



## Second Revision No. 31-NFPA 54-2022 [ Global Comment ]

See attached Word document for revisions separating out sections with multiple requirements.

### Supplemental Information

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
SR_31_Multi_Requirement.docx	See Word Document for revisions.	
NFPA_54_Global_SR_31_Multi_requirements_for_ballot.docx	for ballot	

### Submitter Information Verification

**Committee:** NFG-AAA

**Submittal Date:** Wed Oct 26 16:10:00 EDT 2022

### Committee Statement

**Committee Statement:** The revision is revising requirements to comply with the NFPA Manual of Style by splitting out sections that contain multiple requirements.

**Response Message:** SR-31-NFPA 54-2022

### 1.1.1 Applicability.

#### 1.1.1.1

This code is a safety code that shall apply to the installation of fuel gas piping systems, appliances, equipment, and related accessories as shown in 1.1.1.1(A) through 1.1.1.1(F).

##### ~~(A)~~1.1.1.1.1\*

Coverage of piping systems shall extend from the point of delivery to the appliance connections. ~~For other than undiluted liquefied petroleum gas (LP-Gas) systems, the point of delivery shall be the outlet of the service meter assembly or the outlet of the service regulator or service shutoff valve where no meter is provided. For undiluted LP-Gas systems, the point of delivery shall be considered to be the outlet of the final pressure regulator, exclusive of line gas regulators where no meter is installed. Where a meter is installed, the point of delivery shall be the outlet of the meter.~~

##### 1.1.1.1.2

For other than undiluted liquefied petroleum gas (LP-Gas) systems, the point of delivery shall be the outlet of the service meter assembly or the outlet of the service regulator or service shutoff valve where no meter is provided.

##### 1.1.1.1.3

For undiluted LP-Gas systems, the point of delivery shall be considered to be the outlet of the final pressure regulator, exclusive of line gas regulators where no meter is installed.

##### 1.1.1.1.4

Where a meter is installed, the point of delivery shall be the outlet of the meter.

##### ~~(1.1.1.1.5B)~~

This code shall apply to natural gas systems operating at a pressure of 125 psi (862 kPa) or less.

##### ~~(1.1.1.1.6C)~~

This code shall apply to LP-Gas systems operating at a pressure of 50 psi (345 kPa) or less.

##### ~~(1.1.1.1.7D)~~

This code shall apply to gas-air mixture systems operating within the flammable range at a pressure of 10 psi (69 kPa) or less.

##### ~~(1.1.1.1.8E)~~

Requirements for piping systems shall include design, materials, components, fabrication, assembly, installation, testing, inspection, purging, operation, and maintenance.

##### ~~(1.1.1.1.9F)~~

Requirements for appliances, equipment, and related accessories shall include installation, combustion air, ventilation air, and venting.

#### 4.2.1 Notification of Interrupted Service.

~~When the gas supply is to be turned off, it shall be the duty of the qualified agency to notify all affected users. Where two or more users are served from the same supply system, precautions shall be exercised to ensure that service only to the proper user is turned off.~~

#### 4.2.1.1

When the gas supply is to be turned off, it shall be the duty of the qualified agency to notify all affected users.

#### 4.2.1.2

Where two or more users are served from the same supply system, precautions shall be exercised to ensure that service only to the proper user is turned off.

#### 4.3.1 Potential Ignition Sources.

Where work is being performed on piping that contains or has contained gas, the following shall apply:

1. Provisions for electrical continuity shall be made before alterations are made in a metallic piping system.
2. Smoking, open flames, lanterns, welding, or other sources of ignition shall not be permitted.
- ~~3.~~ 3. A metallic electrical bond shall be installed around the location of cuts in metallic gas pipes made by other than cutting torches. ~~Where cutting torches, welding, or other sources of ignition are to be used, it shall be determined that all sources of gas or gas-air mixtures have been secured and that all flammable gas or liquids have been cleared from the area. Piping shall be purged as required in Section 8.3 before welding or cutting with a torch is attempted.~~
4. Where cutting torches, welding, or other sources of ignition are to be used, it shall be determined that all sources of gas or gas-air mixtures have been secured and that all flammable gas or liquids have been cleared from the area.
- ~~3-5.~~ 5. Piping shall be purged as required in Section 8.3 before welding or cutting with a torch is attempted.
6. Artificial illumination shall be restricted to listed safety-type flashlights and safety lamps.
7. Electric switches shall not be turned on or turned off.

#### 5.5.2.2 Steel, Stainless Steel, and Wrought Iron.

~~Steel, stainless steel, and wrought-iron pipe shall be at least Schedule 10 and shall comply with the dimensional standards of ANSI/ASME B36.10M, Welded and Seamless Wrought Steel Pipe, and one of the following:~~

- ~~1. ASTM A53, Standard Specification for Pipe, Steel, Black and Hot Dipped, Zinc Coated Welded and Seamless~~
- ~~2. ASTM A106, Standard Specification for Seamless Carbon Steel Pipe for High Temperature Service~~
- ~~3. ASTM A312, Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes~~

#### 5.5.2.2.1

Steel, stainless steel, and wrought-iron pipe shall be at least Schedule 10.

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#### 5.5.2.2.2

Steel, stainless steel, and wrought-iron pipe shall comply with both the dimensional standards of ANSI/ASME B36.10M, *Welded and Seamless Wrought Steel Pipe*, and one of the following:

1. ASTM A53, *Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless*
2. ASTM A106, *Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service*
3. ASTM A312, *Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes*

#### 5.5.2.5 Aluminum Alloy.

~~Aluminum alloy pipe shall comply with ASTM B241, *Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube* (except that the use of alloy 5456 is prohibited), and shall be marked at each end of each length indicating compliance. Aluminum alloy pipe shall be coated to protect against external corrosion where it is in contact with masonry, plaster, or insulation or is subject to repeated wettings by such liquids as water, detergents, or sewage.~~

#### 5.5.2.5.1

Aluminum alloy pipe shall comply with ASTM B241, *Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube*.

#### 5.5.2.5.2

Alloy 5456, in accordance with ASTM B241, *Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube*, shall be prohibited.

#### 5.5.2.5.3

Aluminum alloy pipe shall be marked at each end of each length indicating compliance.

#### 5.5.2.5.4

Aluminum alloy pipe shall be coated to protect against external corrosion where it is in contact with masonry, plaster, or insulation or is subject to repeated wettings by such liquids as water, detergents, or sewage.

#### 5.5.3.4\* Copper and Copper Alloy.

~~Copper and copper alloy tubing shall not be used if the gas contains more than an average of 0.3 grains of hydrogen sulfide per 100 scf of gas (0.7 mg/100 L). Copper tubing shall comply with standard Type K or Type L of ASTM B88, *Standard Specification for Seamless Copper Water Tube*, or ASTM B280, *Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service*.~~

#### 5.5.3.4.1

Copper and copper alloy tubing shall not be used if the gas contains more than an average of 0.3 grains of hydrogen sulfide per 100 scf of gas (0.7 mg/100 L).

#### 5.5.3.4.2

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Copper tubing shall comply with standard Type K or Type L of ASTM B88, *Standard Specification for Seamless Copper Water Tube*, or ASTM B280, *Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service*.

#### 5.5.6.4.3

Thread joint sealing materials shall be both non-hardening and ~~shall be~~ resistant to the chemical constituents of the gases to be conducted through the piping.

#### 5.5.7.2 Copper Tubing Joints.

~~Copper tubing joints shall be assembled with approved gas tubing fittings, shall be brazed with a material having a melting point in excess of 1000°F (538°C), or shall be assembled with press-connect fittings listed to ANSI LC 4/CSA 6.32, *Press-Connect Metallic Fittings for Use in Fuel Gas Distribution Systems*. Brazing alloys shall not contain more than 0.05 percent phosphorus.~~

##### 5.5.7.2.1

Copper tubing joints shall be in accordance with any of the following:

1. Assembled with approved gas tubing fittings, ~~shall~~
2. Be brazed with a material having a melting point in excess of 1000°F (538°C), ~~or shall~~
3. Be assembled with press-connect fittings listed to ANSI LC 4/CSA 6.32, *Press-Connect Metallic Fittings for Use in Fuel Gas Distribution Systems*.

##### 5.5.7.2.2

Brazing alloys shall not contain more than 0.05 percent phosphorus.

#### 5.5.7.3 Stainless Steel Tubing Joints.

~~Stainless steel joints shall be welded, assembled with approved tubing fittings, brazed with a material having a melting point in excess of 1000°F (538°C), or assembled with press-connect fittings listed to ANSI LC 4/CSA 6.32, *Press-Connect Metallic Fittings for Use in Fuel Gas Distribution Systems*. Brazing alloys and fluxes shall be recommended by the manufacturer for use on stainless steel alloys.~~

##### 5.5.7.3.1

Stainless steel joints shall be in accordance with any of the following:

1. Welded
2. Assembled with approved tubing fittings
3. Brazed with a material having a melting point in excess of 1000°F (538°C)
4. Assembled with press-connect fittings listed to ANSI LC 4/CSA 6.32, *Press-Connect Metallic Fittings for Use in Fuel Gas Distribution Systems*.

##### 5.5.7.3.2

Brazing alloys and fluxes shall be recommended by the manufacturer for use on stainless steel alloys.

#### 5.5.8 Plastic Piping Joints and Fittings.

~~Plastic pipe, tubing, and fittings shall be joined in accordance with the manufacturers' instructions. The following shall be observed when making such joints:~~

- ~~1. The joint shall be designed and installed so that the longitudinal pullout resistance of the joint will be at least equal to the tensile strength of the plastic piping material.~~

- ~~2. Heat fusion joints shall be made in accordance with qualified procedures that have been established and proven by test to produce gastight joints at least as strong as the pipe or tubing being joined. Joints shall be made with the joining method recommended by the pipe manufacturer. Polyethylene heat fusion fittings shall be marked "ASTM D2513." Polyamide heat fusion fittings shall be marked "ASTM F2945."~~
- ~~3. Where compression-type mechanical joints are used, the gasket material in the fitting shall be compatible with the plastic piping and with the gas distributed by the system. An internal tubular rigid stiffener shall be used in conjunction with the fitting. The stiffener shall be flush with the end of the pipe or tubing and shall extend at least to the outside end of the compression fitting when installed. The stiffener shall be free of rough or sharp edges and shall not be a force fit in the plastic. Split tubular stiffeners shall not be used.~~
- ~~4. Plastic piping joints and fittings for use in LP-Gas piping systems shall be in accordance with NFPA 58.~~

#### 5.5.8.1

Plastic pipe, tubing, and fittings shall be joined in accordance with the manufacturers' instructions.

#### 5.5.8.2

The following shall be observed when making such joints as stated in 5.5.8.1:

1. The joint shall be designed and installed so that the longitudinal pullout resistance of the joint will be at least equal to the tensile strength of the plastic piping material.
2. Heat fusion joints shall be made in accordance with qualified procedures that have been established and proven by test to produce gastight joints at least as strong as the pipe or tubing being joined.
3. Heat fusion Joints shall be made with the joining method recommended by the pipe manufacturer.
4. Polyethylene heat fusion fittings shall be marked "ASTM D2513."
- ~~2-5.~~ Polyamide heat fusion fittings shall be marked "ASTM F2945."
6. Where~~The following shall apply when~~ compression-type mechanical joints are used;
  - a. The gasket material in the fitting shall be compatible with the plastic piping and with the gas distributed by the system.
  - b. An internal tubular rigid stiffener shall be used in conjunction with the fitting~~compression-type mechanical joints~~.
  - c. The stiffener shall be both flush with the end of the pipe or tubing and ~~shall extend~~ed at least to the outside end of the compression fitting when installed.
  - d. The stiffener shall be free of rough or sharp edges.
  - e. The stiffener ~~and~~ shall not be a force fit in the plastic.
  - ~~a.f.~~ Split tubular stiffeners shall not be used.
- ~~3-7.~~ Plastic piping joints and fittings for use in LP-Gas piping systems shall be in accordance with NFPA 58.

#### 5.5.9.3 Flange Facings.

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

#### 5.5.9.3.1

Standard facings shall be permitted for use under this code.

#### 5.5.9.3.2

Where 150 psi (1034 kPa) steel flanges are bolted to Class 125 cast-iron flanges, the raised face on the steel flange shall be removed.

#### 5.5.10 Flange Gaskets.

~~The 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 the material.~~

#### 5.5.10.1

The 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.

#### 5.5.10.1.1

The effects of fire exposure to the joint shall be considered in choosing the material.

#### 5.5.10.1 [move to 5.10.1.2]

Acceptable materials shall include the following:

1. Metal (plain or corrugated)
2. Composition
3. Aluminum "O" rings
4. Spiral-wound metal gaskets
5. Rubber-faced phenolic
6. Elastomeric

#### 5.8.1 Where Required.

~~Where the serving gas supplier delivers gas at a pressure greater than 2 psi (14 kPa) for piping systems serving appliances designed to operate at a gas pressure of 14 in. w.c. (3.4 kPa) or less, overpressure protection devices shall be installed. Piping systems serving equipment designed to operate at inlet pressures greater than 14 in. w.c. (3.4 kPa) shall be equipped with overpressure protection devices as required by the appliance manufacturer's installation instructions.~~

#### 5.8.1.1

Where the serving gas supplier delivers gas at a pressure greater than 2 psi (14 kPa) for piping systems serving appliances designed to operate at a gas pressure of 14 in. w.c. (3.4 kPa) or less, overpressure protection devices shall be installed.

#### 5.8.1.2

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Piping systems serving equipment designed to operate at inlet pressures greater than 14 in. w.c. (3.4 kPa) shall be equipped with overpressure protection devices as required by the appliance manufacturer's installation instructions.

#### 5.8.3.2

The devices in 5.8.3.1 shall be installed either as an integral part of the service or line pressure regulator or as separate units. ~~Where separate overpressure protection devices are installed, they shall comply with 5.8.4 through 5.8.9.~~

#### 5.8.3.3

Where separate overpressure protection devices are installed, they shall comply with 5.8.4 through 5.8.9.

#### 5.8.8.1

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

#### 5.8.8.2

Discharge stacks or vents shall be designed to prevent the entry of water, insects, or other foreign material that could cause blockage.

#### 5.8.8.32

The discharge stack or vent line shall be at least the same size as the outlet of the ~~pressure-pressure-~~relieving device.

#### 5.11 Shutoff Valves.

~~Shutoff valves shall be selected in accordance with Table 5.11. Shutoff valves of size 1 in. (25 mm) National Pipe Thread and smaller shall be listed and labeled. Where used outdoors, such use shall be in accordance with the manufacturer's recommendation.~~

~~Table 5.11 Manual Gas Valve Standards~~

<del>Shutoff Valve Application</del>	<del>Valve Meeting the Following Standards</del>
<del>Appliance shutoff valve up to 1/2 psi</del>	<del>ANSI Z21.15/CSA 9.1</del>
<del>-</del>	<del>ANSI/ASME B16.44</del>
<del>-</del>	<del>ANSI/ASME B16.33 marked 125-G</del>
<del>-</del>	<del>ANSI LC 4/CSA 6.32</del>
<del>Valve up to 1/2 psi</del>	<del>ANSI/ASME B16.44</del>
<del>-</del>	<del>ANSI/ASME B16.33 marked 125-G</del>
<del>-</del>	<del>ANSI LC 4/CSA 6.32</del>
<del>Valve up to 2 psi</del>	<del>ANSI/ASME B16.44 labeled 2G</del>
<del>-</del>	<del>ANSI/ASME B16.33 marked 125-G</del>
<del>-</del>	<del>ANSI LC 4/CSA 6.32 with ANSI/ASME B16.44 labeled 2G or labeled 5G</del>



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<b>Shutoff Valve Application</b>	<b>Valve Meeting the Following Standards</b>
-	ANSI LC 4/CSA 6.32 with ANSI/ASME B16.33 marked 125 G
Valve up to 5 psi	ANSI/ASME B16.44 labeled 5G
-	ANSI/ASME B16.33
-	ANSI LC 4/CSA 6.32 with ANSI/ASME B16.44 marked 5G
-	ANSI LC 4/CSA 6.32 with ANSI/ASME B16.33 marked 125 G
Valve up to 125 psi	ANSI/ASME B16.33 marked 125 G
-	ANSI LC 4/CSA 6.32 with ANSI/ASME B16.33 marked 125 G

For SI units, 1 psi gauge = 6.895 kPa.

### 5.11.1

Shutoff valves shall be selected in accordance with Table 5.11.1.

Table 5.11.1 Manual Gas Valve Standards

<b>Shutoff Valve Application</b>	<b>Valve Meeting the Following Standards</b>
Appliance shutoff valve up to 1/2 psi	ANSI Z21.15/CSA 9.1 ANSI/ASME B16.44 ANSI/ASME B16.33 marked 125 G ANSI LC 4/CSA 6.32
Valve up to 1/2 psi	ANSI/ASME B16.44 ANSI/ASME B16.33 marked 125 G ANSI LC 4/CSA 6.32
Valve up to 2 psi	ANSI/ASME B16.44 labeled 2G ANSI/ASME B16.33 marked 125 G ANSI LC 4/CSA 6.32 with ANSI/ASME B16.44 labeled 2G or labeled 5G ANSI LC 4/CSA 6.32 with ANSI/ASME B16.33 marked 125 G
Valve up to 5 psi	ANSI/ASME B16.44 labeled 5G ANSI/ASME B16.33 ANSI LC 4/CSA 6.32 with ANSI/ASME B16.44 marked 5G ANSI LC 4/CSA 6.32 with ANSI/ASME B16.33 marked 125 G
Valve up to 125 psi	ANSI/ASME B16.33 marked 125 G ANSI LC 4/CSA 6.32 with ANSI/ASME B16.33 marked 125 G

For SI units, 1 psi gauge = 6.895 kPa.

### 5.11.2

Shutoff valves of size 1 in. (25 mm) National Pipe Thread and smaller shall be listed and labeled.

### 5.11.3

Where shutoff valves are used outdoors, such use shall be in accordance with the manufacturer's recommendation.

#### 5.12 Excess Flow Valve(s).

~~Where automatic excess flow valves are installed, they shall be listed in accordance with ANSI Z21.93/CSA 6.30, Excess Flow Valves for Natural and LP-Gas with Pressures Up to 5 psig, and shall be sized and installed in accordance with the manufacturers' instructions.~~

##### 5.12.1

Where automatic excess flow valves are installed, they shall be listed in accordance with ANSI Z21.93/CSA 6.30, *Excess Flow Valves for Natural and LP-Gas with Pressures Up to 5 psig*.

##### 5.12.2

Excess flow valves shall be sized and installed in accordance with the manufacturers' instructions.

#### 5.14 Pressure Regulator and Pressure Control Venting.

The venting of the atmospheric side of diaphragms in line pressure regulators, gas appliance regulators, and gas pressure limit controls shall be in accordance with all of the following:

1. An independent vent pipe to the outdoors, sized in accordance with the device manufacturer's instructions, shall be provided where the location of a device is such that a discharge of fuel gas will cause a hazard.
2. For devices other than appliance regulators, vents shall not be required to be independent where the vents are connected to a common manifold designed in accordance with engineering methods to minimize backpressure in the event of diaphragm failure and such design is approved.
3. A regulator and vent limiting means combination listed in accordance with ANSI Z21.80/CSA 6.22, *Line Pressure Regulators*, shall not be required to be vented to the outdoors.
4. A listed gas appliance regulator factory equipped with a ~~vent-vent~~-limiting device is not required to be vented to the outdoors.
5. A listed gas pressure limit control that is factory equipped with a ~~vent-vent~~-limiting device and in accordance with UL 353, *Limit Controls*, or UL 60730-2-6, *Automatic Electrical Controls for Household and Similar Use, Part 2*, shall not be required to be vented to the outdoors.
6. Materials for vent piping shall be in accordance with Section 5.5.
7. The vent terminus shall be designed to prevent the entry of water, insects, and other foreign matter that could cause blockage.
8. Vent piping shall be installed to minimize static loads and bending moments placed on the regulators and gas pressure control devices.
9. Vents shall terminate not less than 3 ft (0.9 m) from a possible source of ignition.
10. At locations where a vent termination could be submerged during floods or snow accumulations, an antiflood-type breather vent fitting shall be installed, or the vent terminal ~~shall~~ be located above the height of the expected flood waters or snow.
11. Vent piping from pressure regulators and gas pressure controls shall not be connected to a common manifold that serves a bleed line from a diaphragm-type gas valve.

#### 7.1.2 Protection Against Damage.

~~Means shall be provided to prevent excessive stressing of the piping where vehicular traffic is heavy or soil conditions are unstable and settling of piping or foundation walls could occur. Piping shall be buried~~

~~or covered in a manner so as to protect the piping from physical damage. Piping shall be protected from physical damage where it passes through flower beds, shrub beds, and other such cultivated areas where such damage is reasonably expected.~~

#### 7.1.2.1 Piping Protection.

Means shall be provided to prevent excessive stressing of the piping where vehicular traffic is heavy or soil conditions are unstable and settling of piping or foundation walls could occur.

##### 7.1.2.1.1

Piping shall be buried or covered in a manner so as to protect the piping from physical damage.

##### 7.1.2.1.2

Piping shall be protected from physical damage where it passes through flower beds, shrub beds, and other such cultivated areas where such damage is reasonably expected.

##### 7.1.3.3

Cathodic protection systems shall be monitored by testing.

##### 7.1.4.4

~~Testing results for cathodic protection systems and the results~~ shall be documented.

