Fire Code*.

G.2 Construction requirements.

Buildings with high pressure natural gas installations shall meet the requirements of this section.

G.2.1 Structural requirements.

The structural integrity of the building shall meet the requirements of Section 1615.6 of the *New York City Building Code* for gas explosions. An explosion analysis shall be conducted where the gas pressure exceeds 125 psig (862 kPa gauge). Where an explosion analysis shows explosion pressure exceeding 430 psf (20.5 kPa gauge), the building's structural integrity shall be maintained at pressure levels determined by the explosion analysis. The explosion scenario and explosion analysis shall be approved by the Fire Department.

G.2.2 Fire-resistance rated rooms and spaces.

Rooms and spaces containing high pressure natural gas piping shall be separated from all other areas of the building by fire barriers or horizontal assemblies, or both, having a fire-resistance rating of not less than 3 hours.

G.2.2.1 Shaft requirements.

Vertical runs of high pressure gas piping within a building shall be enclosed in masonry shafts constructed of walls not less than 4 inches in thickness and sealed to prevent any gas leakage from the shaft. Such shaft shall be vented to the outdoors at the top. Such shaft shall not be located adjacent to an exit stairway or exit passageway unless the shaft wall separating the exit stairway or exit passageway from the shaft is designed to resist a potential gas explosion in accordance with Section 1615.6 of the *New York City Building Code*.

G.2.3 Automatic sprinkler system.

Buildings and structures shall be equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 of the *New York City Building Code*, except where an alternative fire-extinguishing system is approved in accordance with Section 904.1 of the *New York City Building Code*.

G.2.4 Gas detection.

Rooms and spaces containing the high pressure gas piping must be equipped with an approved and listed gas detection alarm system.

G.2.4.1 Gas detection system.

A gas detection system including placement of gas detectors shall be installed in accordance with the manufacturer's recommendations, its listing and Section 908 of the *New York City Building Code*.

G.2.4.2 Supervision.

Gas detectors shall be supervised by a building fire alarm system in buildings where fire alarm systems are required or installed.

G.2.4.3 Power supply.

Power supply to the system, wiring of the system, its associated components and outputs shall be in accordance with NFPA 72 and Section 907 of the *New York City Building Code*.

G.2.4.4 Alarm.

An audible and visual alarm shall be provided at the gas detection panel with an audible silence switch only.

G.2.4.5 Alarm transmission.

The gas detection system shall transmit a trouble signal and an alarm to the supervising station and to a 24-hour supervised location within the building.

G.2.4.6 Shutoff valves closure.

The gas detection system alarm activation shall trigger emergency gas shutoff valves serving the affected area to close and stop the gas flow.

G.2.5 Ventilation.

Rooms containing appliances or equipment operating with gas pressure at or above 15 psig (103 kPa gauge) shall be provided with ventilation in accordance with the requirements of Chapter 4 of the *New York City Mechanical Code*.

G.2.5.1 Explosion prevention.

For rooms or spaces containing appliances operating with gas pressure at or above 15 psig (103 kPa gauge) and less than 125 psig (862 kPa gauge), explosion prevention systems shall be provided in accordance with NFPA 69.

G.3 High hazard.

Rooms and areas containing appliances and equipment operating with gas pressure at or above 125 psig (862 kPa gauge) shall be classified as a Group H-2 occupancy and shall comply with the requirements of this section.

G.3.1 Explosion venting.

Appliances and equipment using gas at or above 125 psig (862 kPa gauge) shall be located in rooms provided with explosion venting in accordance with NFPA 68.

G.3.1.1 Gas turbines.

Gas turbine installations shall comply with the requirements of NFPA 37 and the requirements of Title 28 of the *Administrative Code*.

G.3.1.2 Gas turbine rooms.

For rooms containing gas turbines and fuel gas compressors, the design of the explosion venting system shall be based on the explosion resulting from the lower explosion limit

being achieved within the room housing the turbine or fuel gas compressor, including its enclosure. All control valve stations, filters, and related accessories shall be placed in the gas turbine room or a separately protected room.

G.3.2 Emergency ventilation.

An emergency ventilation system shall be provided in accordance with NFPA 69 and shall be approved by the Fire Department. Ventilation calculations as listed in Annex D Ventilation Calculations of NFPA 69 shall be provided, and the gas release rate shall be approved.

G.3.3 Electrical equipment.

Electrical equipment within rooms and enclosures requiring emergency ventilation shall conform to the *New York City Electrical Code* for Class 1 Division 2 requirements.

G.4 Gas meter room.

A gas meter room served by gas at a pressure at or above 15 psig (103 kPa gauge) shall meet the requirements of Appendix E of this code and the *New York City Electrical Code* for Class 1 Division 2 requirements.

G.5 Piping requirements.

High pressure gas piping shall comply with the requirements of this section.

G.5.1 Piping material.

Installations of natural gas piping operating at pressures of 125 psig (862 kPa gauge) and above shall comply with the requirements of ASME B 31.1.

G.5.2 Double wall piping.

Horizontal piping that traverses within a building from a protected room or shaft to a protected room or shaft shall be run in an outer pipe of the same pressure rating as the inner pipe. The outer pipe shall be welded and the annular space between the inner and outer pipe shall be equal to or greater than the inside diameter of the inner pipe. The annular space shall be monitored for natural gas with an approved gas detection alarm system and shall be vented to the exterior of the building. The outer pipe must open to the shaft and/or protected room or to the outside air.

G.5.3 Piping identification.

Piping shall be identified with markings in accordance with ASME A13.1.

G.5.4 Emergency gas shutoff.

An emergency gas shutoff valve shall be provided on the gas supply outside of any room containing an appliance utilizing gas at a pressure at or above 15 psig (103 kPa gauge). The emergency shutoff valve shall be controlled from a break glass station located outside the room served and from the gas detection system monitoring the room. The emergency shutoff valve shall automatically stop the gas flow to the room(s) containing the appliance(s) in the event of an unsafe condition. The emergency shutoff valve shall be manually operable. Emergency gas shutoff valve bypasses shall be prohibited.

G.6 Special inspection required.

The entire high pressure natural gas installation, including piping, equipment, appliances, gas detection and control systems, shall be subject to special inspection as set forth in Section 1704.19 of the *New York City Building Code*.

G.7 Cleaning and purging procedures.

Cleaning and purging procedures for high pressure natural gas piping, equipment and appliances shall be in accordance with NFPA 56PS.