#### 7.1.3.34 [1<sup>st</sup> line moving to new section before]

~~Cathodic protection systems shall be monitored by testing and the results shall be documented.~~ The test results shall demonstrate one of the following:

1. A pipe-to-soil voltage of  $-0.85$  volts or more negative is produced, with reference to a saturated copper-copper sulfate half cell
2. A pipe-to-soil voltage of  $-0.78$  volts or more negative is produced, with reference to a saturated KCl calomel half cell
3. A pipe-to-soil voltage of  $-0.80$  volts or more negative is produced, with reference to a silver-silver chloride half cell
4. Compliance with a method described in Appendix D of Title 49 of the Code of Federal Regulations, Part 192

##### 7.1.3.54

Sacrificial anodes shall be tested in accordance with the following:

1. Upon installation of the cathodic protection system, except where prohibited by climatic conditions, in which case the testing shall be performed not later than 180 days after the installation of the system
2. 12 to 18 months after the initial test
3. Upon successful verification testing in accordance with (1) and (2), periodic follow-up testing shall be performed at intervals not to exceed 36 months

##### 7.1.3.65

Systems failing a test shall be repaired not more than 180 days after the date of the failed testing. ~~The testing schedule shall be restarted as required in 7.1.3.4(1) and 7.1.3.4(2), and the results shall comply with 7.1.3.3.~~

#### 7.1.3.7

The testing schedule shall be restarted as required in 7.1.3.4(1) and 7.1.3.4(2).

#### 7.1.3.8

~~The~~ results ~~of the testing in 7.1.3.7~~ shall comply with 7.1.3.3.

7.1.6.1 Conduit with One End Terminating Outdoors. [text moving to subs]

~~The conduit shall extend into an accessible 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. Where the end sealing is of a type that retains the full pressure of the pipe, the conduit shall be designed for the same pressure as the pipe. The conduit shall extend at least 4 in. (100 mm) outside the building, be vented outdoors above finished ground level, and be installed so as to prevent the entrance of water and insects.~~

#### 7.1.6.1.1

~~Where the conduit has one end that terminates indoors.~~ ~~The~~ ~~the~~ conduit shall extend into an accessible portion of the building.

#### 7.1.6.1.2

~~and, a~~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.

#### 7.1.6.1.3

Where the end sealing is of a type that retains the full pressure of the pipe, the conduit shall be designed for the same pressure as the pipe.

#### 7.1.6.1.4

The conduit shall comply with all of the following:

- (1) extend ~~Extend~~ at least 4 in. (100 mm) outside the building
- (2) , ~~b~~Be vented outdoors above finished ground level;
- (1)(3) \_\_\_\_\_ ~~and b~~Be installed so as to prevent the entrance of water and insects.

7.1.6.2 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.~~

#### 7.1.6.2.1

Where the conduit originates and terminates within the same building, the conduit shall originate and terminate in an accessible portion of the building.

#### 7.1.6.2.2

~~Where the conduit originates and terminates within the same building, the conduit and shall not be sealed.~~

#### 7.1.7.3.2

~~Where tracer wire is used, access shall be provided from aboveground or one end of the tracer wire or tape shall be brought aboveground at a building wall or riser. either of the following shall apply;~~

- ~~1) Access shall~~ be provided from aboveground.
- ~~1)2) One~~ end of the tracer wire or tape ~~shall be~~ shall be brought aboveground at a building wall or riser.

#### 7.2.2\* Protective Coating.

~~Where piping is in contact with a material or an atmosphere corrosive to the piping system, the piping and fittings shall be coated with a corrosion-resistant material. Any such coating used on piping or components shall not be considered as adding strength to the system.~~

##### 7.2.2.1

Where piping is in contact with a material or an atmosphere corrosive to the piping system, the piping and fittings shall be coated with a corrosion-resistant material.

##### 7.2.2.2

Any ~~corrosion-resistant~~ such coating used on piping or components shall not be considered as adding strength to the system.

#### 7.2.6.1

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 equipment and shall not be supported by other piping. Pipe hangers and supports shall conform to the requirements of ANSI/MSS SP-58, Pipe Hangers and Supports — Materials, Design Manufacture, Selection, Application, and Installation.~~

##### 7.2.6.2

Piping shall be anchored to prevent undue strains on connected appliances and equipment.

##### 7.2.6.3

~~and~~ Piping shall not be supported by other piping.

##### 7.2.6.4

Pipe hangers and supports shall conform to the requirements of ANSI/MSS SP-58, *Pipe Hangers and Supports — Materials, Design Manufacture, Selection, Application, and Installation*.

##### 7.2.6.5

Spacings of supports in gas piping installations shall not be greater than shown in Table 7.2.6.2.

##### 7.2.6.6

Spacing of supports of CSST shall be in accordance with the CSST manufacturer's instructions.

#### 7.2.6.7~~3~~

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 system shall be designed and installed so they are not disengaged by movement of the supported piping.~~

#### 7.2.6.8

All parts of the supporting system shall be designed and installed so they are not disengaged by movement of the supported piping.

#### 7.3.4 Tubing in Partitions.

~~This provision shall not apply to tubing that pierces walls, floors, or partitions. Tubing installed vertically and horizontally inside hollow walls or partitions without protection along its entire concealed length shall meet the following requirements:~~

- ~~1. A steel striker barrier not less than 0.0508 in. (1.3 mm) thick, or equivalent, is installed between the tubing and the finished wall and extends at least 4 in. (100 mm) beyond concealed penetrations of plates, firestops, wall studs, and so on.~~
- ~~2. The tubing is installed in single runs and is not rigidly secured.~~

#### 7.3.4.1

~~Section 7.3.4~~ This provision shall not apply to tubing that pierces walls, floors, or partitions.

#### 7.3.4.2

Tubing installed vertically and horizontally inside hollow walls or partitions without protection along its entire concealed length shall meet the following requirements:

- 1) A steel striker barrier not less than 0.0508 in. (1.3 mm) thick, or equivalent, is shall be installed between the tubing and the finished wall and extends at least 4 in. (100 mm) beyond concealed penetrations of plates, firestops, wall studs, and so on.
- 2) The tubing is shall be installed in single runs.
- 2)3) and is The tubing shall not be rigidly secured.

#### 7.3.5 Piping in Floors in Industrial Occupancies.

##### 7.3.5.1 ~~Industrial Occupancies.~~

In industrial occupancies, gas piping in solid floors such as concrete shall be both laid in channels in the floor and covered to permit access to the piping with a minimum of damage to the building. ~~Where piping in floor channels could be exposed to excessive moisture or corrosive substances, the piping shall be protected in an approved manner.~~

##### 7.3.5.2

Where piping in floor channels could be exposed to excessive moisture or corrosive substances, the piping shall be protected in an approved manner.

### 7.3.5.2 Piping in Floors in Other Than Industrial Occupancies. **[Move to 7.3.6]**

Gas piping in nonindustrial occupancies shall not be embedded in concrete floor slabs unless in accordance with 7.3.5.2.1 through 7.3.5.2.5.

#### 7.4.1 Pressure Reduction.

~~Where pressure reduction is required in branch connections for compliance with 5.4.1, such reduction shall take place either inside the chase or immediately adjacent to the outside wall of the chase. Regulator venting and downstream overpressure protection shall comply with 5.7.5 and Section 5.8. The regulator shall be accessible for service and repair and vented in accordance with one of the following:~~

- ~~1. Where the fuel gas is lighter than air, regulators equipped with a vent limiting means shall be permitted to be vented into the chase. Regulators not equipped with a vent limiting means shall be permitted to be vented either directly to the outdoors or to a point within the top 1 ft (0.3 m) of the chase.~~
- ~~2. Where the fuel gas is heavier than air, the regulator vent shall be vented only directly to the outdoors.~~

##### 7.4.1.1

Where pressure reduction is required in branch connections for compliance with 5.4.1, such reduction shall take place either inside the chase or immediately adjacent to the outside wall of the chase.

##### 7.4.1.2

Regulator venting and downstream overpressure protection shall comply with 5.7.5 and Section 5.8.

##### 7.4.1.3

The regulator shall be accessible for service and repair and vented in accordance with one of the following:

- 1) Where the fuel gas is lighter than air, either of the following shall apply:
  - a. Regulators equipped with a vent limiting means shall be permitted to be vented into the chase.
  - ~~a.b.~~ Regulators not equipped with a vent limiting means shall be permitted to be vented either directly to the outdoors or to a point within the top 1 ft (0.3 m) of the chase.
- 2) Where the fuel gas is heavier than air, the regulator vent shall be vented only directly to the outdoors.

#### 7.4.3\* Ventilation.

~~A chase shall be ventilated to the outdoors and only at the top. The opening(s) shall have a minimum free area [in square inches (square meters)] equal to the product of one-half of the maximum pressure in the piping [in pounds per square inch (kilopascals)] times the largest nominal diameter of that piping [in inches (millimeters)], or the cross-sectional area of the chase, whichever is smaller. Where more than one fuel gas piping system is present, the free area for each system shall be calculated and the largest area used.~~

##### 7.4.3.1

A chase shall be ventilated to the outdoors and only at the top.

#### 7.4.3.2

The ventilation opening(s) shall have a minimum free area [in square inches (square meters)] equal to the product of one-half of the maximum pressure in the piping [in pounds per square inch (kilopascals)] times the largest nominal diameter of that piping [in inches (millimeters)], or the cross-sectional area of the chase, whichever is smaller.

#### 7.4.3.3

Where more than one fuel gas piping system is present, the free area for each system shall be calculated and the largest area used.

#### 7.5.2 Plastic Pipe.

Plastic pipe bends shall comply with the following:

1. The pipe shall not be damaged, ~~and the internal diameter of the pipe shall not be effectively reduced.~~
- ~~1.2.~~ 2. The internal diameter of the pipe shall not be effectively reduced.
- ~~2.3.~~ 3. Joints shall not be located in pipe bends.
- ~~3.4.~~ 4. The radius of the inner curve of such bends shall not be less than 25 times the inside diameter of the pipe.
- ~~4.5.~~ 5. Where the piping manufacturer specifies the use of special bending tools or procedures, such tools or procedures shall be used.

#### 7.6.1 Provide Drips Where Necessary.

~~For other than dry gas conditions, a drip shall be provided at any point in the line of pipe where condensate could collect. Where required by the authority having jurisdiction or the serving gas supplier, a drip shall also be provided at the outlet of the meter. This drip shall be installed so as to constitute a trap wherein an accumulation of condensate shuts off the flow of gas before it runs back into the meter.~~

#### 7.6.1.1

For other than dry gas conditions, a drip shall be provided at any point in the line of pipe where condensate could collect.

#### 7.6.1.2

Where required by the authority having jurisdiction or the serving gas supplier, a drip shall also be provided at the outlet of the meter.

#### 7.6.1.3

~~This~~ A drip shall be installed so as to constitute a trap wherein an accumulation of condensate shuts off the flow of gas before it runs back into the meter.

#### 7.6.2 Location of Drips.

All drips shall be installed only in such locations that they are readily accessible to permit cleaning or emptying. ~~A drip shall not be located where the condensate is likely to freeze.~~

#### 7.6.2.1



All drips shall be installed only in such locations that they are readily accessible to permit cleaning or emptying.

#### 7.6.2.2

A drip shall not be located where the condensate is likely to freeze.

#### 7.7.1.6

The provisions of 7.7.1.4 and 7.7.1.5 shall not apply to listed quick-disconnect devices of the flush-mounted type or listed gas convenience outlets. ~~Such devices shall be installed in accordance with the manufacturers' installation instructions.~~

#### 7.7.1.7

Quick-disconnect devices of the flush-mounted type or listed gas convenience outlets ~~Such devices~~ shall be installed in accordance with the manufacturers' installation instructions.

#### 7.8.2 Valves at Regulators.

~~An accessible gas shutoff valve shall be provided upstream of each gas pressure regulator. Where two gas pressure regulators are installed in series in a single gas line, a manual valve shall not be required at the second regulator.~~

#### 7.8.2.1

An accessible gas shutoff valve shall be provided upstream of each gas pressure regulator.

#### 7.8.2.2

Where two gas pressure regulators are installed in series in a single gas line, a manual valve shall not be required at the second regulator.

#### 7.8.3 Valves Controlling Multiple Systems.

##### 7.8.3.1 Shutoff Valves for Multiple House Lines.

~~In multiple-tenant buildings supplied through a master meter, through one service regulator where a meter is not provided, or where meters or service regulators are not readily accessible from the appliance or equipment location, an individual shutoff valve for each apartment or tenant line shall be provided at a convenient point of general accessibility. In a common system serving a number of individual buildings, shutoff valves shall be installed at each building.~~

#### 7.8.3.1.1

In multiple-tenant buildings supplied through a master meter, through one service regulator where a meter is not provided, or where meters or service regulators are not readily accessible from the appliance or equipment location, an individual shutoff valve for each apartment or tenant line shall be provided at a **convenient** point of general accessibility.

#### 7.8.3.1.2

In a common system serving a number of individual buildings, shutoff valves shall be installed at each building.

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### 7.8.3.2 Emergency Shutoff Valves.

~~An exterior shutoff valve to permit turning off the gas supply to each building in an emergency shall be provided. The emergency shutoff valves shall be plainly marked as such and their locations posted as required by the authority having jurisdiction.~~

#### 7.8.3.2.1

An exterior shutoff valve to permit turning off the gas supply to each building in an emergency shall be provided.

#### 7.8.3.2.2

The emergency shutoff valves shall be ~~plainly~~ marked as such and their locations posted as required by the authority having jurisdiction.

### 7.8.3.3 Shutoff Valve for Laboratories.

~~Each laboratory space containing two or more gas outlets installed on tables, benches, or in hoods in educational, research, commercial, and industrial occupancies shall have a single shutoff valve through which all such gas outlets are supplied. The shutoff valve shall be accessible, located within the laboratory or adjacent to the laboratory's egress door, and identified.~~

#### 7.8.3.3.1

Each laboratory space containing two or more gas outlets installed on tables, benches, or in hoods in educational, research, commercial, and industrial occupancies shall have a single shutoff valve through which all such gas outlets are supplied.

#### 7.8.3.3.2

The shutoff valve shall be accessible, located within the laboratory or adjacent to the laboratory's egress door, and identified.

### 7.11.3 Additional Requirements.

~~Gas-mixing machines shall have nonsparking blowers and shall be constructed so that a flashback does not rupture machine casings.~~

#### 7.11.3.1

Gas-mixing machines shall have nonsparking blowers.

#### 7.11.3.2

Gas-mixing machines ~~and~~ shall be constructed so that a flashback does not rupture machine casings.

### 7.11.4\* Special Requirements for Mixing Blowers.

~~A mixing blower system shall be limited to applications with minimum practical lengths of mixture piping, limited to a maximum mixture pressure of 10 in. w.c. (2.5 kPa) and limited to gases containing no more than 10 percent hydrogen. The blower shall be equipped with a gas control valve at its air entrance arranged so that gas is admitted to the airstream, entering the blower in proper proportions for correct combustion by the type of burners employed, the said gas control valve being of either the zero governor or mechanical ratio valve type that controls the gas and air adjustment simultaneously.~~

~~No valves or other obstructions shall be installed between the blower discharge and the burner or burners.~~

#### 7.11.4.1

A mixing blower system shall be limited to applications with minimum practical lengths of mixture piping, limited to a maximum mixture pressure of 10 in. w.c. (2.5 kPa), and limited to gases containing no more than 10 percent hydrogen.

#### 7.11.4.2

The blower shall be equipped with a gas control valve at its air entrance arranged so that gas is admitted to the airstream, entering the blower in ~~proper~~ proportions for correct combustion by the type of burners employed, with the ~~said~~ gas control valve being of either the zero governor or mechanical ratio valve type that controls the gas and air adjustment simultaneously.

#### 7.11.4.3

No valves or other obstructions shall be installed between the blower discharge and the burner or burners.

#### 7.11.5.1\* Location.

~~The gas-mixing machine shall be located in a well-ventilated area or in a detached building or cutoff room provided with room construction and explosion vents in accordance with engineering methods. Such rooms or belowgrade installations shall have adequate positive ventilation.~~

#### 7.11.5.1.1

The gas-mixing machine shall be located in a well-ventilated area or in a detached building or cutoff room provided with room construction and explosion vents in accordance with engineering methods.

#### 7.11.5.1.2

~~Such Cut-off~~ rooms or below grade installations shall have adequate positive ventilation.

#### 7.11.5.4\* Controls.

~~Controls for gas-mixing machines shall include interlocks and a safety shutoff valve of the manual reset type in the gas supply connection to each machine arranged to automatically shut off the gas supply in the event of high or low gas pressure. Except for open burner installations only, the controls shall be interlocked so that the blower or compressor stops operating following a gas supply failure. Where a system employs pressurized air, means shall be provided to shut off the gas supply in the event of air failure.~~

#### 7.11.5.4.1

Controls for gas-mixing machines shall include interlocks and a safety shutoff valve of the manual reset type in the gas supply connection to each machine arranged to automatically shut off the gas supply in the event of high or low gas pressure.

#### 7.11.5.4.2

Except for open burner installations only, the controls shall be interlocked so that the blower or compressor stops operating following a gas supply failure.

#### 7.11.5.4.3

Where a system employs pressurized air, means shall be provided to shut off the gas supply in the event of air failure.

#### 7.11.6 Use of Automatic Firechecks, Safety Blowouts, or Backfire Preventers.

~~Automatic firechecks and safety blowouts or backfire preventers shall be provided in piping systems distributing flammable air-gas mixtures from gas-mixing machines to protect the piping and the machines in the event of flashback, in accordance with the following:~~

- ~~1. \*Approved automatic firechecks shall be installed upstream as close as practical to the burner inlets following the firecheck manufacturers' instructions.~~
- ~~2. A separate manually operated gas valve shall be provided at each automatic firecheck for shutting off the flow of the gas-air mixture through the firecheck after a flashback has occurred. The valve shall be located upstream as close as practical to the inlet of the automatic firecheck. Caution: these valves shall not be reopened after a flashback has occurred until the firecheck has cooled sufficiently to prevent re-ignition of the flammable mixture and has been reset properly.~~
- ~~3. A safety blowout or backfiring preventer shall be provided in the mixture line near the outlet of each gas-mixing machine where the size of the piping is larger than 2 1/2 in. (64 mm) NPS, or equivalent, to protect the mixing equipment in the event of an explosion passing through an automatic firecheck. The manufacturers' instructions shall be followed when installing these devices, particularly after a disc has burst. The discharge from the safety blowout or backfire preventer shall be located or shielded so that particles from the ruptured disc cannot be directed toward personnel. Wherever there are interconnected installations of gas-mixing machines with safety blowouts or backfire preventers, provision shall be made to keep the mixture from other machines from reaching any ruptured disc opening. Check valves shall not be used for this purpose.~~
- ~~4. Large capacity premix systems provided with explosion heads (rupture discs) to relieve excessive pressure in pipelines shall be located at and vented to a safe outdoor location. Provisions shall be provided for automatically shutting off the supply of the gas-air mixture in the event of rupture.~~

#### 7.11.6.1

Automatic firechecks and safety blowouts or backfire preventers shall be provided in piping systems distributing flammable air-gas mixtures from gas-mixing machines to protect the piping and the machines in the event of flashback.

#### 7.11.6.2

The automatic firechecks and safety blowouts or backfire preventors provided in 7.11.6.1 shall be in accordance with the following:

1. \*Approved automatic firechecks shall be installed upstream as close as practical to the burner inlets following the firecheck manufacturers' instructions.

2. A separate manually operated gas valve shall be provided at each automatic firecheck for shutting off the flow of the gas-air mixture through the firecheck after a flashback has occurred.
3. The valve required in 7.11.6.2(2) shall be located upstream as close as practical to the inlet of the automatic firecheck.  
Caution: ~~these~~ These valves shall not be reopened after a flashback has occurred until the firecheck has cooled sufficiently to prevent re-ignition of the flammable mixture and has been reset ~~properly~~.
4. A safety blowout or backfiring preventer shall be provided in the mixture line near the outlet of each gas-mixing machine where the size of the piping is larger than 2½ in. (64 mm) NPS, or equivalent, to protect the mixing equipment in the event of an explosion passing through an automatic firecheck.
5. The manufacturers' instructions shall be followed when installing these safety blowout or backfiring preventers devices, particularly after a disc has burst.
6. The discharge from the safety blowout or backfire preventer shall be located or shielded so that particles from the ruptured disc cannot be directed toward personnel.
7. Wherever there are interconnected installations of gas-mixing machines with safety blowouts or backfire preventers, provision shall be made to keep the mixture from other machines from reaching any ruptured disc opening.
- ~~2-8.~~ Check valves shall not be used for this purpose as a safety blowout, or backfire preventer.
- ~~3-9.~~ Large-capacity premix systems provided with explosion heads (rupture discs) to relieve excessive pressure in pipelines shall be located at 2 and vented to 2 a safe outdoor location.
- ~~4-10.~~          Provisions shall be provided for automatically shutting off the supply of the gas-air mixture in the event of rupture.

#### 7.12.2.3\*

The length of the jumper between the connection to the gas piping system and the grounding electrode system shall not exceed 75 ft (22 m). ~~Any additional grounding electrodes installed to meet this requirement shall be bonded to the electrical service grounding electrode system or, where provided, lightning protection grounding electrode system.~~

#### 7.12.2.4

Any additional grounding electrodes installed to meet 7.12.2.3 this requirement shall be bonded to the electrical service grounding electrode system or, where provided, lightning protection grounding electrode system.

#### 8.1.2 Test Medium.

~~The test medium shall be air, nitrogen, carbon dioxide, or an inert gas. Oxygen shall not be used as a test medium.~~

##### 8.1.2.1

The test medium shall be air, nitrogen, carbon dioxide, or an inert gas.

##### 8.1.2.2

Oxygen shall not be used as a test medium.

##### 8.1.3.3

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.~~

#### 8.1.3.4

Flanged joints at which blinds are inserted to blank off other equipment during the test shall not be required to be tested.

### 8.1.4 Test Pressure.

#### 8.1.4.1

Test pressure shall be measured with a manometer or with a pressure measuring device designed and calibrated to read, record, or indicate a pressure loss due to leakage during the pressure test period. ~~The source of pressure shall be isolated before the pressure tests are made. Mechanical gauges used to measure test pressures shall have a range such that the highest end of the scale is not greater than 5 times the test pressure.~~

#### 8.1.4.2

The source of pressure shall be isolated before the pressure tests are made.

#### 8.1.4.3

Mechanical gauges used to measure test pressures shall have a range such that the highest end of the scale is not greater than 5 times the test pressure.

#### ~~8.1.4.4~~

The test pressure to be used shall be no less than 1½ times the proposed maximum working pressure, but not less than 3 psi (20 kPa). ~~Where the test pressure exceeds 125 psi (862 kPa), 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.~~

#### 8.1.4.5

Where the test pressure exceeds 125 psi (862 kPa), 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.

#### ~~8.1.4.6~~<sup>\*</sup>

Test duration shall be not less than ½ hour for each 500 ft<sup>3</sup> (14 m<sup>3</sup>) of pipe volume or fraction thereof. ~~When testing a system having a volume less than 10 ft<sup>3</sup> (0.28 m<sup>3</sup>) or a system in a single-family dwelling, the test duration shall be a minimum of 10 minutes. The duration of the test shall not be required to exceed 24 hours.~~

#### 8.1.4.7

When testing a system having a volume less than 10 ft<sup>3</sup> (0.28 m<sup>3</sup>) or a system in a single-family dwelling, the test duration shall be a minimum of 10 minutes.

#### 8.1.4.8

The duration of the test shall not be required to exceed 24 hours.

#### 8.1.5.1

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.~~

#### 8.1.5.2

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.

#### 8.2.3\* 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.~~

##### 8.2.3.1

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.

##### 8.2.3.2

Where leakage is indicated, the gas supply shall be shut off until the necessary repairs have been made.

#### 8.3.1.2\* Placing in Operation.

~~Where gas piping containing air and meeting the criteria of Table 8.3.1 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 8.3.1.3.~~

##### 8.3.1.2.1

Where gas piping containing air and meeting the criteria of Table 8.3.1 is placed in operation, the air in the piping shall first be displaced with an inert gas.

##### 8.3.1.2.2

The inert gas shall then be displaced with fuel gas in accordance with 8.3.1.3.

#### 8.3.1.3 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 ft (3.0 m) from sources of ignition, at least 10 ft (3.0 m) from building openings and at least 25 ft (7.6 m) 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 8.3.1.4.~~

~~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 ft (3.0 m) of the point of discharge.~~

#### 8.3.1.3.1

The open end of a piping system being pressure vented or purged shall discharge directly to an outdoor location.

#### 8.3.1.3.2

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 ft (3.0 m) from sources of ignition, at least 10 ft (3.0 m) from building openings, and at least 25 ft (7.6 m) 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 8.3.1.4.
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 ft (3.0 m) of the point of discharge.

#### 8.3.1.4\* Combustible Gas Indicator.

~~Combustible gas indicators shall be listed and calibrated in accordance with the manufacturer's instructions. Combustible gas indicators shall numerically display a volume scale from 0 percent to 100 percent in 1 percent or smaller increments.~~

#### 8.3.1.4.1

Combustible gas indicators shall be listed and calibrated in accordance with the manufacturer's instructions.

#### 8.3.1.4.2

Combustible gas indicators shall numerically display a volume scale from 0 percent to 100 percent in 1 percent or smaller increments.

#### 8.3.2.2 Combustible Gas Detector.

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

#### 8.3.2.2.1

Combustible gas detectors shall be listed and calibrated or tested in accordance with the manufacturer's instructions.

#### 8.3.2.2.2

Combustible gas detectors shall be capable of indicating the presence of fuel gas.



#### 9.1.1.3

The unlisted appliance, equipment, or accessory shall be safe ~~and suitable for the proposed service and shall be recommended for the service by the manufacturer.~~

#### 9.1.1.4

The unlisted appliance, equipment, or accessory shall be recommended for the service by the manufacturer.

#### 9.1.3 Type of Gas(es).

~~The appliance shall be connected to the fuel gas for which it was designed. No attempt shall be made to convert the appliance from the gas specified on the rating plate for use with a different gas without consulting the installation instructions, the serving gas supplier, or the appliance manufacturer for complete instructions. Listed appliances shall not be converted unless permitted by and in accordance with the manufacturer's installation instructions.~~

#### 9.1.3.1

The appliance shall be connected to the fuel gas for which it was designed.

#### 9.1.3.2

No attempt shall be made to convert the appliance from the gas specified on the rating plate for use with a different gas without consulting the installation instructions, the serving gas supplier, or the appliance manufacturer for complete instructions.

#### 9.1.3.3

Listed appliances shall not be converted unless permitted by, and in accordance with, the manufacturer's installation instructions.

#### 9.1.5 Use of Air or Oxygen Under Pressure.

~~Where air or oxygen under pressure is used in connection with the gas supply, effective means such as a back pressure regulator and relief valve shall be provided to prevent air or oxygen from passing back into the gas piping. Where oxygen is used, installation shall be in accordance with NFPA 51.~~

#### 9.1.5.1

Where air or oxygen under pressure is used in connection with the gas supply, effective means such as a back pressure regulator and relief valve shall be provided to prevent air or oxygen from passing back into the gas piping.

#### 9.1.5.2

Where oxygen is used, installation shall be in accordance with NFPA 51.

#### 9.1.8.2

At the locations selected for installation of appliances and equipment, the dynamic and static load carrying capacities of the building structure shall be checked to determine whether they are adequate to carry the additional loads. ~~The appliances and equipment shall be supported and shall be connected to the piping so as not to exert undue stress on the connections.~~

#### 9.1.8.3

The appliances and equipment shall be both supported and ~~shall be~~ connected to the piping so as not to exert undue stress on the connections.

#### 9.1.9 Flammable Vapors.

~~Appliances shall not be installed in areas where the open use, handling, or dispensing of flammable liquids occurs, unless the design, operation, or installation reduces the potential of ignition of the flammable vapors. Appliances installed in compliance with 9.1.10 through 9.1.12 shall be considered to comply with the intent of this provision.~~

#### 9.1.9.1

Appliances shall not be installed in areas where the open use, handling, or dispensing of flammable liquids occurs, unless the design, operation, or installation reduces the potential of ignition of the flammable vapors.

#### 9.1.9.2

Appliances installed in compliance with 9.1.10 through 9.1.12 shall be considered to comply with the intent of this provision.

#### 9.1.18 Bleed Lines for Diaphragm-Type Valves.

Bleed lines shall comply with the following requirements:

1. Diaphragm-type valves shall be equipped to convey bleed gas to the outdoors or into the combustion chamber adjacent to a continuous pilot.
2. In the case of bleed lines leading outdoors, means shall be employed to prevent water from entering this piping and also to prevent blockage of vents by insects and foreign matter.
3. Bleed lines shall not terminate in the appliance flue or exhaust system.
4. In the case of bleed lines entering the combustion chamber, the bleed line shall be located so the bleed gas is readily ignited by the pilot and the heat liberated thereby does not adversely affect the normal operation of the safety shutoff system. ~~The terminus of the bleed line shall be securely held in a fixed position relative to the pilot. For manufactured gas, the need for a flame arrester in the bleed line piping shall be determined.~~
5. The terminus of the bleed line entering the combustion chamber shall be securely held in a fixed position relative to the pilot.
- ~~4.6.~~ For manufactured gas, the need for a flame arrester in the bleed line piping entering the combustion chamber shall be determined.
- ~~5.7.~~ A bleed line(s) from a diaphragm-type valve and a vent line(s) from an appliance pressure regulator shall not be connected to a common manifold terminating in a combustion chamber. Bleed lines shall not terminate in positive-pressure-type combustion chambers.

#### 9.1.20\* Installation Instructions.

~~The installer shall conform to the appliance and equipment manufacturers' recommendations in completing an installation. The installer shall leave the manufacturers' installation, operating, and maintenance instructions on the premises.~~

#### 9.1.20.1

The installer shall conform to the appliance and equipment manufacturers' recommendations in completing an installation.

#### 9.1.20.2

The installer shall leave the manufacturers' installation, operating, and maintenance instructions on the premises.

#### 9.1.22\* Existing Appliances.

~~Existing appliance installations shall be inspected to verify compliance with the provisions of Section 9.3 and Chapter 12 where a component of the building envelope is modified as described by one or more of 9.1.22(1) through 9.1.22(6). Where the appliance installation does not comply with Section 9.3 and Chapter 12, the installation shall be altered as necessary to be in compliance with Section 9.3 and Chapter 12.~~

- ~~1. The building is modified under a weatherization program.~~
- ~~2. A building permit is issued for a building addition or exterior building modification.~~
- ~~3. Three or more window assemblies are replaced.~~
- ~~4. Three or more storm windows are installed over existing windows.~~
- ~~5. One or more exterior door and frame assemblies are replaced.~~
- ~~6. A building air barrier is installed or replaced.~~

#### 9.1.22.1

Existing appliance installations shall be inspected to verify compliance with the provisions of Section 9.3 and Chapter 12 where a component of the building envelope is modified as described by one or more of 9.1.22(1) through 9.1.22(6), the following:

1. The building is modified under a weatherization program.
2. A building permit is issued for a building addition or exterior building modification.
3. Three or more window assemblies are replaced.
4. Three or more storm windows are installed over existing windows.
5. One or more exterior door and frame assemblies are replaced.
6. A building air barrier is installed or replaced.

#### 9.1.22.2

Where the appliance installation does not comply with Section 9.3 and Chapter 12, the installation shall be altered as necessary to be in compliance with Section 9.3 and Chapter 12.

#### 9.3.2 Indoor Combustion Air.

~~The required volume of indoor air shall be determined in accordance with the method in 9.3.2.1 or 9.3.2.2 except that where the air infiltration rate is known to be less than 0.40 ACH (air change per hour), the method in 9.3.2.2 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 9.3.2.3, are considered a part of the required volume.~~

#### 9.3.2.1 Required Indoor Air Volume.

The required volume of indoor air shall be determined in accordance with the method in 9.3.2.1 or 9.3.2.2 (see 9.3.2.1.1).

##### 9.3.2.1.1

~~except that w~~Where the air infiltration rate is known to be less than 0.40 ACH (air change per hour), the method in 9.3.2.2 shall be used.

##### 9.3.2.1.12

The total required volume shall be the sum of the required volume calculated for all appliances located within the space.

##### 9.3.2.1.23

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 9.3.2.3, ~~are shall be~~ considered a part of the required volume.

#### 9.3.2.3 Indoor Opening Size and Location.

Openings used to connect indoor spaces shall be sized and located in accordance with the following:

1. \*Combining spaces on the same story ~~shall be in accordance with the following:- Each opening shall have a minimum free area of 1 in.<sup>2</sup>/1000 Btu/hr (2200 mm<sup>2</sup>/kW) of the total input rating of all appliances in the space but not less than 100 in.<sup>2</sup> (0.06 m<sup>2</sup>). One permanent opening shall commence within 12 in. (300 mm) of the top of the enclosure and one permanent opening shall commence within 12 in. (300 mm) of the bottom of the enclosure. The minimum dimension of air openings shall not be less than 3 in. (80 mm).~~
  - a. Each opening shall have a minimum free area of 1 in.<sup>2</sup>/1000 Btu/hr (2200 mm<sup>2</sup>/kW) of the total input rating of all appliances in the space but not less than 100 in.<sup>2</sup> (0.06 m<sup>2</sup>).
  - b. One permanent opening shall commence within 12 in. (300 mm) of the top of the enclosure.
  - c. ~~and o~~One permanent opening shall commence within 12 in. (300 mm) of the bottom of the enclosure.
  - d. The minimum dimension of air openings shall not be less than 3 in. (80 mm).
2. ~~Where Combining combining~~ spaces in different stories. ~~The the~~ volumes of spaces in different stories shall be considered as communicating spaces where such spaces are connected by one or more permanent openings in doors or floors having a total minimum free area of 2 in.<sup>2</sup>/1000 Btu/hr (4400 mm<sup>2</sup>/kW) of total input rating of all appliances.

#### 9.3.3.1 Two Permanent Openings Method.

~~Two permanent openings, one commencing within 12 in. (300 mm) of the top of the enclosure and one commencing within 12 in. (300 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, as follows:~~

- ~~1. \*Where directly communicating with the outdoors or where communicating to the outdoors through vertical ducts, each opening shall have a minimum free area of 1 in.<sup>2</sup>/4000 Btu/hr (550 mm<sup>2</sup>/kW) of total input rating of all appliances in the enclosure.~~
- ~~2. \*Where communicating with the outdoors through horizontal ducts, each opening shall have a minimum free area of 1 in.<sup>2</sup>/2000 Btu/hr (1100 mm<sup>2</sup>/kW) of total input rating of all appliances in the enclosure.~~

#### 9.3.3.1.1

Two permanent openings, one commencing within 12 in. (300 mm) of the top of the enclosure and one commencing within 12 in. (300 mm) of the bottom of the enclosure, shall be provided.

#### 9.3.3.1.2

The openings shall communicate directly, or by ducts, with the outdoors or spaces that freely communicate with the outdoors, as follows:

- \*Where directly communicating with the outdoors or where communicating to the outdoors through vertical ducts, each opening shall have a minimum free area of 1 in.<sup>2</sup>/4000 Btu/hr (550 mm<sup>2</sup>/kW) of total input rating of all appliances in the enclosure.
- \*Where communicating with the outdoors through horizontal ducts, each opening shall have a minimum free area of 1 in.<sup>2</sup>/2000 Btu/hr (1100 mm<sup>2</sup>/kW) of total input rating of all appliances in the enclosure.

#### 9.3.3.2\* One Permanent Opening Method.

~~One permanent opening, commencing within 12 in. (300 mm) of the top of the enclosure, shall be provided. The appliance shall have clearances of at least 1 in. (25 mm) from the sides and back and 6 in. (150 mm) from the front of the appliance. The opening shall directly communicate with the outdoors or shall communicate through a vertical or horizontal duct to the outdoors or spaces that freely communicate with the outdoors and shall have a minimum free area of the following:~~

- ~~1. 1 in.<sup>2</sup>/3000 Btu/hr (700 mm<sup>2</sup>/kW) of the total input rating of all appliances located in the enclosure~~
- ~~2. Not less than the sum of the areas of all vent connectors in the space~~

#### 9.3.3.2.1

One permanent opening, commencing within 12 in. (300 mm) of the top of the enclosure, shall be provided.

#### 9.3.3.2.2

The appliance shall have clearances of at least 1 in. (25 mm) from the sides and back and 6 in. (150 mm) from the front of the appliance.

#### 9.3.3.2.3

The opening shall either directly communicate with the outdoors or ~~shall~~ communicate through a vertical or horizontal duct to the outdoors or spaces that freely communicate with the outdoors.

#### 9.3.3.2.4

The openings in 9.3.3.2.3 shall have a minimum free area of the following:

1. 1 in.<sup>2</sup>/3000 Btu/hr (700 mm<sup>2</sup>/kW) of the total input rating of all appliances located in the enclosure
2. Not less than the sum of the areas of all vent connectors in the space

#### 9.3.4 Combination Indoor and Outdoor Combustion Air.

The use of a combination of indoor and outdoor combustion air shall be in accordance with the following:

1. *Indoor openings.* Where used, openings connecting the interior spaces shall comply with 9.3.2.3.
2. *Outdoor opening(s) location.* Outdoor opening(s) shall be located in accordance with 9.3.3.
3. *Outdoor opening(s) size.* The outdoor opening(s) size shall be calculated in accordance with the following:
  - a. The ratio of the interior spaces shall be the available volume of all communicating spaces divided by the required volume.
  - b. The outdoor size reduction factor shall be 1 minus the ratio of interior spaces.
  - c. The minimum size of outdoor opening(s) shall be the full size of outdoor opening(s) calculated in accordance with 9.3.3, multiplied by the reduction factor. ~~The minimum dimension of air openings shall not be less than 3 in. (80 mm).~~
  - e.d. The minimum dimension of air openings shall not be less than 3 in. (80 mm).

#### 9.3.7.1 Louvers and Grilles.

~~The required size of openings for combustion, ventilation, and dilution air shall be based on the net free area of each opening. Where the free area through a design of louver, grille, or screen is known, it shall be used in calculating the size opening required to provide the free area specified. Where the louver and grille design and free area are not known, it shall be assumed that wood louvers have 25 percent free area, and metal louvers and grilles have 75 percent free area. Nonmotorized louvers and grilles shall be fixed in the open position.~~

#### 9.3.7.1.1

The required size of openings for combustion, ventilation, and dilution air shall be based on the net free area of each opening.

#### 9.3.7.1.2

Where the free area through a design of louver, grille, or screen is known, it shall be used in calculating the size opening required to provide the free area specified.

#### 9.3.7.1.3

Where the louver and grille design and free area are not known, it shall be assumed that wood louvers have 25 percent free area, and metal louvers and grilles have 75 percent free area.

#### 9.3.7.1.4

Nonmotorized louvers and grilles shall be fixed in the open position.

#### 9.3.7.3 Motorized Louvers.

~~Motorized louvers shall be interlocked with the appliance so they are proven 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 should the louver fail to open during burner startup and to shut down the main burner if the louvers close during burner operation.~~

#### 9.3.7.3.1

Motorized louvers shall be interlocked with the appliance so they are proven in the full open position prior to main burner ignition and during main burner operation.

#### 9.3.7.3.2

Means shall be provided to prevent the main burner from igniting should the louver fail to open during burner startup and to shut down the main burner if the louvers close during burner operation.

#### 9.3.8.4

Ducts shall 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.~~

#### 9.3.8.5

The separation between ducts serving upper and lower combustion air openings shall be maintained to the source of combustion air.

#### 9.4.1 General.

#### 9.4.1.1

Appliances on roofs shall be designed or enclosed so as to withstand climatic conditions in the area in which they are installed. ~~Where enclosures are provided, each enclosure shall permit easy entry and movement, shall be of reasonable height, and shall have at least a 30 in. (760 mm) clearance between the entire service access panel(s) of the appliance and the wall of the enclosure.~~

#### 9.4.1.2

Where enclosures are provided, each enclosure shall be in accordance with the following:

1. Permit easy entry and movement
2. Be of reasonable height
- ~~3. Have~~ at least a 30 in. (760 mm) clearance between the entire service access panel(s) of the appliance and the wall of the enclosure.

#### 9.4.1.32

Roofs on which appliances are to be installed shall be either capable of supporting the additional load or ~~shall be~~ reinforced to support the additional load.

#### 9.4.1.43

All access locks, screws, and bolts shall be of corrosion-resistant material.

#### 9.4.2.2

Appliances shall be installed on a well-drained surface of the roof. ~~At least 6 ft (1.8 m) of clearance shall be available between any part of the appliance and the edge of a roof or similar hazard, or rigidly fixed rails, guards, parapets, or other building structures at least 42 in. (1.1 m) in height shall be provided on the exposed side.~~

#### 9.4.2.3

At least 6 ft (1.8 m) of clearance shall be available between any part of the appliance and the edge of a roof or similar hazard ([see 9.4.2.4](#)).

#### 9.4.2.4

~~If least 6 ft (1.8 m) of clearance is not possible between any part of the appliance and the edge of a roof or similar hazard, or rigidly fixed rails, guards, parapets, or other building structures at least 42 in. (1.1 m) in height shall be provided on the exposed side.~~

#### 9.4.2.53

Appliances requiring an external source of electrical power shall be installed in accordance with *NFPA 70*.

#### 9.4.2.64

Where water stands on the roof at the appliance or in the passageways to the appliance, or where the roof is of a design having a water seal, a suitable platform, walkway, or both shall be provided above the water line. ~~Such platform(s) or walkway(s) shall be located adjacent to the appliance and control panels so that the appliance can be safely serviced where water stands on the roof.~~

#### 9.4.2.7

Such platform(s) or walkway(s) [as stated in 9.4.2.6](#) shall be located adjacent to the appliance and control panels so that the appliance can be safely serviced where water stands on the roof.

#### 9.4.3.3

The inside means of access shall be a permanent or foldaway inside stairway or ladder, terminating in an enclosure, scuttle, or trapdoor. ~~Such scuttles or trapdoors shall be at least 22 in. × 24 in. (560 mm × 610 mm) in size, shall open easily and safely under all conditions, especially snow, and shall be constructed so as to permit access from the roof side unless deliberately locked on the inside. At least 6 ft (1.8 m) of clearance shall be available between the access opening and the edge of the roof or similar hazard, or rigidly fixed rails or guards a minimum of 42 in. (1.1 m) in height shall be provided on the exposed side. Where parapets or other building structures are utilized in lieu of guards or rails, they shall be a minimum of 42 in. (1.1 m) in height.~~

[9.4.3.4](#) ~~Such scuttles~~ Scuttles or trapdoors shall be at least 22 in. × 24 in. (560 mm × 610 mm) in size.

#### 9.4.3.5

~~Scuttles or trapdoors~~ shall open easily and safely under all conditions, especially snow.



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9.4.3.6 Scuttles or trapdoors shall be constructed so as to permit access from the roof side unless deliberately locked on the inside.

9.4.3.7

At least 6 ft (1.8 m) of clearance shall be available between the access opening and the edge of the roof or similar hazard (see 9.4.3.8).

9.4.3.8

If at least 6 ft (1.8 m) of clearance is not possible between the access opening and the edge of the roof or similar hazard, or rigidly fixed rails or guards a minimum of 42 in. (1.1 m) in height shall be provided on the exposed side.

9.4.3.9

Where parapets or other building structures are utilized in lieu of guards or rails, they shall be a minimum of 42 in. (1.1 m) in height.

9.5.1.2

The passageway shall be unobstructed ~~and shall have solid flooring not less than 24 in. (610 mm) wide from the entrance opening to the appliance.~~

9.5.1.3

The passageway shall have solid flooring not less than 24 in. (610 mm) wide from the entrance opening to the appliance.

9.5.3 Lighting and Convenience Outlet.

~~A permanent 120 V receptacle outlet and a luminaire shall be installed near the appliance. The switch controlling the luminaire shall be located at the entrance to the passageway.~~

9.5.3.1

A permanent 120 V receptacle outlet and a luminaire shall be installed near the appliance.

9.5.3.2

The switch controlling the luminaire shall be located at the entrance to the passageway.

9.6.1.1 Protection of Connectors.

~~Connectors and tubing addressed in 9.6.1(2), 9.6.1(3), 9.6.1(4), 9.6.1(5), and 9.6.1(6) shall be installed to be protected against physical and thermal damage. Aluminum alloy tubing and connectors shall be coated to protect against external corrosion where they are in contact with masonry, plaster, or insulation or are subject to repeated wettings by such liquids as detergents, sewage, or water other than rainwater.~~

9.6.1.1.1

Connectors and tubing addressed in 9.6.1(2), 9.6.1(3), 9.6.1(4), 9.6.1(5), and 9.6.1(6) shall be installed to be protected against physical and thermal damage.

#### 9.6.1.1.2

Aluminum alloy tubing and connectors shall be coated to protect against external corrosion where they are in contact with masonry, plaster, or insulation or are subject to repeated wettings by such liquids as detergents, sewage, or water other than rainwater.

#### 9.6.4.4

Where flexible connections are used, they shall be of the minimum practical length ~~and shall not extend from one room to another or pass through any walls, partitions, ceilings, or floors. Flexible connections shall not be used in any concealed location. They shall be protected against physical or thermal damage and shall be provided with gas shutoff valves in readily accessible locations in rigid piping upstream from the flexible connections.~~

#### 9.6.4.5

Flexible connections shall not extend from one room to another or pass through any walls, partitions, ceilings, or floors.

#### 9.6.4.6

Flexible connections shall not be used in any concealed location.

#### 9.6.4.7

~~They~~ Flexible connections shall be protected against physical or thermal damage.

#### 9.6.4.8

Flexible connections shall be provided with gas shutoff valves in readily accessible locations in rigid piping upstream from the flexible connections.

#### 9.6.5 Appliance Shutoff Valves and Connections.

~~Each appliance connected to a piping system shall have an accessible, approved manual shutoff valve with a nondisplaceable valve member, or a listed gas convenience outlet. Appliance shutoff valves and convenience outlets shall serve a single appliance only and shall be installed in accordance with 9.6.5.1.~~

#### 9.6.5.1

Each appliance connected to a piping system shall have an accessible, approved manual shutoff valve with a nondisplaceable valve member, or a listed gas convenience outlet.

#### 9.6.5.2

Appliance shutoff valves and convenience outlets shall serve a single appliance only.

#### 9.6.5.3

Appliance shutoff valves and convenience outlets ~~and~~ shall be installed in accordance with 9.6.5.1.

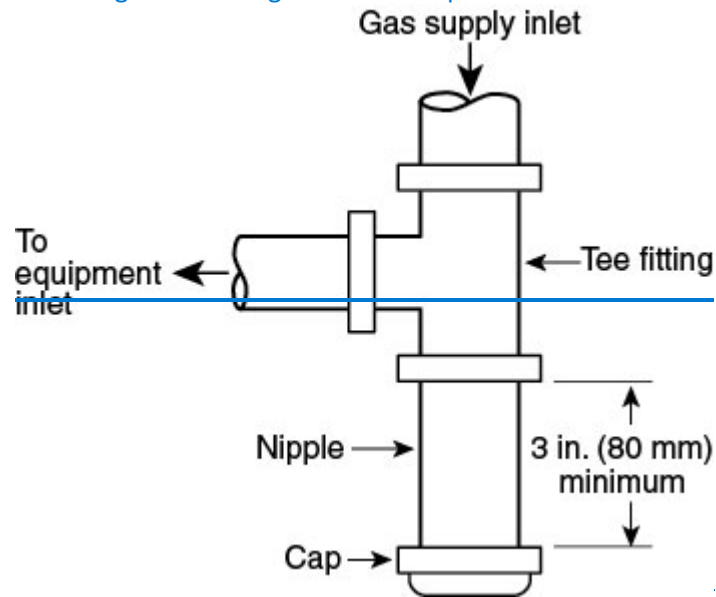
#### 9.6.8 Sediment Trap.

~~Where a sediment trap is not incorporated as a 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 at the time of appliance installation. The sediment trap shall be either a tee fitting with a capped nipple in the bottom outlet, as illustrated in Figure 9.6.8, or another device recognized as an effective sediment trap.~~

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~~Illuminating appliances, gas ranges, clothes dryers, decorative appliances for installation in vented fireplaces, gas fireplaces, and outdoor cooking appliances shall not be required to be so equipped.~~

Figure 9.6.8 Method of Installing a Tee Fitting Sediment Trap.



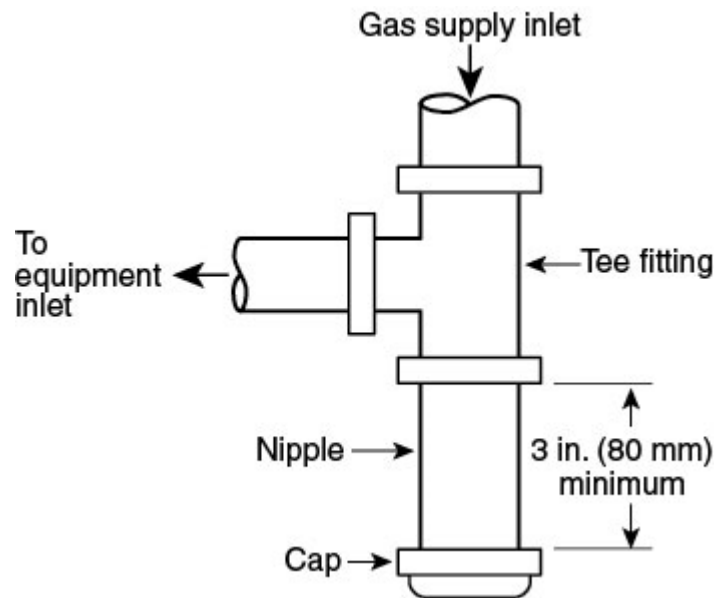
#### 9.6.8.1

Where a sediment trap is not incorporated as a 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 at the time of appliance installation.

#### 9.6.8.2

The sediment trap shall be either a tee fitting with a capped nipple in the bottom outlet, as illustrated in Figure 9.6.8.2, or another device recognized as an effective sediment trap.

Figure 9.6.8.2 Method of Installing a Tee Fitting Sediment Trap.



#### 9.6.8.3

Illuminating appliances, gas ranges, clothes dryers, decorative appliances for installation in vented fireplaces, gas fireplaces, and outdoor cooking appliances shall not be required to be ~~so~~ equipped with a sediment trap.

#### 10.1.1\* Application.

~~Appliances shall be installed in accordance with the manufacturers' installation instructions and, as elsewhere specified in this chapter, as applicable to the appliance. Unlisted appliances shall be installed as specified in this chapter as applicable to the appliances.~~

##### 10.1.1.1

Appliances shall be installed in accordance with the manufacturers' installation instructions and, as elsewhere specified in this chapter, as applicable to the appliance.

##### 10.1.1.2

Unlisted appliances shall be installed as specified in this chapter as applicable to the appliances.

#### 10.3.2 Location.

Central heating furnace and low-pressure boiler installations in bedrooms or bathrooms shall comply with one of the following:

1. ~~Central heating furnaces and low-pressure boilers shall be installed in a closet equipped with a weather-stripped door with no openings, and with a self-closing device. All combustion air shall be obtained from the outdoors in accordance with 9.3.3. in accordance with the following:~~
  - a. ~~The closet is~~ equipped with a weather-stripped door with no openings, and with a self-closing device.
  - a.b. All combustion air ~~is shall be~~ obtained from the outdoors in accordance with 9.3.3.
2. Central heating furnaces and low-pressure boilers shall be of the ~~direct-direct~~-vent type.

#### 10.3.3.7

~~Supply air ducts connecting to listed central heating furnaces shall have the same minimum clearance to combustibles as required for the furnace supply plenum for a distance of not less than 3 ft (0.9 m) from the supply plenum. Clearance shall not be required beyond the 3 ft (0.9 m) distance.~~

##### 10.3.3.7.1

Supply air ducts connecting to listed central heating furnaces shall have the same minimum clearance to combustibles as required for the furnace supply plenum for a distance of not less than 3 ft (0.9 m) from the supply plenum.

##### 10.3.3.7.2

Clearance shall not be required beyond the 3 ft (0.9 m) distance.

#### 10.3.3.8

~~Supply air ducts connecting to unlisted central heating furnaces equipped with temperature limit controls with a maximum setting of 250°F (121°C) shall have a minimum clearance to combustibles of 6 in. (150 mm) for a distance of not less than 6 ft (1.8 m) from the furnace supply plenum. Clearance shall not be required beyond the 6 ft (1.8 m) distance.~~

##### 10.3.3.8.1

Supply air ducts connecting to unlisted central heating furnaces equipped with temperature limit controls with a maximum setting of 250°F (121°C) shall have a minimum clearance to combustibles of 6 in. (150 mm) for a distance of not less than 6 ft (1.8 m) from the furnace supply plenum.

##### 10.3.3.8.2

Clearance shall not be required beyond the 6 ft (1.8 m) distance.

#### 10.3.5 Temperature or Pressure Limiting Devices.

~~Steam and hot water boilers, respectively, shall be provided with approved automatic limiting devices for shutting down the burner(s) to prevent boiler steam pressure or boiler water temperature from exceeding the maximum allowable working pressure or temperature. Safety limit controls shall not be used as operating controls.~~

##### 10.3.5.1

Steam and hot water boilers, respectively, shall be provided with approved automatic limiting devices for shutting down the burner(s) to prevent boiler steam pressure or boiler water temperature from exceeding the maximum allowable working pressure or temperature.

##### 10.3.5.2

Safety limit controls shall not be used as operating controls.

#### 10.3.6 Low-Water Cutoff.

~~All water boilers and steam boilers shall be provided with an automatic means to shut off the fuel supply to the burner(s) if the boiler water level drops below the lowest safe water line. In lieu of the low water cutoff, water tube or coil type boilers that require forced circulation to prevent overheating and failure~~

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~~shall have an approved flow sensing device arranged to shut down the boiler when the flow rate is inadequate to protect the boiler against overheating.~~

#### 10.3.6.1

All water boilers and steam boilers shall be provided with an automatic means to shut off the fuel supply to the burner(s) if the boiler water level drops below the lowest safe water line.

#### 10.3.6.2

In lieu of the low-water cutoff, water tube or coil-type boilers that require forced circulation to prevent overheating and failure shall have an approved ~~flow-flow~~-sensing device arranged to shut down the boiler when the flow rate is inadequate to protect the boiler against overheating.

#### 10.3.7\* Steam Safety and Pressure Relief Valves.

~~Steam and hot water boilers shall be equipped, respectively, with listed or approved steam safety or pressure relief valves of appropriate discharge capacity and conforming with ASME requirements. A shutoff valve shall not be placed between the relief valve and the boiler or on discharge pipes between such valves and the atmosphere.~~

#### 10.3.7.1

Steam and hot water boilers shall be equipped, respectively, with listed or approved steam safety or pressure relief valves of appropriate discharge capacity and conforming with ASME requirements.

#### 10.3.7.2

A shutoff valve shall not be placed between the relief valve and the boiler or on discharge pipes between such valves and the atmosphere.

#### 10.3.8.3\*

Where a furnace plenum is not supplied with the furnace, any fabrication and installation instructions provided by the manufacturer shall be followed. ~~The method of connecting supply and return ducts shall facilitate proper circulation of air.~~

#### 10.3.8.4

The method of connecting supply and return ducts shall facilitate proper circulation of air.

#### 10.3.8.54

Where a furnace is installed so supply ducts carry air circulated by the furnace to areas outside the space containing the furnace, the return air shall also be handled by a duct(s) sealed to the furnace casing and terminating outside the space containing the furnace. ~~Return air shall not be taken from the mechanical room containing the furnace.~~

#### 10.3.8.6

Return air shall not be taken from the mechanical room containing the furnace.

#### 10.4.2 Clearance.

~~The installation of clothes dryers shall comply with the following requirements:~~

- ~~1. Type 1 clothes dryers shall be installed with a minimum clearance of 6 in. (150 mm) from adjacent combustible material. Clothes dryers listed for installation at reduced clearances shall be installed in accordance with the manufacturer's installation instructions. Type 1 clothes dryers installed in closets shall be specifically listed for such installation.~~
- ~~2. Type 2 clothes dryers shall be installed with clearances of not less than those shown on the marking plate and in the manufacturer's instructions. Type 2 clothes dryers designed and marked "For use only in noncombustible locations" shall not be installed elsewhere.~~

#### 10.4.2.1

The installation of Type 1 clothes dryers shall comply with the following requirements:

1. Type 1 clothes Clothes dryers shall be installed with a minimum clearance of 6 in. (150 mm) from adjacent combustible material.
2. Clothes dryers listed for installation at reduced clearances shall be installed in accordance with the manufacturer's installation instructions.
- ~~1.3. Type 1 clothes~~ Clothes dryers installed in closets shall be specifically listed for such installation.

#### 10.4.2.2

The installation of Type 2 clothes dryers shall comply with the following requirements:

1. Type 2 clothes Clothes dryers shall be installed with clearances of not less than those shown on the marking plate and in the manufacturer's instructions.
2. Type 2 clothes Clothes dryers designed and marked "For use only in noncombustible locations" shall not be installed elsewhere.

#### 10.4.5.3

Exhaust ducts shall be constructed of rigid metallic material. ~~Transition ducts used to connect the dryer to the exhaust duct shall be listed and labeled in accordance with UL 2158A, Clothes Dryer Transition Ducts, and installed in accordance with the clothes dryer manufacturer's installation instructions.~~

#### 10.4.5.4

Transition ducts used to connect the dryer to the exhaust duct shall be listed and labeled in accordance with UL 2158A, *Clothes Dryer Transition Ducts*, and installed in accordance with the clothes dryer manufacturer's installation instructions.

#### 10.4.6.2

Exhaust ducts for Type 2 clothes dryers shall be constructed of sheet metal or other noncombustible material. ~~Such ducts shall be equivalent in strength and corrosion resistance to ducts made of galvanized sheet steel not less than 0.0195 in. (0.5 mm) thick.~~

#### 10.4.6.3

Such ducts for Type 2 clothes dryers shall be equivalent in strength and corrosion resistance to ducts made of galvanized sheet steel not less than 0.0195 in. (0.5 mm) thick.

#### 10.6.3 Installation.

~~A decorative appliance for installation in a vented fireplace shall be installed only in a vented fireplace having a working chimney flue and constructed of noncombustible materials. These appliances shall not be thermostatically controlled.~~

#### 10.6.3.1

A decorative appliance for installation in a vented fireplace shall be installed only in a vented fireplace having a working chimney flue and constructed of noncombustible materials.

#### 10.6.3.2

These appliances in 10.6.3.1 shall not be thermostatically controlled.

### 10.7.3 Installation.

The installation of vented gas fireplaces shall comply with the following requirements:

1. Vented gas fireplaces shall be installed in accordance with the manufacturer's installation instructions ~~and where installed in or attached to combustible material shall be specifically listed for such installation.~~
- ~~1-2.~~ 2. Where installed in or attached to combustible material, the vented gas fireplace shall be specifically listed for such installation.
- ~~2-3.~~ 3. Panels, grilles, and access doors that are required to be removed for normal servicing operations shall not be attached to the building.
- ~~3-4.~~ 4. ~~Direct-Direct~~-vent gas fireplaces shall be installed with the vent air intake terminal in the outdoors and in accordance with the manufacturer's instructions.

#### 10.8.5.2

Ventilation air to the recirculating direct gas-fired heating and forced ventilation appliance shall be ducted directly from outdoors. ~~Air in excess of the minimum ventilation air specified on the heater's rating plate shall be taken from the building, ducted directly from outdoors, or a combination of both.~~

#### 10.8.5.3

Air in excess of the minimum ventilation air specified on the heater's rating plate shall be taken from the building, ducted directly from outdoors, or a combination of both.

### 10.8.6 Atmospheric Vents or Gas Reliefs or Bleeds.

~~Direct gas-fired heating and forced ventilation appliances with valve train components equipped with atmospheric vents, gas reliefs, or bleeds shall have their vent lines, gas reliefs, or bleeds lead to a safe point outdoors. Means shall be employed on these lines to prevent water from entering and to prevent blockage from 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.~~

#### 10.8.6.1

Direct gas-fired heating and forced ventilation appliances with valve train components equipped with atmospheric vents, gas reliefs, or bleeds shall have their vent lines, gas reliefs, or bleeds lead to a safe point outdoors.

#### 10.8.6.2



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Means shall be employed on these lines to prevent water from entering and to prevent blockage from insects and foreign matter.

#### 10.8.6.3

An atmospheric vent line shall not be required to be provided on a valve train component equipped with a listed vent limiter.

#### 10.8.7.2

Louver or counterbalanced gravity damper relief openings shall be permitted. ~~Where motorized dampers or closable louvers are used, they shall be proved to be in their open position prior to main burner operation.~~

#### 10.8.7.3

Where motorized dampers or closable louvers are used, they shall be proved to be in their open position prior to main burner operation.

#### 10.9.5 Location of Draft Hood and Controls.

~~The controls, combustion air inlet, and draft hoods for duct furnaces shall be located outside the ducts. The draft hood shall be located in the same enclosure from which combustion air is taken.~~

#### 10.9.5.1

The controls, combustion air inlet, and draft hoods for duct furnaces shall be located outside the ducts.

#### 10.9.5.2

The draft hood shall be located in the same enclosure from which combustion air is taken.

#### 10.9.6 Circulating Air.

~~Where a duct furnace is installed so that supply ducts carry air circulated by the furnace to areas outside the space containing the furnace, the return air shall also be handled 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.~~

#### 10.9.6.1

Where a duct furnace is installed so that supply ducts carry air circulated by the furnace to areas outside the space containing the furnace, the return air shall also be handled by a duct(s) sealed to the furnace casing and terminating outside the space containing the furnace.

#### 10.9.6.2

The duct furnace shall be installed on the positive-pressure side of the circulating air blower.

#### 10.9.7.3\*

Where a duct furnace is installed downstream of an evaporative cooler or air washer, the heat exchanger shall be constructed of corrosion-resistant materials. ~~Air washers operating with chilled water that deliver air below the dew point of the ambient air at the duct furnace shall be considered as refrigeration systems.~~

#### 10.9.7.4

Air washers operating with chilled water that deliver air below the dew point of the ambient air at the duct furnace shall be considered as refrigeration systems.

#### 10.10.5 Placement.

The following provisions apply to furnaces that serve one story:

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 exitway from any such room or space.
2. ~~Walls and Corners.~~ Floor furnaces installed in walls and corners shall be in accordance with the following:
  - a. ~~The register of a floor furnace with a horizontal warm air outlet shall not be placed closer than 6 in. (150 mm) from the nearest wall. A distance of at least 18 in. (460 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 a minimum of 6 in. (150 mm) from a wall. Wall register models shall not be placed closer than 6 in. (150 mm) to a corner.~~
  - b. A distance of at least 18 in. (460 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.
  - c. The remaining sides shall be a minimum of 6 in. (150 mm) from a wall.
  - d. Wall register models shall not be placed closer than 6 in. (150 mm) to a corner.
3. ~~Draperies.~~ The furnace shall be placed so that a door, drapery, or similar object cannot be nearer than 12 in. (300 mm) to any portion of the register of the furnace.

#### 10.10.8 Clearance.

~~The lowest portion of the floor furnace shall have at least a 6 in. (150 mm) clearance from the general ground level. A reduced clearance to a minimum of 2 in. (50 mm) shall be permitted, provided the lower 6 in. (150 mm) portion of the floor furnace is sealed by the manufacturer to prevent entrance of water. Where these clearances are not present, the ground below and to the sides shall be excavated to form a "basin-like" pit under the furnace so that the required clearance is provided beneath the lowest portion of the furnace. A 12 in. (300 mm) clearance shall be provided on all sides except the control side, which shall have an 18 in. (460 mm) clearance.~~

##### 10.10.8.1

The lowest portion of the floor furnace shall have at least a 6 in. (150 mm) clearance from the general ground level.

##### 10.10.8.1

A reduced clearance to a minimum of 2 in. (50 mm) shall be permitted, provided the lower 6 in. (150 mm) portion of the floor furnace is sealed by the manufacturer to prevent entrance of water.

##### 10.10.8.2

Where these clearances [in 10.10.8.1](#) are not present, the ground below and to the sides shall be excavated to form a “basin-like” pit under the furnace so that the required clearance is provided beneath the lowest portion of the furnace.

#### [10.10.8.3](#)

A 12 in. (300 mm) clearance shall be provided on all sides except the control side.

#### [10.10.8.4](#)

[The control side](#) shall have an 18 in. (460 mm) clearance.

#### 10.10.10 Seepage Pan.

~~Where the excavation exceeds 12 in. (300 mm) in depth or water seepage is likely to collect, a watertight copper pan, concrete pit, or other suitable material shall be used, unless adequate drainage is provided or the appliance is sealed by the manufacturer to meet this condition. A copper pan shall be made of not less than 16 oz/ft<sup>2</sup> (4.9 kg/m<sup>2</sup>) sheet copper. The pan shall be anchored in place so as to prevent floating, and the walls shall extend at least 4 in. (100 mm) above the ground level with at least a 6 in. (150 mm) clearance on all sides, except on the control side, which shall have at least an 18 in. (460 mm) clearance.~~

#### [10.10.10.1](#)

Where the excavation exceeds 12 in. (300 mm) in depth or water seepage is likely to collect, a watertight copper pan, concrete pit, or other suitable material shall be used, unless ~~adequate~~ drainage is provided or the appliance is sealed by the manufacturer to meet this condition.

#### [10.10.10.2](#)

A copper pan shall be made of not less than 16 oz/ft<sup>2</sup> (4.9 kg/m<sup>2</sup>) sheet copper.

#### [10.10.10.3](#)

The pan shall be anchored in place ~~so as~~ to prevent floating.

#### [10.10.10.4](#)

~~The walls of the pan shall extend at least 4 in. (100 mm) above the ground level with at least a 6 in. (150 mm) clearance on all sides and 18 in. (460 mm) on the control side, except on the control side, which shall have at least an 18 in. (460 mm) clearance.~~

#### 10.10.12 Upper Floor Installations.

~~Floor furnaces shall be permitted to be installed in an upper floor, provided the furnace assembly projects below into a utility room, closet, garage, or similar nonhabitable space. In such installations, the floor furnace shall be enclosed completely (entirely separated from the nonhabitable space) with means for air intake to meet the provisions of Section 9.3, with access for servicing, minimum furnace clearances of 6 in. (150 mm) to all sides and bottom, and with the enclosure constructed of Portland cement plaster or metal lath or other noncombustible material.~~

#### [10.10.12.1](#)

Floor furnaces shall be permitted to be installed in an upper floor, provided the furnace assembly projects below into a utility room, closet, garage, or similar nonhabitable space.

#### 10.10.12.2

In ~~the such~~ installations in 10.10.12.1, the floor furnace shall be enclosed completely (i.e., entirely separated from the nonhabitable space) with means for air intake to meet the provisions of Section 9.3, with access for servicing, minimum furnace clearances of 6 in. (150 mm) to all sides and bottom, and with the enclosure constructed of Portland cement plaster or metal lath or other noncombustible material.

#### 10.10.13 First Floor Installation.

~~Floor furnaces installed in the first or ground floors of buildings shall not be required to be enclosed unless the basements of these buildings have been converted to apartments or sleeping quarters, in which case the floor furnace shall be enclosed as specified for upper floor installations and shall project into a nonhabitable space.~~

#### 10.10.13.1

Floor furnaces installed in the first or ground floors of buildings shall not be required to be enclosed.

#### 10.10.13.2

~~Where the~~ basements of ~~these~~ buildings have been converted to apartments or sleeping quarters, ~~in which case~~ the floor furnace shall be enclosed as specified in 10.10.12.

#### 10.10.13.3

The enclosure required by 10.10.13.2 shall project into a nonhabitable space.

#### 10.11.3.2

Floor-mounted food service appliances that are not listed for installation on a combustible floor shall be installed in accordance ~~with 10.11.4 or be installed in accordance~~ with one of the following:

1. It shall be installed in accordance with 10.11.4.

~~1.2.~~ Where the appliance is set on legs that provide not less than 18 in. (460 mm) open space under the base of the appliance or where it has no burners and no portion of any oven or broiler within 18 in. (460 mm) of the floor, it shall be permitted to be installed on a combustible floor without special floor protection, provided at least one sheet metal baffle is between the burner and the floor.

3. Where the appliance is set on legs that provide not less than 8 in. (200 mm) open space under the base of the appliance, ~~it shall be permitted to be installed on combustible floors, provided the floor under the appliance is protected with not less than 3/8 in. (9.5 mm) insulating millboard covered with sheet metal not less than 0.0195 in. (0.5 mm) thick. The preceding specified floor protection shall extend not less than 6 in. (150 mm) beyond the appliance on all sides.~~ the following shall apply:

a. It shall be permitted to be installed on combustible floors, provided the floor under the appliance is protected with not less than  $\frac{3}{8}$  in. (9.5 mm) insulating millboard covered with sheet metal not less than 0.0195 in. (0.5 mm) thick.

~~a.b.~~ The ~~preceding specified~~ floor protection shall extend not less than 6 in. (150 mm) beyond the appliance on all sides.

~~4.~~ Where the appliance is set on legs that provide not less than 4 in. (100 mm) under the base of the appliance, ~~it shall be permitted to be installed on combustible floors, provided the floor under the appliance is protected with hollow masonry not less than 4 in. (100 mm) in thickness covered with sheet metal not less than 0.0195 in. (0.5 mm) thick. Such masonry courses shall be laid with ends unsealed and joints matched in such a way as to provide for free circulation of air through the masonry.~~ the following shall apply:

- ~~a.~~ It shall be permitted to be installed on combustible floors, provided the floor under the appliance is protected with hollow masonry not less than 4 in. (100 mm) in thickness covered with sheet metal not less than 0.0195 in. (0.5 mm) thick.
- ~~b.~~ Such masonry courses shall be laid with ends unsealed and joints matched in such a way as to provide for free circulation of air through the masonry.

~~2-5.~~ Where the appliance does not have legs at least 4 in. (100 mm) high, it shall be permitted to be installed on combustible floors, provided the floor under the appliance is protected by two courses of 4 in. (100 mm) hollow clay tile, or equivalent, with courses laid at right angles and with ends unsealed and joints matched in such a way as to provide for free circulation of air through such masonry courses, and covered with steel plate not less than 3/16 in. (4.8 mm) in thickness.

#### 10.13.3 Clearances.

~~Floor-mounted household cooking appliances, where installed on combustible floors, shall be set on their own bases or legs and shall not interfere with combustion air, accessibility for operation, and servicing.~~

##### 10.13.3.1

Floor-mounted household cooking appliances, where installed on combustibles floors, shall be set on their own bases or legs.

##### 10.13.3.2

Floor-mounted household cooking appliances shall not interfere with combustion air, accessibility for operation, and servicing.

##### 10.13.3.31\* ~~Vertical Clearance Above Cooking Top.~~

Household cooking appliances shall have a vertical clearance above the cooking top of not less than 30 in. (760 mm) to combustibles material or metal cabinets. ~~A minimum clearance of 24 in. (610 mm) shall be permitted when one of the following is installed:~~

- ~~1.—The underside of the combustibles material or metal cabinet above the cooking top is protected with not less than 1/4 in. (6 mm) insulating millboard covered with sheet metal not less than 0.0122 in. (0.3 mm) thick.~~
- ~~2.—A metal ventilating hood of sheet metal not less than 0.0122 in. (0.3 mm) thick is installed above the cooking top with a clearance of not less than 1/4 in. (6 mm) between the hood and the underside of the combustibles material or metal cabinet, and the hood is at least as wide as the appliance and is centered over the appliance.~~
- ~~3.1. A cooking appliance or microwave oven is installed over a cooking appliance and conforms to the terms of the upper appliance's manufacturer's installation instructions.~~

#### 10.13.3.4

A minimum clearance of 24 in. (610 mm) shall be permitted when 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 ¼ in. (6 mm) insulating millboard covered with sheet metal not less than 0.0122 in. (0.3 mm) thick.
- (2) A metal ventilating hood of sheet metal not less than 0.0122 in. (0.3 mm) thick is installed above the cooking top with a clearance of not less than ¼ in. (6 mm) between the hood and the underside of the combustible material or metal cabinet, and the hood is at least as wide as the appliance and is centered over the appliance.
- (3) A cooking appliance or microwave oven is installed over a cooking appliance and conforms to the terms of the upper appliance's manufacturer's installation instructions.

#### 10.14.2.2 Open-Flame Type.

Clearance shall comply with the following:

1. Unlisted open-flame illuminating appliances installed outdoors shall have clearances ~~from combustible material not less than that specified in Table 10.14.2.2. The distance from ground level to the base of the burner shall be a minimum of 7 ft (2.1 m) where installed within 2 ft (0.6 m) of walkways. Lesser clearances shall be permitted to be used where acceptable to the authority having jurisdiction.~~ in accordance with the following:
  - a. ~~From~~ combustible material not less than that specified in Table 10.14.2.2.
  - b. The distance from ground level to the base of the burner shall be a minimum of 7 ft (2.1 m) where installed within 2 ft (0.6 m) of walkways.
  - a-c. Lesser clearances shall be permitted to be used where acceptable to the authority having jurisdiction.
2. Unlisted open-flame illuminating appliances installed outdoors shall be equipped with a limiting orifice or other limiting devices that maintain a flame height consistent with the clearance from combustible material, as given in Table 10.14.2.2.
3. Appliances designed for flame heights in excess of 30 in. (760 mm) shall be approved. ~~Such appliances shall be equipped with a safety shutoff device or automatic ignition.~~
- 3.4. ~~Such appliances.~~ Appliances with a flame heights in excess of 30 in. (760 mm) shall be equipped with a safety shutoff device or automatic ignition.
- 4-5. Clearances to combustible material from unlisted open-flame illuminating appliances shall be approved.

#### 10.14.4 Installation on Posts.

~~Illuminating appliances designed for installation on a post shall be securely and rigidly attached to a post. Posts shall be rigidly installed. The strength and rigidity of posts greater than 3 ft (0.9 m) in height shall be at least equivalent to that of a 2 1/2 in. (64 mm) diameter post constructed of 0.064 in. (1.6 mm) thick steel or a 1 in. Schedule 40 steel pipe. Posts 3 ft (0.9 m) or less in height shall not be smaller than a 3/4 in. Schedule 40 steel pipe. Drain openings shall be provided near the base of posts where water collecting inside the posts is possible.~~

#### 10.14.4.1

Illuminating appliances designed for installation on a post shall be securely and rigidly attached to a post.

#### [10.14.4.2](#)

Posts shall be rigidly installed.

#### [10.14.4.3](#)

The strength and rigidity of posts greater than 3 ft (0.9 m) in height shall be at least equivalent to that of a 2½ in. (64 mm) diameter post constructed of 0.064 in. (1.6 mm) thick steel or a 1 in. Schedule 40 steel pipe.

#### [10.14.4.5](#)

Posts 3 ft (0.9 m) or less in height shall not be smaller than a ¾ in. Schedule 40 steel pipe.

#### [10.14.4.6](#)

Drain openings shall be provided near the base of posts where water collecting inside the posts is possible.

### 10.16.2 Support.

~~Suspended-type infrared heaters shall be fixed in position independent of gas and electric supply lines. Hangers and brackets shall be of noncombustible material. Heaters subject to vibration shall be provided with vibration-isolating hangers.~~

#### [10.16.2.1](#)

Suspended-type infrared heaters shall be fixed in position independent of gas and electric supply lines.

#### [10.16.2.2](#)

Hangers and brackets shall be of noncombustible material.

#### [10.16.2.3](#)

Heaters subject to vibration shall be provided with vibration-isolating hangers.

### 10.16.5 Installation in Commercial Garages and Aircraft Hangars.

~~Overhead heaters installed in garages for more than three motor vehicles or in aircraft hangars shall be listed and shall be installed in accordance with 9.1.11 and 9.1.12.~~

#### [10.16.5.1](#)

Overhead heaters installed in garages for more than three motor vehicles or in aircraft hangars shall be listed.

#### [10.16.5.2](#)

Overhead heaters installed in garages for more than three motor vehicles or in aircraft hangars shall be installed in accordance with 9.1.11 and 9.1.12.

### 10.20.2 Clearance.

~~Refrigerators shall be provided with clearances for ventilation at the top and back in accordance with the manufacturers' instructions. Where such instructions are not available, at least 2 in. (50 mm) shall be provided between the back of the refrigerator and the wall and at least 12 in. (300 mm) above the top.~~

#### 10.20.2.1

Refrigerators shall be ~~installed~~provided with clearances for ventilation at the top and back in accordance with the manufacturers' instructions.

#### 10.20.2.2

Where ~~manufacturers'such~~ instructions are not available, clearance shall be provided of at least 2 in. (50 mm) ~~shall be provided~~ between the back of the refrigerator and ~~the wall and~~ at least 12 in. (300 mm) above the top.

#### 10.24.2 Support.

~~Suspended-type unit heaters shall be safely and adequately supported, with due consideration given to their weight and vibration characteristics. Hangers and brackets shall be of noncombustible material.~~

#### 10.24.2.1

Suspended-type unit heaters shall be ~~safely and adequately~~ supported, with due consideration given to their weight and vibration characteristics.

#### 10.24.2.2

Hangers and brackets shall be of noncombustible material.

#### 10.24.3 Clearance for Suspended-Type Unit Heaters.

Suspended-type unit heaters shall meet the following requirements:

1. Unit heaters shall be installed with clearances from combustible material of not less than 18 in. (460 mm) at the sides, 12 in. (300 mm) at the bottom, and 6 in. (150 mm) above the top where the unit heater has an internal draft hood, or 1 in. (25 mm) above the top of the sloping side of a vertical draft hood. ~~A unit heater listed for reduced clearances shall be installed in accordance with the manufacturer's installation instructions.~~
- ~~1.2.~~ A unit heater listed for reduced clearances shall be installed in accordance with the manufacturer's installation instructions.
- ~~2.3.~~ Clearances for servicing shall be in accordance with the manufacturers' installation instructions.

#### 10.25.2 Installation.

##### 10.25.2.1

Wall furnaces shall be installed in accordance with the manufacturer's installation instructions. ~~Wall furnaces installed in or attached to combustible material shall be listed for such installation.~~

##### 10.25.2.2

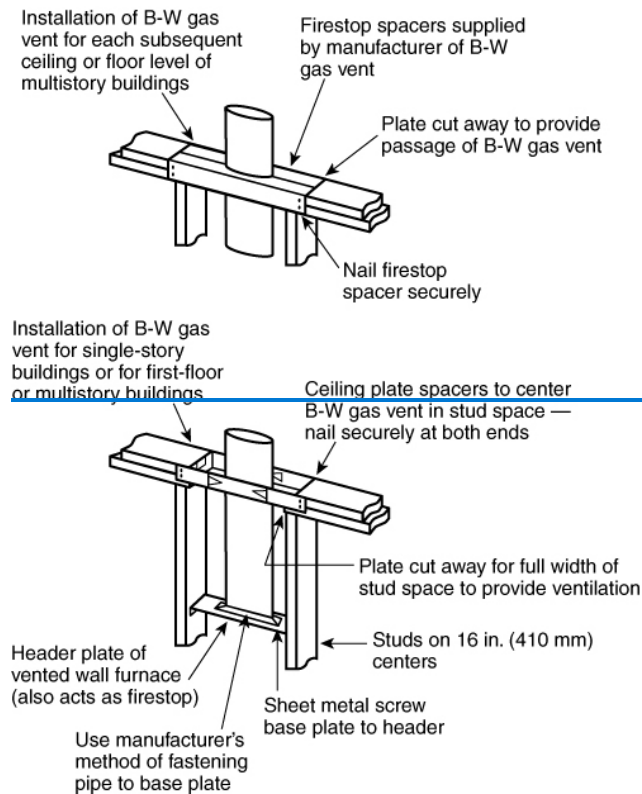
Wall furnaces installed in or attached to or combustible material shall be listed for such installation.



### 10.25.2.2-3

Vented wall furnaces connected to a Type B-W gas vent system listed only for a single story shall be installed only in single-story buildings or the top story of multistory buildings. ~~Vented wall furnaces connected to a Type B-W gas vent system listed for installation in multistory buildings shall be permitted to be installed in single-story or multistory buildings. Type B-W gas vents shall be attached directly to a solid header plate that serves as a firestop at that point and that shall be permitted to be an integral part of the vented wall furnace, as illustrated in Figure 10.25.2.2. The stud space in which the vented wall furnace is installed shall be ventilated at the first ceiling level by installation of the ceiling plate spacers furnished with the gas vent. Firestop spacers shall be installed at each subsequent ceiling or floor level penetrated by the vent.~~

Figure 10.25.2.2 Installation of Type B-W Gas Vents for Vented Wall Furnaces.



### 10.25.2.4

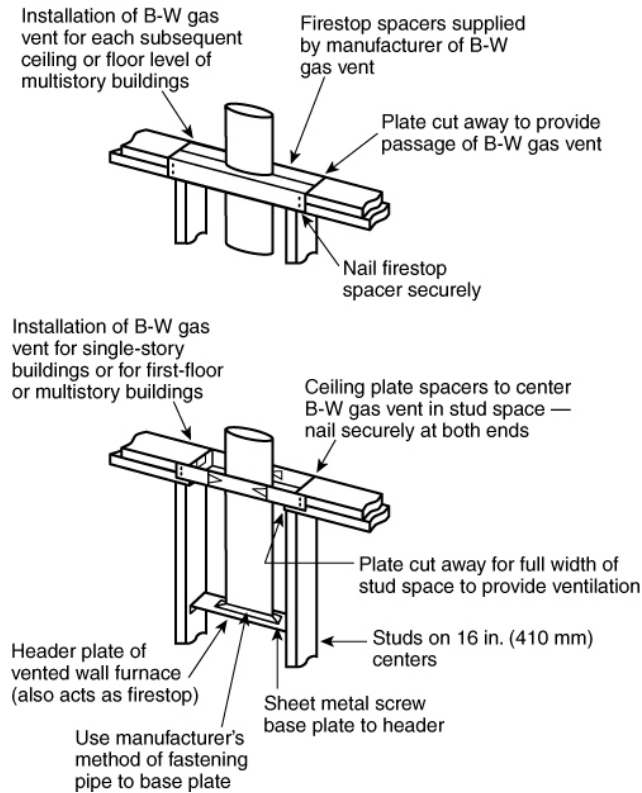
Vented wall furnaces connected to a Type B-W gas vent system listed for installation in multistory buildings shall be permitted to be installed in single-story or multistory buildings.

### 10.25.2.5

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Type B-W gas vents shall be both attached directly to a solid header plate that serves as a firestop at that point and ~~that shall be~~ permitted to be an integral part of the vented wall furnace, as illustrated in Figure 10.25.2.25.

Figure 10.25.2.25 Installation of Type B-W Gas Vents for Vented Wall Furnaces.



#### 10.25.2.6

The stud space in which the vented wall furnace is installed shall be ventilated at the first ceiling level by installation of the ceiling plate spacers furnished with the gas vent.

#### 10.25.2.7

Firestop spacers shall be installed at each subsequent ceiling or floor level penetrated by the vent.

#### 10.25.2.38

~~Direct-Direct~~-vent wall furnaces shall be installed with the combustion air intake terminal outdoors.

#### 10.25.2.49

Panels, grilles, and access doors that are required to be removed for normal servicing operations shall not be attached to the building. *(For additional information on the venting of wall furnaces, see Chapter 12.)*

#### 10.25.3 Location.

~~Wall furnaces shall be located so as not to cause a hazard to walls, floors, curtains, furniture, or doors. Wall furnaces installed between bathrooms and adjoining rooms shall not circulate air from bathrooms to other parts of the building.~~

#### 10.25.3.1

Wall furnaces shall be located so as not to cause a hazard to walls, floors, curtains, furniture, or doors.

#### 10.25.3.2

Wall furnaces installed between bathrooms and adjoining rooms shall not circulate air from bathrooms to other parts of the building.

#### 10.26.1 Application.

~~Water heaters shall be listed in accordance with ANSI Z21.10.1/CSA 4.1, *Gas Water Heaters, Volume I, Storage Water Heaters with Input Ratings of 75,000 Btu per Hour or Less*, or ANSI Z21.10.3/CSA 4.3, *Gas Water Heaters, Volume III, Storage Water Heaters with Input Ratings Above 75,000 Btu per Hour, Circulating or Instantaneous*, and shall be installed in accordance with the manufacturer's installation instructions.~~

#### 10.26.1.1

Water heaters shall be listed in accordance with ANSI Z21.10.1/CSA 4.1, *Gas Water Heaters, Volume I, Storage Water Heaters with Input Ratings of 75,000 Btu per Hour or Less*, or ANSI Z21.10.3/CSA 4.3, *Gas Water Heaters, Volume III, Storage Water Heaters with Input Ratings Above 75,000 Btu per Hour, Circulating or Instantaneous*.

#### 10.26.1.2

Water heaters shall be installed in accordance with the manufacturer's installation instructions.

#### 10.26.2 Location.

Water heater installations in bedrooms and bathrooms shall comply with one of the following:

1. ~~Water heater shall be installed in a closet equipped with a weather-stripped door with no openings and with a self-closing device. All combustion air shall be obtained from the outdoors in accordance with 9.3.3.~~ in accordance with the following:
  - a. ~~The closet~~ is shall be equipped with a weather-stripped door with no openings and with a self-closing device.
  - a.b. All combustion air shall be obtained from the outdoors in accordance with 9.3.3.
2. Water heater shall be of the direct vent type.

#### 10.26.3 Clearance.

~~The clearances shall not be such as to interfere with combustion air, draft hood clearance and relief, and accessibility for servicing. Listed water heaters shall be installed in accordance with the manufacturer's installation instructions.~~

#### 10.26.3.1

The clearances shall not be such as to interfere with combustion air, draft hood clearance and relief, and accessibility for servicing.

### 10.26.3.2

Listed water heaters shall be installed in accordance with the manufacturer's installation instructions.

### 10.26.4 Pressure Relief Devices.

~~A water heater installation shall be provided with overpressure protection by means of a device listed in accordance with ANSI Z21.22/CSA 4.4, *Relief Valves for Hot Water Supply Systems*, and installed in accordance with the manufacturer's installation instructions. The pressure setting of the device shall exceed the water service pressure and shall not exceed the maximum pressure rating of the water heater.~~

### 10.26.4.1

A water heater installation shall be provided with overpressure protection by means of a device listed in accordance with ANSI Z21.22/CSA 4.4, *Relief Valves for Hot Water Supply Systems*, and installed in accordance with the manufacturer's installation instructions.

### 10.26.4.2

The pressure setting of the device shall exceed the water service pressure *(see 10.26.4.3)*.

### 10.26.4.3

~~The pressure setting of the device and~~ shall not exceed the maximum pressure rating of the water heater.

### 10.26.6 Temperature, Pressure, and Vacuum Relief Devices.

~~Temperature, pressure, and vacuum relief devices, or combinations thereof, and automatic gas shutoff devices shall be installed in accordance with the manufacturer's installation instructions. A shutoff valve shall not be placed between the relief valve and the water heater or on discharge pipes between such valves and the atmosphere. The hourly Btu discharge capacity or the rated steam relief capacity of the device shall not be less than the input rating of the water heater.~~

### 10.26.6.1

Temperature, pressure, and vacuum relief devices, or combinations thereof, and automatic gas shutoff devices shall be installed in accordance with the manufacturer's installation instructions.

### 10.26.6.2

A shutoff valve shall not be placed between the relief valve and the water heater or on discharge pipes between such valves and the atmosphere.

### 10.26.6.3

The hourly Btu discharge capacity or the rated steam relief capacity of the device shall not be less than the input rating of the water heater.

### 10.27 Compressed Natural Gas (CNG) Vehicular Fuel Systems.

~~The installation of compressed natural gas (CNG) fueling (dispensing) systems shall be in accordance with NFPA 52, *Residential CNG fueling appliances* shall be listed in accordance with ANSI/CSA NGV 5.1, *Residential Fueling Appliances*, and installed in accordance to the appliance manufacturer's installation~~

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~~instructions. Non-residential CNG fueling appliances shall be listed in accordance with ANSI/CSA NGV 5.2, *Vehicle Fueling Appliances (VFA)*, and installed in accordance with the appliance manufacturer's installation instructions.~~

#### 10.27.1

The installation of compressed natural gas (CNG) fueling (i.e., dispensing) systems shall be in accordance with NFPA 52.

#### 10.27.2

Residential CNG fueling appliances shall be both listed in accordance with ANSI/CSA NGV 5.1, *Residential Fueling Appliances*, and installed in accordance to the appliance manufacturer's installation instructions.

#### 10.27.3

Non-residential CNG fueling appliances shall be both listed in accordance with ANSI/CSA NGV 5.2, *Vehicle Fueling Appliances (VFA)*, and installed in accordance with the appliance manufacturer's installation instructions.

### 10.28 Appliances for Installation in Manufactured Housing.

~~Appliances installed in manufactured housing after the initial sale shall be listed for installation in manufactured housing, or approved, and shall be installed in accordance with the requirements of this code and the manufacturers' installation instructions. Appliances installed in the living space of manufactured housing shall be in accordance with the requirements of Section 9.3.~~

#### 10.28.1

Appliances installed in manufactured housing after the initial sale shall be either listed for installation in manufactured housing, ~~or approved.~~

#### 10.28.2

Appliances shall be installed in accordance with the requirements of this code and the manufacturers' installation instructions.

#### 10.28.3

Appliances installed in the living space of manufactured housing shall be in accordance with the requirements of Section 9.3.

### 10.29 Fuel Cell Power Plants.

~~Fuel cell power plants with a power output of less than 50 kW shall be listed in accordance with ANSI/CSA FC 1, *Fuel Cell Technologies — Part 3-100: Stationary Fuel Cell Power Systems — Safety*, and installed in accordance with the manufacturer's instructions. Fuel cell power plants with a power output of greater than 50 kW shall be installed in accordance with NFPA 853.~~

#### 10.29.1

Fuel cell power plants with a power output of less than 50 kW shall be both listed in accordance with ANSI/CSA FC 1, *Fuel Cell Technologies — Part 3-100: Stationary Fuel Cell Power Systems — Safety*, and installed in accordance with the manufacturer's instructions.

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### 10.29.2

Fuel cell power plants with a power output of greater than 50 kW shall be installed in accordance with NFPA 853.

### 10.30.1 Application.

~~Outdoor open flame decorative appliances shall be listed in accordance with ANSI Z21.97/CSA 2.41, Outdoor Decorative Gas Appliances, and shall be installed in accordance with the manufacturer's installation instructions.~~

#### 10.30.1.1

Outdoor open flame decorative appliances shall be listed in accordance with ANSI Z21.97/CSA 2.41, *Outdoor Decorative Gas Appliances*.

#### 10.30.1.2

Outdoor open flame decorative appliances shall be installed in accordance with the manufacturer's installation instructions.

### 10.31 Outdoor Infrared Heaters.

~~Outdoor infrared heaters for residential and commercial applications shall be listed in accordance with ANSI Z83.26/CSA 2.27, Gas-Fired Outdoor Infrared Patio Heaters, and shall be installed in accordance with the manufacturer's installation instructions.~~

#### 10.31.1

Outdoor infrared heaters for residential and commercial applications shall be listed in accordance with ANSI Z83.26/CSA 2.27, *Gas-Fired Outdoor Infrared Patio Heaters*.

#### 10.31.2

Outdoor infrared heaters for residential and commercial applications shall be installed in accordance with the manufacturer's installation instructions.

### 11.1.1\* Adjusting Input.

~~The input rate of the burner shall be adjusted to the proper value in accordance with the appliance manufacturer's instructions. Firing at a rate in excess of the nameplate rating shall be prohibited.~~

#### 11.1.1.1

The input rate of the burner shall be adjusted ~~to the proper value~~ in accordance with the appliance manufacturer's instructions.

#### 11.1.1.2

Firing at a rate in excess of the nameplate rating shall be prohibited.

### 11.1.2 High Altitude.

~~Gas input ratings of appliances shall be used for elevations up to 2000 ft (600 m). The input ratings of appliances operating at elevations above 2000 ft (600 m) shall be reduced in accordance with one of the following methods:~~

- ~~1. At the rate of 4 percent for each 1000 ft (300 m) above sea level before selecting appropriately sized appliance~~
- ~~2. As permitted by the authority having jurisdiction~~
- ~~3. In accordance with the manufacturer's installation instructions~~

#### 11.1.2.1

Gas input ratings of appliances shall be used for elevations up to 2000 ft (600 m).

#### 11.1.2.2

The input ratings of appliances operating at elevations above 2000 ft (600 m) shall be reduced in accordance with one of the following methods:

1. At the rate of 4 percent for each 1000 ft (300 m) above sea level ~~before selecting appropriately sized appliance~~
2. As permitted by the authority having jurisdiction
3. In accordance with the manufacturer's installation instructions

#### 11.2\* Primary Air Adjustment.

~~The primary air for injection (Bunsen)-type burners shall be adjusted for proper flame characteristics in accordance with the appliance manufacturer's instructions. After setting the primary air, the adjustment means shall be secured in position.~~

#### 11.2.1

The primary air for injection (Bunsen)-type burners shall be adjusted for proper flame characteristics in accordance with the appliance manufacturer's instructions.

#### 11.2.2

After setting the primary air, the adjustment means shall be secured in position.

#### 11.3 Safety Shutoff Devices.

~~Where a safety shutoff device is provided, it shall be checked for proper operation and adjustment in accordance with the appliance manufacturer's instructions. Where the device does not turn off the gas supply in the event of pilot outage or other ignition malfunction, the device shall be serviced or replaced with a new device.~~

#### 11.3.1

Where a safety shutoff device is provided, it shall be checked for proper operation and adjustment in accordance with the appliance manufacturer's instructions.

#### 11.3.2

Where the device does not turn off the gas supply in the event of pilot outage or other ignition malfunction, the device shall be serviced or replaced with a new device.

#### 11.4 Automatic Ignition.

~~Appliances supplied with means for automatic ignition shall be checked for operation within the parameters provided by the manufacturer. Any adjustments made shall be in accordance with the manufacturer's installation instructions.~~

#### 11.4.1

Appliances supplied with means for automatic ignition shall be checked for operation within the parameters provided by the manufacturer.

#### 11.4.2

Any adjustments made shall be in accordance with the manufacturer's installation instructions.

### 11.5 Protective Devices.

~~Where required by the manufacturer's installation instructions, all protective devices furnished with the appliance, such as a limit control, fan control to blower, temperature and pressure relief valve, low-water cutoff device, or manual operating features, shall be checked for operation within the parameters provided by the manufacturer. Any adjustments made shall be in accordance with the manufacturer's installation instructions.~~

#### 11.5.1

Where required by the manufacturer's installation instructions, all protective devices furnished with the appliance, such as a limit control, fan control to blower, temperature and pressure relief valve, low-water cutoff device, or manual operating features, shall be checked for operation within the parameters provided by the manufacturer.

#### 11.5.2

Any adjustments made shall be in accordance with the manufacturer's installation instructions.

### 11.7 Operating Instructions.

~~Operating instructions shall be furnished and shall be left in a prominent position near the appliance for use by the consumer.~~

#### 11.7.1

Operating instructions shall be furnished.

#### 11.7.2

Operating instructions shall be left in a prominent position near the appliance for use by the consumer.

### 12.5.2 Plastic Piping.

~~Where plastic piping is used to vent an appliance, the appliance shall be listed for use with such venting materials and the appliance manufacturer's installation instructions shall identify the specific plastic piping material. The plastic pipe venting materials shall be labeled in accordance with the product standards specified by the appliance manufacturer or shall be listed and labeled in accordance with UL 1738, *Venting Systems for Gas-Burning Appliances, Categories II, III, and IV*.~~

#### 12.5.2.1

Where plastic piping is used to vent an appliance, both of the following shall apply:



(1) The appliance shall be listed for use with such venting materials.

(2) The appliance manufacturer's installation instructions shall identify the specific plastic piping material.

#### 12.5.2.2

The plastic pipe venting materials shall be either labeled in accordance with the product standards specified by the appliance manufacturer or ~~shall be~~ listed and labeled in accordance with UL 1738, *Venting Systems for Gas-Burning Appliances, Categories II, III, and IV*.

#### 12.5.3 Plastic Vent Joints.

~~Plastic pipe and fittings used to vent appliances shall be installed in accordance with the appliance manufacturer's installation instructions. Plastic pipe venting materials listed and labeled in accordance with UL 1738, *Venting Systems for Gas-Burning Appliances, Categories II, III, and IV*, shall be installed in accordance with the vent manufacturer's installation instructions. Where primer is required, it shall be of a contrasting color.~~

#### 12.5.3.1

Plastic pipe and fittings used to vent appliances shall be installed in accordance with the appliance manufacturer's installation instructions.

#### 12.5.3.2

Plastic pipe venting materials listed and labeled in accordance with UL 1738, *Venting Systems for Gas-Burning Appliances, Categories II, III, and IV*, shall be installed in accordance with the vent manufacturer's installation instructions.

#### 12.5.3.3

Where primer is required, it shall be of a contrasting color.

#### 12.6.1.1

Factory-built chimneys shall be listed in accordance with UL 103, *Factory-Built Chimneys for Residential Type and Building Heating Appliances*; UL 959, *Medium Heat Appliance Factory-Built Chimneys*; or UL 2561, *1400 Degree Fahrenheit Factory-Built Chimneys*. ~~Factory-built chimneys used to vent appliances that operate at positive vent pressure shall be listed for such application.~~

#### 12.6.1.2

Factory-built chimneys used to vent appliances that operate at positive vent pressure shall be listed for such application.

#### 12.6.4 Inspection of Chimneys.

##### 12.6.4.1

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 shall be cleaned if previously used for venting solid or liquid fuel-burning appliances or fireplaces.~~

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#### 12.6.4.2

The chimney passageway shall be cleaned if previously used for venting solid- or ~~liquid-liquid-fuel-~~ burning appliances or fireplaces.

#### 12.6.4.32

Chimneys shall be lined in accordance with NFPA 211.

#### 12.6.4.43

Cleanouts shall be examined ~~and where they do not remain tightly closed when not in use, they shall be repaired or replaced.~~

#### 12.6.4.5

Where cleanouts they do not remain tightly closed when not in use, they shall be repaired or replaced.

#### 12.6.4.564

When 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 shall be suitable for the appliances to be attached.~~

#### 12.6.4.7

Vents and chimneys shall be suitable for the appliances to be attached.

#### 12.6.5.2

Where one chimney serves gas appliances and ~~liquid-liquid-fuel-~~ burning appliances, the appliances shall be either connected through separate openings or 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 gas appliance is automatically controlled, it shall be equipped with a safety shutoff device.~~

#### 12.6.5.3

Where two or more openings are provided into one chimney flue, they shall be at different levels.

#### 12.6.5.4

Where the gas appliance is automatically controlled, it shall be equipped with a safety shutoff device.

#### 12.6.5.53\*

A listed combination gas- and ~~solid-solid-fuel-~~ burning appliance connected to a single chimney flue shall be equipped with a manual reset device to shut off gas to the main burner in the event of sustained backdraft or flue gas spillage. ~~The chimney flue shall be sized to properly vent the appliance.~~

#### 12.6.5.6

The chimney flue shall be sized to ~~properly~~ vent the appliance.

#### 12.6.6 Support of Chimneys.

~~All portions of chimneys shall be supported for the design and weight of the materials employed. Listed factory-built chimneys shall be supported and spaced in accordance with the manufacturer's installation instructions.~~

#### 12.6.6.1

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

#### 12.6.6.2

Listed factory-built chimneys shall be supported and spaced in accordance with the manufacturer's installation instructions.

#### 12.6.7 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 be installed so its upper edge is at least 6 in. (150 mm) below the lower edge of the lowest chimney inlet opening.~~

#### 12.6.7.1

Where a chimney that formerly carried flue products from liquid\_ or ~~solid~~ solid-fuel--burning appliances is used with an appliance using fuel gas, an accessible cleanout shall be provided.

#### 12.6.7.2

The cleanout shall have a tight-fitting cover and be installed so its upper edge is at least 6 in. (150 mm) below the lower edge of the lowest chimney inlet opening.

#### 12.6.9 Insulation Shield.

~~Where a factory-built chimney passes through insulated assemblies, an insulation shield constructed of steel having a minimum thickness of 0.0187 in. (0.4712 mm) (nominal 26 gage) shall be installed to provide clearance between the chimney and the insulation material. The clearance shall not be less than the clearance to combustibles specified by the chimney manufacturer's installation instructions. Where chimneys pass through attic space, the shield shall terminate not less than 2 in. (51 mm) above the insulation materials and shall be secured in place to prevent displacement.~~

#### 12.6.9.1

Where a factory-built chimney passes through insulated assemblies, an insulation shield constructed of steel having a minimum thickness of 0.0187 in. (0.4712 mm) (nominal 26 gage) shall be installed to provide clearance between the chimney and the insulation material.

#### 12.6.9.2

The clearance shall not be less than the clearance to combustibles specified by the chimney manufacturer's installation instructions.

#### 12.6.9.3

Where chimneys pass through attic space, both of the following shall apply:

- (1) The shield shall terminate not less than 2 in. (51 mm) above the insulation materials.

(2) The shield shall be secured in place to prevent displacement.

## 12.7 Gas Vents.

### 12.7.1 Materials.

~~Type B and Type BW gas vents shall be listed in accordance with UL 441, Gas Vents. Vents for listed combination gas- and oil-burning appliances shall be listed in accordance with UL 641, Type L Low-Temperature Venting Systems.~~

#### 12.7.1.1

Type B and Type BW gas vents shall be listed in accordance with UL 441, *Gas Vents*.

#### 12.7.1.2

Vents for listed combination gas- and oil-burning appliances shall be listed in accordance with UL 641, *Type L Low-Temperature Venting Systems*.

### 12.7.4.2 Vent Offsets.

~~Type B and Type L vents sized in accordance with 12.7.4.1(3) or 12.7.4.1(4) shall extend in a generally vertical direction with offsets not exceeding 45 degrees, except that a vent system having not more than one 60-degree offset shall be permitted. Any angle greater than 45 degrees from the vertical is considered horizontal. The total horizontal distance of a vent plus the horizontal vent connector serving draft hood-equipped appliances shall not be greater than 75 percent of the vertical height of the vent.~~

#### 12.7.4.2.1

Type B and Type L vents sized in accordance with 12.7.4.1(3) or 12.7.4.1(4) shall extend in a generally vertical direction with offsets not exceeding 45 degrees, except that a vent system having not more than one ~~60-60~~-degree offset shall be permitted.

#### 12.7.4.2.2

Any angle greater than 45 degrees from the vertical is considered horizontal.

#### 12.7.4.2.3

The total horizontal distance of a vent plus the horizontal vent connector serving ~~draft-draft~~-hood--equipped appliances shall not be greater than 75 percent of the vertical height of the vent.

### 12.7.4.3 Category II, Category III, and Category IV Appliances.

~~The sizing of gas vents for Category II, Category III, and Category IV appliances shall be in accordance with the appliance manufacturers' instructions. The sizing of plastic pipe specified by the appliance manufacturer as a venting material for Category II, III, and IV appliances shall be in accordance with the appliance manufacturers' instructions.~~

#### 12.7.4.3.1

The sizing of gas vents for Category II, Category III, and Category IV appliances shall be in accordance with the appliance manufacturers' instructions.

#### 12.7.4.3.2

The sizing of plastic pipe specified by the appliance manufacturer as a venting material for Category II, III, and IV appliances shall be in accordance with the appliance manufacturers' instructions.

#### 12.7.5.1

Where a common vent is installed in a multistory installation to vent Category I appliances located on more than one floor level, the venting system shall be designed and installed in accordance with engineering methods. ~~Crawl spaces, basements, and attics shall be considered as floor levels.~~

#### 12.7.5.2

Crawl spaces, basements, and attics shall be considered as floor levels.

#### 12.7.7 Marking.

~~In those localities where solid and liquid fuels are used extensively, 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." The authority having jurisdiction shall determine whether its area constitutes such a locality.~~

#### 12.7.7.1

In those localities where solid and liquid fuels are used extensively, 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.

#### 12.7.7.2

The label ~~stated in 12.7.7.1~~ shall read: "This gas vent is for appliances that burn gas. Do not connect to solid\_ or ~~liquid-liquid-~~fuel\_ burning appliances or incinerators."

#### 12.7.7.3

The authority having jurisdiction shall determine whether its area constitutes such a locality.

#### 12.8.4.2

Single-wall metal pipe shall be used only for runs directly from the space in which the appliance is located through the roof or exterior wall to the outer air. ~~A pipe passing through a roof shall extend without interruption through the roof flashing, roof jacket, or roof thimble.~~

#### 12.8.4.3

A pipe passing through a roof shall extend without interruption through the roof flashing, roof jacket, or roof thimble.

#### 12.8.4.4~~3~~

Single-wall metal pipe shall ~~not-neither~~ originate in any unoccupied attic or concealed space ~~and shall notnor~~ pass through any attic, inside wall, concealed space, or floor.

#### 12.8.4.5~~4~~

Minimum clearances from single-wall metal pipe to combustible material shall be in accordance with Table 12.8.4.4. ~~Reduced clearances from single-wall metal pipe to combustible material shall be as specified for vent connectors in Table 10.2.4.~~

#### 12.8.4.6

Reduced clearances from single-wall metal pipe to combustible material shall be as specified for vent connectors in Table 10.2.4.

#### 12.8.4.5

Where a single-wall metal pipe passes through a roof constructed of combustible material, a noncombustible, nonventilating thimble shall be used at the point of passage. ~~The thimble shall extend at least 18 in. (460 mm) above and 6 in. (150 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 12.8.4.6.~~

#### 12.8.4.6

The thimble ~~stated in 12.8.4.5~~ shall extend at least 18 in. (460 mm) above and 6 in. (150 mm) below the roof with the annular space open at the bottom and closed only at the top.

#### 12.8.4.7

The thimble ~~stated in 12.8.4.5~~ shall be sized in accordance with 12.8.4.~~86~~.

#### 12.8.4.~~86~~

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 with draft hoods and appliances listed for use with Type B gas vents, the thimble shall be a minimum of 4 in. (100 mm) larger in diameter than the metal pipe. ~~Where there is a run of not less than 6 ft (1.8 m) of metal pipe in the opening between the draft hood outlet and the thimble, the thimble shall be a minimum of 2 in. (50 mm) larger in diameter than the metal pipe.~~
- 1.2. For listed appliances with draft hoods and appliances listed for use with Type B gas vents and ~~Where~~ where there is a run of not less than 6 ft (1.8 m) of metal pipe in the opening between the draft hood outlet and the thimble, the thimble shall be a minimum of 2 in. (50 mm) larger in diameter than the metal pipe.
- 2.3. For unlisted appliances having draft hoods, the thimble shall be a minimum of 6 in. (150 mm) larger in diameter than the metal pipe.
- 3.4. For residential and low-heat appliances, the thimble shall be a minimum of 12 in. (300 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.~~

#### 12.8.4.9

~~In lieu of Where a thimble protection is not installed, the following shall be required permitted.;~~

1. ~~a~~ 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.
- ~~1.2.~~ Any material used to ~~seal~~ ~~close up~~ ~~such an~~ opening shall be noncombustible.

#### 12.8.5 Size of Single-Wall Metal Pipe.

Single-wall metal piping shall comply with the following requirements:

1. \*A venting system of a single-wall metal pipe shall be sized in accordance with one of the following methods and the appliance manufacturer's instructions:
  - a. For a ~~draft~~ ~~draft~~ ~~hood~~ ~~equipped~~ appliance, in accordance with Chapter 13.
  - b. For a venting system for a single appliance with a draft hood, ~~the areas of the connector and the pipe each shall not be 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.~~ the following:
    - i. The areas of the connector and the pipe each shall not be less than the area of the appliance flue collar or draft hood outlet, whichever is smaller.
    - ii. The vent area shall not be greater than seven times the draft hood outlet area.
  - ~~b-c.~~ Engineering methods.
2. Where a single-wall metal pipe is used and has a shape other than round, it shall have an equivalent effective area equal to the effective area of the round pipe for which it is substituted and the minimum internal dimension of the pipe shall be 2 in. (50 mm).
3. The vent cap or a roof assembly shall have a venting capacity not less than that of the pipe to which it is attached.

#### 12.11.2.4

A vent connector for a nonresidential 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 12.11.2.4. ~~Factory-built chimney sections shall be joined together in accordance with the chimney manufacturer's instructions.~~

#### 12.11.2.5

Factory-built chimney sections shall be joined together in accordance with the chimney manufacturer's instructions.

#### 12.11.2.6

Vent connectors for medium-heat appliances shall be constructed of factory-built, medium-heat chimney sections or steel of a thickness not less than that specified in Table 12.11.2.5 ~~and~~ shall comply with the following:

#### 12.11.2.57

Vent connectors for medium-heat appliances ~~shall be constructed of factory built, medium heat chimney sections or steel of a thickness not less than that specified in Table 12.11.2.5 and~~ shall comply with the following:

1. A steel vent connector for an appliance with a vent gas temperature in excess of 1000°F (538°C) measured at the entrance to the connector shall be lined with medium-duty fire brick or the equivalent.

2. The lining shall be at least 2½ in. (64 mm) thick for a vent connector having a diameter or greatest cross-sectional dimension of 18 in. (460 mm) or less.
3. The lining shall be at least 4½ in. (110 mm) thick laid on the 4½ in. (110 mm) bed for a vent connector having a diameter or greatest cross-sectional dimension greater than 18 in. (460 mm).
4. Where factory-built chimney sections are installed, they shall be joined together in accordance with the chimney manufacturer's instructions.

#### 12.11.3.2

Where a single appliance having more than one draft hood outlet or flue collar is installed, 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 engineering methods. As an alternative 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 ft (0.3 m) rise.~~

#### 12.11.3.3

Where there are no instructions, the manifold shall be designed and constructed in accordance with engineering methods.

#### 12.11.3.4

As an alternative method, the effective area of the manifold shall be in accordance with the following:

1. The effective area shall be equal the combined area of the flue collars or draft hood outlets.
2. The vent connectors shall have a minimum 1 ft (0.3 m) rise.

#### 12.11.9.2

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. ~~The maximum length of an individual connector for a chimney or vent system serving multiple appliances, from the appliance outlet to the junction with the common vent or another connector, shall be 100 percent of the height of the chimney or vent.~~

#### 12.11.9.3

The maximum length of an individual connector for a chimney or vent system serving multiple appliances, from the appliance outlet to the junction with the common vent or another connector, shall be 100 percent of the height of the chimney or vent.

#### 12.13.3 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 manufacturer's instructions. In the absence of manufacturer's instructions, the device shall be attached to the flue collar of the appliance or as near to the appliance as practical.~~

#### 12.13.3.1

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 manufacturer's instructions.

#### 12.13.3.2



In the absence of manufacturer's instructions, the device shall be attached to the flue collar of the appliance or as near to the appliance as practical.

#### 12.13.4\* Additional Devices.

Appliances requiring controlled chimney draft shall be permitted to be equipped with listed double-acting barometric draft regulators installed and adjusted in accordance with the manufacturer's instructions.

#### 12.13.5 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.

#### 12.13.6 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.~~

##### 12.13.6.1

Draft hoods and draft regulators shall be installed in the position for which they were designed with reference to the horizontal and vertical planes.

##### 12.13.6.2

Draft hoods and draft regulators shall be located so that the relief opening is not obstructed by any part of the appliance or adjacent construction.

##### 12.13.6.3

The appliance and its draft hood shall be located so that the relief opening is accessible for checking vent operation.

#### 12.13.7 Clearance.

~~A draft hood shall be located so that its relief opening is not less than 6 in. (150 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 not be less than that specified on the label. Such clearances shall not be reduced.~~

##### 12.13.7.1

A draft hood shall be located so that its relief opening is not less than 6 in. (150 mm) from any surface except that of the appliance it serves and the venting system to which the draft hood is connected.

##### 12.13.7.2

Where a greater or lesser clearance is indicated on the appliance label, the clearance shall not be less than that specified on the label.

### 12.13.7.3

~~The~~Such clearances in 12.13.7 shall not be reduced.

### 12.14.1

A manually operated damper shall not be placed in any appliance vent connector. ~~Fixed baffles and balancing baffles shall not be classified as manually operated dampers.~~

### 12.14.2

Fixed baffles and balancing baffles shall not be classified as manually operated dampers.

### 12.16 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 manufacturer's installation instructions~~
- ~~2.—Approved draft regulators and safety controls designed and installed in accordance with engineering methods~~
- ~~3.—Listed heat reclaimers and automatically operated vent dampers installed in accordance with the manufacturers' installation instructions~~
- ~~4.—Vent dampers serving listed appliances installed in accordance with 13.1.1 or 13.2.1 or engineering methods~~
- ~~5.—Approved economizers, heat reclaimers, and recuperators installed in venting systems of appliances not required to be equipped with draft hoods, provided the appliance manufacturer's instructions cover the installation of such a device in the venting system and performance in accordance with Section 12.1 and 12.4.1 is obtained~~

### 12.16.1

Devices that retard the flow of vent gases shall not be installed in a vent connector, chimney, or vent.

### 12.16.2

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 manufacturer's installation instructions
2. Approved draft regulators and safety controls designed and installed in accordance with engineering methods
3. Listed heat reclaimers and automatically operated vent dampers installed in accordance with the manufacturers' installation instructions
4. Vent dampers serving listed appliances installed in accordance with 13.1.1 or 13.2.1 or engineering methods
5. Approved economizers, heat reclaimers, and recuperators installed in venting systems of appliances not required to be equipped with draft hoods, provided the appliance manufacturer's instructions cover the installation of such a device in the venting system and performance in accordance with Section 12.1 and 12.4.1 is obtained

### 13.1.1 Obstructions and Vent Dampers.

~~Venting Table 13.1(a) through Table 13.1(f) shall not be used where obstructions 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 though 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.~~

#### 13.1.1.1

Venting Table 13.1(a) through Table 13.1(f) shall not be used where obstructions are installed in the venting system.

#### 13.1.1.2

The installation of vents serving listed appliances with vent dampers shall be either 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 though the appliance were a fan-assisted appliance, using the "FAN Min" column to determine the minimum capacity of the vent system.
3. Where the corresponding "Fan Min" is "NA," both of the following shall apply:
  - a) The vent configuration shall not be permitted.
  - a)b) An alternative venting configuration shall be utilized.

### 13.1.2 Vent Downsizing.

~~Where the vent size determined from the tables is smaller than the appliance draft hood outlet or flue collar, the use of the smaller size shall be permitted, provided that the installation complies with all of the following requirements:~~

- ~~1. The total vent height (*H*) is at least 10 ft (3 m).~~
- ~~2. Vents for appliance draft hood outlets or flue collars 12 in. (300 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 in. (300 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 in. (100 mm) in diameter. A 3 in. (80 mm) diameter vent shall not be connected to a 4 in. (100 mm) diameter draft hood outlet. This provision shall not apply to fan-assisted appliances.~~

#### 13.1.2.1

Where the vent size determined from the tables is smaller than the appliance draft hood outlet or flue collar, the use of the smaller size shall be permitted, provided that the installation complies with all of the following ~~requirements~~:

1. The total vent height (H) is at least 10 ft (3 m).
2. Vents for appliance draft hood outlets or flue collars 12 in. (300 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 in. (300 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 in. (100 mm) in diameter.

#### 13.1.2.2

A 3 in. (80 mm) diameter vent shall not be connected to a 4 in. (100 mm) diameter draft hood outlet.

#### 13.1.2.3

~~This provision~~ The provision in 13.1.2.1(5) shall not apply to fan-assisted appliances.

#### 13.1.3 Elbows.

~~Single-appliance venting configurations with zero (0) lateral lengths in Table 13.1(a), Table 13.1(c), and Table 13.1(f) shall not have elbows in the venting system. Single-appliance venting with lateral lengths include two 90-degree elbows. For each additional elbow up to and including 45 degrees, the maximum capacity listed in the venting tables shall be reduced by 5 percent. For each additional elbow greater than 45 degrees up to and including 90 degrees, 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 Table 13.1(a) through Table 13.1(e).~~

#### 13.1.3.1\*

Single-appliance venting configurations with zero (0) lateral lengths in Table 13.1(a), Table 13.1(c), and Table 13.1(f) shall not have elbows in the venting system.

#### A.13.1.3.1

Single-appliance venting with lateral lengths include two ~~90-90~~-degree elbows.

#### 13.1.3.2

For each additional elbow up to and including 45 degrees, the maximum capacity listed in the venting tables shall be reduced by 5 percent.

#### 13.1.3.3

For each additional elbow greater than 45 degrees up to and including 90 degrees, the maximum capacity listed in the venting tables shall be reduced by 10 percent.

#### 13.1.3.4

Where multiple offsets occur in a vent, the total lateral length of all offsets combined shall not exceed that specified in Table 13.1(a) through Table 13.1(e).

#### 13.1.4 Zero Lateral.

Zero (0) lateral (L) shall apply only to a straight vertical vent attached to a top outlet draft hood or flue collar.

#### 13.1.5 High-Altitude Installations.

##### 13.1.5.1

Sea level input ratings shall be used when determining maximum capacity for high-altitude installation. ~~Actual input (derated for altitude) shall be used for determining minimum capacity for high-altitude installation.~~

##### 13.1.5.2

Actual input (derated for altitude) shall be used for determining minimum capacity for high-altitude installation.

#### 13.1.7\* Corrugated Chimney Liners.

~~Listed corrugated metallic chimney liner systems in masonry chimneys shall be sized by using Table 13.1(a) or Table 13.1(c) for Type B vents, with the maximum capacity reduced by 20 percent (0.80 × maximum capacity) and the minimum capacity as shown in Table 13.1(a) or Table 13.1(c). Corrugated metallic liner systems installed with bends or offsets shall have their maximum capacity further reduced in accordance with 13.1.3. The 20 percent reduction for corrugated metallic chimney liner systems includes an allowance for one long radius 90-degree turn at the bottom of the liner.~~

##### 13.1.7.1

Listed corrugated metallic chimney liner systems in masonry chimneys shall be sized by using Table 13.1(a) or Table 13.1(c) for Type B vents, with the maximum capacity reduced by 20 percent (0.80 × maximum capacity) and the minimum capacity as shown in Table 13.1(a) or Table 13.1(c).

##### 13.1.7.2

Corrugated metallic liner systems installed with bends or offsets shall have their maximum capacity further reduced in accordance with 13.1.3.

##### 13.1.7.3

The 20 percent reduction for corrugated metallic chimney liner systems includes an allowance for one long radius 90-degree turn at the bottom of the liner.

#### 13.1.8 Connection to Chimney Liners.

Connections between chimney liners and listed double-wall connectors shall be made with listed adapters designed for such purpose.

#### 13.1.9 Vertical Vent Upsizing/7 × Rule.

~~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 engineering methods.~~

#### 13.1.9.1

Where the vertical vent has a larger diameter than the vent connector, both of the following shall apply:

- (1) The vertical vent diameter shall be used to determine the minimum vent capacity.
- (2) The connector diameter shall be used to determine the maximum vent capacity.

#### 13.1.9.2

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 engineering methods.

#### 13.1.11 Chimneys and Vent Locations.

~~Table 13.1(a) through Table 13.1(f) 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. Where vents extend outdoors above the roof more than 5 ft (1.5 m) higher than required by Table 12.7.3, and where vents terminate in accordance with 12.7.3(1)(b), the outdoor portion of the vent shall be enclosed as required by this paragraph for vents not considered to be exposed to the outdoors, or such venting system shall be engineered. A Type B vent passing through an unventilated enclosure or chase insulated to a value of not less than R8 shall not be considered to be exposed to the outdoors. Table 13.1(d) in combination with Table 13.1(g) shall be used for clay tile lined exterior masonry chimneys, provided all of the following requirements are met:~~

- ~~1. The vent connector is Type B double wall.~~
- ~~2. The vent connector length is limited to 18 in./in. (18 mm/mm) of vent connector diameter.~~
- ~~3. The appliance is draft hood equipped.~~
- ~~4. The input rating is less than the maximum capacity given in Table 13.1(d).~~
- ~~5. For a water heater, the outdoor design temperature shall not be less than 5°F (-15°C).~~
- ~~6. For a space heating appliance, the input rating is greater than the minimum capacity given by Table 13.1(g).~~

#### 13.1.11.1

Table 13.1(a) through Table 13.1(f) shall be used only for chimneys and vents not exposed to the outdoors below the roof line.

#### 13.1.11.2

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.

#### 13.1.11.3

Where vents extend outdoors above the roof more than 5 ft (1.5 m) higher than required by Table 12.7.3, and where vents terminate in accordance with 12.7.3(1)(b), one of the following shall apply:

- ~~(1)~~ The outdoor portion of the vent shall be enclosed as required by ~~this paragraph~~ 13.1.11 for vents not considered to be exposed to the outdoors.
- ~~(1)(2)~~ The venting system shall be engineered.

#### 13.1.11.4

A Type B vent passing through an unventilated enclosure or chase insulated to a value of not less than R8 shall not be considered to be exposed to the outdoors.

#### 13.1.11.5

Table 13.1(d) in combination with Table 13.1(g) shall be used for ~~clay-clay-tile--~~ lined exterior masonry chimneys, provided all of the following ~~requirements~~ are met:

1. The vent connector is Type B double wall.
2. The vent connector length is limited to 18 in./in. (18 mm/mm) of vent connector diameter.
3. The appliance is draft hood equipped.
4. The input rating is less than the maximum capacity given in Table 13.1(d).
5. For a water heater, the outdoor design temperature ~~shall is~~ not be less than 5°F (-15°C).
6. For a space-heating appliance, the input rating is greater than the minimum capacity given by Table 13.1(g).

### 13.2.1 Obstructions and Vent Dampers.

~~Venting Table 13.2(a) through Table 13.2(j) shall not be used where obstructions 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, as follows:~~
  - ~~1. The minimum capacity of the vent connector shall be determined using the FAN Min column.~~
  - ~~2. The FAN+FAN column shall be used when the second appliance is a fan-assisted appliance, and the FAN+NAT column shall be used when 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.~~

#### 13.2.1.1

Venting Table 13.2(a) through Table 13.2(j) shall not be used where obstructions are installed in the venting system.

### 13.2.1.2

The installation of vents serving listed appliances with vent dampers shall be either 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, as follows:
  - a. The minimum capacity of the vent connector shall be determined using the FAN Min column.
  - b. The FAN+FAN column shall be used when the second appliance is a fan-assisted appliance.
  - c. The FAN+NAT column shall be used when the second appliance is equipped with a draft hood, to determine whether the vertical vent or chimney configuration is not ~~permitted~~ applicable (NA).
  - d. Where the vent configuration is NA, both of the following shall apply:
    - i. The vent configuration shall not be permitted.
    - ii. An alternative venting configuration shall be utilized.

### 13.2.3 Vent Connector Exceeding Maximum Length.

~~The vent connector shall be routed to the vent utilizing the shortest possible route. Connectors with longer horizontal lengths than those listed in Table 13.2.2 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 listed in Table 13.2.2. For example, the maximum length listed for a 4 in. (100 mm) connector is 6 ft (1.8 m). With a connector length greater than 6 ft (1.8 m) but not exceeding 12 ft (3.7 m), the maximum capacity must be reduced by 10 percent (0.90 × maximum vent connector capacity). With a connector length greater than 12 ft (3.7 m) but not exceeding 18 ft (5.5 m), 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 13.1(a) shall be used. For single-wall connectors, Table 13.1(c) 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.~~

### 13.2.3.1

The vent connector shall be routed to the vent utilizing the shortest possible route.

### 13.2.3.2

Connectors with longer horizontal lengths than those listed in Table 13.2.2 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 listed in Table 13.2.2. For example, the maximum length listed for a 4 in. (100 mm) connector is 6 ft (1.8 m). With a connector length greater than 6 ft (1.8 m) but not exceeding 12 ft (3.7 m), the maximum capacity must be reduced by 10 percent (0.90 × maximum vent connector capacity). With a connector length greater than 12 ft (3.7 m) but not exceeding 18 ft (5.5 m), 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.
3. For Type B double-wall connectors, Table 13.1(a) shall be used.
4. For single-wall connectors, Table 13.1(c) shall be used.
- ~~2.5.~~ 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.

#### A.13.2.3.2(1)

~~For example, the maximum length listed for a 4 in. (100 mm) connector is 6 ft (1.8 m). With a connector length greater than 6 ft (1.8 m) but not exceeding 12 ft (3.7 m), the maximum capacity must be reduced by 10 percent (0.90 × maximum vent connector capacity). With a connector length greater than 12 ft (3.7 m) but not exceeding 18 ft (5.5 m), the maximum capacity must be reduced by 20 percent (0.80 × maximum vent capacity).~~

### 13.2.4 Vent Connector Manifolds.

~~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 manifold ( $LM$ ) shall not exceed 18 in./in. (18 mm/mm) of common vent diameter ( $D$ ).~~

#### 13.2.4.1

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.

#### 13.2.4.2

The length of the common vent manifold ( $LM$ ) shall not exceed 18 in./in. (18 mm/mm) of common vent diameter ( $D$ ).

### 13.2.5 Vent Offsets.

~~Where the common vertical vent is offset, the maximum capacity of the common vent shall be reduced in accordance with 13.2.6 and the horizontal length of the common vent offset shall not exceed 18 in./in. (18 mm/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 18 in./in. (18 mm/mm) of the common vent diameter.~~

#### 13.2.5.1

Where the common vertical vent is offset, both of the following shall apply:

- (1) The maximum capacity of the common vent shall be reduced in accordance with 13.2.6.
- (2) The horizontal length of the common vent offset shall not exceed 18 in./in. (18 mm/mm) of common vent diameter (*D*).

#### 13.2.5.2

Where multiple offsets occur in a common vent, the total horizontal length of all offsets combined shall not exceed 18 in./in. (18 mm/mm) of the common vent diameter.

#### 13.2.6 Elbows in Vents.

~~For each elbow up to and including 45 degrees 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 up to and including 90 degrees, the maximum common vent capacity listed in the venting tables shall be reduced by 10 percent.~~

##### 13.2.6.1

For each elbow up to and including 45 degrees in the common vent, the maximum common vent capacity listed in the venting tables shall be reduced by 5 percent.

##### 13.2.6.2

For each elbow greater than 45 degrees up to and including 90 degrees, the maximum common vent capacity listed in the venting tables shall be reduced by 10 percent.

#### 13.2.7\* Elbows in Connectors.

~~The vent connector capacities listed in the common vent sizing tables include allowance for two 90 degree elbows. For each additional elbow up to and including 45 degrees, the maximum vent connector capacity listed in the venting tables shall be reduced by 5 percent. For each elbow greater than 45 degrees up to and including 90 degrees, the maximum vent connector capacity listed in the venting tables shall be reduced by 10 percent.~~

##### A.13.2.7

The vent connector capacities listed in the common vent sizing tables include allowance for two ~~90-90~~-degree elbows.

##### 13.2.7.1

For each additional elbow up to and including 45 degrees, the maximum vent connector capacity listed in the venting tables shall be reduced by 5 percent.

##### 13.2.7.2

For each elbow greater than 45 degrees up to and including 90 degrees, the maximum vent connector capacity listed in the venting tables shall be reduced by 10 percent.

#### 13.2.10 Tee and Wye Sizing.

~~At the point where tee or wye fittings connect to a common gas 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 gas vent connectors.~~

#### 13.2.10.1

At the point where tee or wye fittings connect to a common gas vent, the opening size of the fitting shall be equal to the size of the common vent.

#### 13.2.10.2

Such fittings ~~as stated in 13.2.10.1~~ shall not be prohibited from having ~~reduced-reduced~~-size openings at the point of connection of appliance gas vent connectors.

#### 13.2.11 High-Altitude Installations.

~~Sea level input ratings shall be used when determining maximum capacity for high altitude installation. Actual input (derated for altitude) shall be used for determining minimum capacity for high altitude installation.~~

#### 13.2.11.1

Sea level input ratings shall be used when determining maximum capacity for high-altitude installation.

#### 13.2.11.2

Actual input (derated for altitude) shall be used for determining minimum capacity for high-altitude installation.

#### 13.2.16 Multistory B Vents Required.

Where used in multistory systems, vertical common vents shall be ~~Type B double wall and shall be installed with a listed vent cap in in~~ accordance with the following:

1. Type B double wall;
- ~~1.2.~~ Installed with a listed vent cap;

#### 13.2.17 Multistory Vent Offsets and Capacity.

~~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 from vertical.
- ~~2.~~ The horizontal length of the offset shall not exceed 18 in./in. (18 mm/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 x maximum common vent capacity).
- ~~4.~~ A multistory common vent shall not be reduced in size above the offset.

#### 13.2.17.1

Offsets in multistory common vent systems shall be limited to a single offset in each system.

### 13.2.17.2

Systems with an offset shall comply with all of the following:

1. The offset angle shall not exceed 45 degrees from vertical.
2. The horizontal length of the offset shall not exceed 18 in./in. (18 mm/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.

### 13.2.19.1

The minimum vent connector capacity (FAN Min) of appliances with more than one input rate shall be determined from the tables ~~and shall be less than the lowest appliance input rating.~~

### 13.2.19.2

The minimum vent connector capacity (FAN Min) of appliances shall be less than the lowest appliance input rating.

### 13.2.20\* Corrugated Chimney Liners.

~~Listed corrugated metallic chimney liner systems in masonry chimneys shall be sized by using Table 13.2(a) or Table 13.2(c) 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 13.2(a) or Table 13.2(c). Corrugated metallic liner systems installed with bends or offsets shall have their maximum capacity further reduced in accordance with 13.2.5 and 13.2.6. The 20 percent reduction for corrugated metallic chimney liner systems includes an allowance for one long radius 90-degree turn at the bottom of the liner.~~

### 13.2.20.1\*

Listed corrugated metallic chimney liner systems in masonry chimneys shall be sized by using Table 13.2(a) or Table 13.2(c) 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 13.2(a) or Table 13.2(c).

### 13.2.20.2

Corrugated metallic liner systems installed with bends or offsets shall have their maximum capacity further reduced in accordance with 13.2.5 and 13.2.6.

#### A.13.2.20.1

The 20 percent reduction for corrugated metallic chimney liner systems includes an allowance for one ~~long long~~ radius 90-degree turn at the bottom of the liner.

### 13.2.21 Connections to Chimney Liners.

~~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.~~

#### 13.2.21.1

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.

#### 13.2.21.2

Connections between chimney liners and listed double-wall fittings shall be made with listed adapter fittings designed for such purpose.

#### 13.2.22 Chimneys and Vent Locations.

~~Table 13.2(a) through Table 13.2(f) 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 passing through an unventilated enclosure or chase insulated to a value of not less than R8 shall not be considered to be exposed to the outdoors. Where vents extend outdoors above the roof more than 5 ft (1.5 m) higher than required by Table 12.7.3, and where vents terminate in accordance with 12.7.3(1)(b), the outdoor portion of the vent shall be enclosed as required by this paragraph for vents not considered to be exposed to the outdoors, or such venting system shall be engineered. Table 13.2(g), Table 13.2(h), Table 13.2(i), and Table 13.2(j) shall be used for clay tile lined exterior masonry chimneys, provided all 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 13.2(g) (for NAT+NAT) or Table 13.2(i) (for FAN+NAT).~~
- ~~4. The input rating of each space heating appliance is greater than the minimum input rating given by Table 13.2(h) (for NAT+NAT) or Table 13.2(j) (for FAN+NAT).~~
- ~~5. The vent connector sizing is in accordance with Table 13.2(d).~~

#### 13.2.22.1

Table 13.2(a) through Table 13.2(f) shall be used only for chimneys and vents not exposed to the outdoors below the roof line.

#### 13.2.22.2

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.

#### 13.2.22.3

A Type B vent passing through an unventilated enclosure or chase insulated to a value of not less than R8 shall not be considered to be exposed to the outdoors.

#### 13.2.22.4

Where vents extend outdoors above the roof more than 5 ft (1.5 m) higher than required by Table 12.7.3, and where vents terminate in accordance with 12.7.3(1)(b), one of the following shall apply:

(1) The outdoor portion of the vent shall be enclosed as required by ~~this paragraph~~ 13.2.22 for vents not considered to be exposed to the outdoors.

(2) The venting system shall be engineered.

#### 13.2.22.5

Table 13.2(g), Table 13.2(h), Table 13.2(i), and Table 13.2(j) shall be used for clay tile-lined exterior masonry chimneys, provided all 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 13.2(g) (for NAT+NAT) or Table 13.2(i) (for FAN+NAT).
4. The input rating of each space-heating appliance is greater than the minimum input rating given by Table 13.2(h) (for NAT+NAT) or Table 13.2(j) (for FAN+NAT).
5. The vent connector sizing is in accordance with Table 13.2(d).

#### 13.2.24 Vent Connector Sizing.

~~Vent connectors shall not be increased 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 in. (300 mm) in diameter or smaller are not reduced by more than one table size [e.g., 12 in. to 10 in. (300 mm to 250 mm) is a one-size reduction], and those larger than 12 in. (300 mm) in diameter are not reduced more than two table sizes [e.g., 24 in. to 20 in. (610 mm to 510 mm) is a two-size reduction].~~
- ~~2. The fan-assisted appliance(s) is common vented with a draft hood equipped appliance(s).~~
- ~~3. The vent connector has a smooth interior wall.~~

#### 13.2.24.1

Vent connectors shall not be increased more than two sizes greater than the listed appliance categorized vent diameter, flue collar diameter, or draft hood outlet diameter.

#### 13.2.24.2

Vent connectors for draft hood-equipped appliances shall not be smaller than the draft hood outlet diameter.

#### 13.2.24.3

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 in. (300 mm) in diameter or smaller are not reduced by more than one table size [e.g., 12 in. to 10 in. (300 mm to 250 mm) is a one-size reduction], and those larger than 12 in. (300 mm) in diameter are not reduced more than two table sizes [e.g., 24 in. to 20 in. (610 mm to 510 mm) is a two-size reduction].
2. The fan-assisted appliance(s) is common vented with a draft\_hood-equipped appliance(s).
3. The vent connector has a smooth interior wall.

#### 13.2.25 Multiple Vent and Connector Sizes.

~~All combinations of pipe sizes, single-wall metal pipe, 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 shall be sized using Table 13.2(c) or Table 13.2(e) as appropriate.~~

##### 13.2.25.1

All combinations of pipe sizes, single-wall metal pipe, and double-wall metal pipe shall be allowed within any connector run(s) or within the common vent, provided ~~ALL~~all of the ~~appropriate~~applicable tables permit ~~ALL~~all of the desired sizes and types of pipe, as if they were used for the entire length of the subject connector or vent.

##### 13.2.25.2

Where single-wall and Type B double-wall metal pipes are used for vent connectors within the same venting system, the common vent shall be sized using Table 13.2(c) or Table 13.2(e) as ~~appropriate~~applicable.



## Second Revision No. 32-NFPA 54-2022 [ Global Comment ]

See attached Word document regarding revisions revising exceptions and other Manual of Style corrections.

### Supplemental Information

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
SR_32_Exception_Revisions.docx	See Word Document for changes.	
NFPA_54_SR_32_Exceptions_for_ballot.docx	for ballot	

### Submitter Information Verification

**Committee:** NFG-AAA

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### Committee Statement

**Committee Statement:** Exceptions are being rewritten into requirements where possible. Additional NFPA Manual of Style changes are also being addressed.

**Response Message:** SR-32-NFPA 54-2022



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#### **4.2.1 Notification of Interrupted Service.**

~~When the gas supply is to be turned off, it shall be the duty of the qualified agency to notify all affected users. Where two or more users are served from the same supply system, precautions shall be exercised to ensure that service only to the proper user is turned off.~~

##### **4.2.1.1**

When the gas supply is to be turned off, ~~it~~ the qualifying agency shall ~~be the duty of the qualified agency~~ to notify all affected users.

##### **4.2.1.2**

~~When the gas supply is to be turned off in~~ in cases of emergency, affected users shall be notified as soon as possible of the actions taken by the qualified agency.

##### **4.2.1.3**

Where two or more users are served from the same supply system, precautions shall be exercised to ensure that service only to the proper user is turned off.

~~Exception: In cases of emergency, affected users shall be notified as soon as possible of the actions taken by the qualified agency.~~

#### **5.3.2.3**

~~The basis for pipe sizing shall be either the total hourly load, assuming all appliances are operating at full capacity simultaneously, or the total hourly load adjusted with established load diversity factors. The total connected hourly load shall be used as the basis for piping sizing, assuming all appliances are operating at full capacity simultaneously.~~

~~Exception: Sizing shall be permitted to be based upon established load diversity factors.~~

#### **5.5.7.1\* Pipe Joints.**

~~Schedule 40 and heavier pipe joints shall be threaded, flanged, brazed, welded, or assembled with press-connect fittings listed to ANSI LC 4/CSA 6.32, Press-Connect Metallic Fittings for Use in Fuel Gas Distribution Systems. Pipe shall be joined in accordance with the following:~~

(1) Schedule 40 and heavier pipe joints shall be threaded, flanged, brazed, welded, or assembled with press-connect fittings listed to ANSI LC 4/CSA 6.32, *Press-Connect Metallic Fittings for Use in Fuel Gas Distribution Systems*.

(2) Pipe lighter than Schedule 40 shall be connected using press-connect fittings, flanges, brazing, or welding.

(3) Where nonferrous pipe is brazed, the brazing materials shall have a melting point in excess of 1000°F (538°C).

~~(4)~~ Brazing alloys shall not contain more than 0.05 percent phosphorus.

~~(A)~~ [Move text to (2)]

~~Pipe lighter than Schedule 40 shall be connected using press-connect fittings, flanges, brazing, or welding.~~

~~(B)~~ [Move text to (3)]

~~Where nonferrous pipe is brazed, the brazing materials shall have a melting point in excess of 1000°F (538°C).~~

~~(C)~~ [Move text to (4)]

~~Brazing alloys shall not contain more than 0.05 percent phosphorus.~~

#### 5.5.7.5 Metallic Pipe Fittings.

Metallic fittings shall comply with the following:

1. Threaded fittings in sizes larger than 4 in. (100 mm) shall not be used.
2. Fittings used with steel, stainless steel, or wrought-iron pipe shall be steel, stainless steel, copper alloy, malleable iron, or cast iron.
3. Fittings used with copper or copper alloy pipe shall be copper or copper alloy.
4. Fittings used with aluminum alloy pipe shall be aluminum alloy.
5. ~~Cast Iron Fittings.~~ Cast-iron fittings shall comply with the following:
  - a. Flanges shall be permitted.
  - b. Bushings shall not be used.
  - c. Fittings shall not be used in systems containing flammable gas-air mixtures.
  - d. Fittings in sizes 4 in. (100 mm) and larger shall not be used indoors unless approved.
  - e. Fittings in sizes 6 in. (150 mm) and larger shall not be used unless approved.
6. ~~Aluminum Alloy Fittings.~~ Threads shall not form the joint seal in aluminum alloy fittings.
7. Zinc ~~Aluminum-aluminum Alloy-alloy Fittings.~~ Fittings-fittings shall not be used in systems containing flammable gas-air mixtures.
8. Special ~~Fittings.~~ Fittings-fittings such as couplings, proprietary-type joints, saddle tees, gland-type compression fittings, and flared, flareless, or compression-type tubing fittings shall be as follows:
  - a. Used within the fitting manufacturer's pressure-temperature recommendations
  - b. Used within the service conditions anticipated with respect to vibration, fatigue, thermal expansion, or contraction
  - c. ~~Acceptable to the authority having jurisdiction~~ Approved
9. When pipe fittings are drilled and tapped in the field, the operation shall be in accordance with the following:
  - a. ~~The operation shall be p~~Performed on systems having operating pressures of 5 psi (34 kPa) or less.

- b. ~~The operation shall be p~~Performed by the gas supplier or their designated representative.
- c. ~~The drilling and tapping operation shall be p~~Performed in accordance with written procedures prepared by the gas supplier.
- ~~d. The fittings shall be located outdoors.~~
- e.d. ~~The tapped fitting assembly shall be inspected~~ Inspected and proven to be free of leaks.

#### 5.8.3.1

Overpressure protection devices shall be one of the following:

1. Pressure relief valve.
2. Monitor regulator.
3. Series regulator installed upstream from the line regulator and set to continuously limit the pressure on the inlet of the line regulator to the maximum values specified by 5.8.2.1 or less.
4. Automatic shutoff device installed in series with the line pressure regulator and set to shut off when the pressure on the downstream piping system reaches the maximum values specified by 5.8.2.1 or less. ~~This device shall be designed so that it will and~~ remains closed until manually reset.

#### 5.8.4 Construction and Installation.

All overpressure protection devices shall meet the following requirements:

1. Be constructed of materials so that the operation of the device is not impaired by corrosion of external parts by the atmosphere or of internal parts by the gas.
2. ~~Be designed and installed so they can be operated to determine whether the valve is free-~~  
~~2.3. The devices shall also be~~ Be designed and installed so they can be tested to determine the pressure at which they operate and be examined for leakage when in the closed position.

#### 6.2 Sizing Natural Gas Piping Systems.

~~Sizing of piping systems shall be in accordance with 6.2.1 or 6.2.2.~~

##### 6.2.1

~~Where natural gas piping systems are sized using tables, either Table 6.2.1(a) through Table 6.2.1(x) or the sizing tables supplied by a manufacturer of a listed gas piping system shall be used in conjunction with one of the methods described in 6.1.26.1.1 through 6.1.46.1.3 for piping materials other than non-corrugated stainless steel tubing.~~

Tables 6.2.1(a)—6.2.1(x) here.

##### 6.2.2

~~Where natural gas piping systems are sized using equations, Section 6.4 shall be used in conjunction with one of the methods described in 6.1.26.1.1 through 6.1.46.1.3 for non-corrugated stainless steel tubing.~~

### 6.3 Sizing Propane Piping Systems.

~~Sizing of piping systems shall be in accordance with 6.3.1 or 6.3.2.~~

#### 6.3.1

~~Where undiluted propane piping systems are sized using tables, either Table 6.3.1 (a) through Table 6.1.3 (m) or the sizing tables supplied by a manufacturer of a listed gas piping system shall be used in conjunction with one of the methods described in 6.1.26.1.1 through 6.1.46.1.3 for piping materials other than non-corrugated stainless steel tubing.~~

Tables 6.3.1(a)—6.3.1(m) here.

#### 6.3.2

~~Where undiluted propane piping systems are sized using equations, Section 6.4 shall be used in conjunction with one of the methods described in 6.1.26.1.1 through 6.1.46.1.3 for non-corrugated stainless steel tubing.~~

Revise **note (1) in Tables 6.2.1(o), (p), (q), (s)** to remove the requirement and revise as follows:

(1) Table includes losses for four ~~90-90~~-degree bends and two end fittings. ~~For Tubing-tubing~~ runs with larger numbers of bends ~~and/or~~ fittings, ~~shall be~~ increased by an equivalent length of tubing to the following equation:  $L = 1.3n$ , where  $L$  is additional length (ft) of tubing and  $n$  is the number of additional fittings ~~and/or~~ bends.

Revise **note (3) in Tables 6.2.1(r) and (s)** to remove the requirement and revise as follows

(3) Table includes losses for four ~~90-90~~-degree bends and two end fittings. ~~For Tubing-tubing~~ runs with larger numbers of bends ~~and/or~~ fittings, ~~shall be~~ increased by an equivalent length of tubing to the following equation:  $L = 1.3n$ , where  $L$  is additional length (ft) of tubing and  $n$  is the number of additional fittings ~~and/or~~ bends.

Revise **note (1) in Table 6.3.1 (h) and note (3) in Tables 6.3.1(i) and (j)** to remove the requirement and revise as follows

Table includes losses for four ~~90-90~~-degree bends and two end fittings. ~~For Tubing-tubing~~ runs with larger numbers of bends ~~and/or~~ fittings, ~~shall be~~ increased by an equivalent length of tubing to the following equation:  $L = 1.3n$ , where  $L$  is additional length (ft) of tubing and  $n$  is the number of additional fittings ~~and/or~~ bends.

#### 7.1.2.1 Cover Requirements.

Underground piping systems shall be installed ~~with a minimum of 12 in. (300 mm) of cover in accordance with any of the following:~~

**(1)** A minimum of 12 in. (300 mm) of cover

~~(2) The A~~ minimum ~~cover shall be increased to of~~ 18 in. (460 mm) if external damage to the pipe or tubing from external forces is likely to result.

~~(3)~~ Where a minimum of 12 in. (300 mm) of cover cannot be provided, the piping ~~shall be~~ installed in conduit.

~~(A)~~

~~The minimum cover shall be increased to 18 in. (460 mm) if external damage to the pipe or tubing from external forces is likely to result.~~

~~(B)\*~~

~~Where a minimum of 12 in. (300 mm) of cover cannot be provided, the piping shall be installed in conduit.~~

#### 7.1.3.2

Underground piping shall comply with one or more of the following unless approved technical justification is provided to demonstrate that protection is unnecessary:

1. The piping ~~is shall be~~ made of corrosion-resistant material that is suitable for the environment in which it will be installed.
2. Pipe ~~has shall have~~ a factory-applied, electrically insulating coating.
- ~~2.3.~~ Fittings and joints between sections of coated pipe ~~are shall be~~ coated in accordance with the coating manufacturer's instructions.
- ~~3.4.~~ The piping ~~has shall have~~ a cathodic protection system in-stalled, and the system ~~is shall be~~ maintained in accordance with 7.1.3.3 or 7.1.3.6.

#### 7.1.3.4

Sacrificial anodes shall be tested in accordance with the following schedule:

1. Upon installation of the cathodic protection system, except where prohibited by climatic conditions, in which case the testing ~~shall be~~ performed not later than 180 days after the installation of the system
2. 12 to 18 months after the initial test
3. Upon successful verification testing in accordance with 7.1.3.4(1) and 7.1.3.4(2), periodic follow-up testing ~~is shall be~~ performed at intervals not to exceed 36 months

#### 7.1.7.1 Connection of Plastic Piping.

Plastic pipe shall be installed outdoors underground only unless one of the following apply: Plastic piping shall be installed outdoors, underground only.

(1) Terminated above ground using an anodeless riser.

(2) Terminated with a wall head adapter aboveground in buildings, including basements, where the plastic piping is inserted in a piping material permitted for use in buildings.

~~Exception No. 1: Plastic piping shall be permitted to terminate aboveground where an anodeless riser is used.~~

~~Exception No. 2: Plastic piping shall be permitted to terminate with a wall head adapter aboveground in buildings, including basements, where the plastic piping is inserted in a piping material permitted for use in buildings.~~

### 7.5.1 Metallic Pipe.

Metallic pipe bends shall comply with the following:

1. Bends ~~are~~ shall be made only with bending tools and procedures intended for that purpose.
2. All bends ~~are~~ shall be smooth and free from buckling, cracks, or other evidence of mechanical damage.
3. The longitudinal weld of the pipe ~~is~~ shall be near the neutral axis of the bend.
4. Pipe ~~is~~ shall not be bent through an arc of more than 90 degrees.
5. The inside radius of a bend ~~is~~ shall be not less than ~~6~~ six times the outside diameter of the pipe.

### 7.5.2 Plastic Pipe.

Plastic pipe bends shall comply with the following:

- ~~1.~~ The pipe ~~is~~ shall not be damaged, ~~and the internal diameter of the pipe shall not be effectively reduced.~~
- ~~1-2.~~ The internal diameter of the pipe ~~shall is~~ not be effectively reduced.
- ~~2-3.~~ Joints ~~are~~ shall not be located in pipe bends.
- ~~3-4.~~ The radius of the inner curve of such bends ~~is~~ shall not be less than 25 times the inside diameter of the pipe.
- ~~4-5.~~ ~~Where~~ Tools specified by the piping manufacturer specifies the use of special bending tools or procedures, such tools or procedures ~~are~~ shall be ~~to be~~ used.

### 7.7.2 Cap All Outlets.

#### 7.7.2.1

Each outlet, including ~~outlets with~~ valves, shall be closed gastight with a threaded plug or cap immediately after installation ~~and shall be left closed until the appliance or equipment is connected thereto. When an appliance or equipment is disconnected from an outlet and the outlet is not to be used again immediately, it shall be capped or plugged gastight.~~

~~Exception No. 1: Laboratory appliances installed in accordance with 9.6.2(1) shall be permitted.~~

~~Exception No. 2: The use of a listed quick-disconnect device with integral shutoff or listed gas convenience outlet shall be permitted.~~

#### 7.7.2.2

Each outlet, including outlets with valves, shall be left closed until the appliance or equipment is connected thereto.

#### 7.7.2.3

When an appliance or equipment is disconnected from an outlet and the outlet is not to be used again immediately, it shall be capped or plugged gastight.

#### 7.7.2.4

Laboratory appliances installed in accordance with 9.6.2(1) shall be permitted to not have a threaded plug or cap.

#### 7.7.2.5

The use of a listed quick-disconnect device with integral shutoff or listed gas convenience outlet shall be permitted to be used in place of a threaded plug or cap.

#### 7.3.7 Drilled and Tapped Fittings.

Drilled and tapped fittings shall be located outdoors.

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#### **7.11.6 Use of Automatic Firechecks, Safety Blowouts, or Backfire Preventers.**

Automatic firechecks and safety blowouts or backfire preventers shall be provided in piping systems distributing flammable air–gas mixtures from gas-mixing machines to protect the piping and the machines in the event of flashback, in accordance with the following:

1. \*Approved automatic firechecks shall be installed upstream as close as practical to the burner inlets following the firecheck manufacturers' instructions.
2. A separate manually operated gas valve shall be provided at each automatic firecheck for shutting off the flow of the gas–air mixture through the firecheck after a flashback has occurred. The valve shall be located upstream as close as practical to the inlet of the automatic firecheck. Caution: ~~these~~ These valves shall not be reopened after a flashback has occurred until the firecheck has cooled sufficiently to prevent re-ignition of the flammable mixture and has been reset properly.
3. \*A safety blowout or backfiring preventer shall be provided in the mixture line near the outlet of each gas-mixing machine where the size of the piping is larger than 2 1/2 in. (64 mm) NPS, or equivalent, to protect the mixing equipment in the event of an explosion passing through an automatic firecheck. The manufacturers' instructions shall be followed when installing these devices, particularly after a disc has burst.
4. The discharge from the safety blowout or backfire preventer shall be located or shielded so that particles from the ruptured disc cannot be directed toward personnel.
- ~~3-5.~~ 5. Wherever there are interconnected installations of gas-mixing machines with safety blowouts or backfire preventers, provision ~~5~~ shall be made to keep the mixture from other machines from reaching any ruptured disc opening. Check valves shall not be used for this purpose.
- ~~4-6.~~ 6. Large-capacity premix systems provided with explosion heads (rupture discs) to relieve excessive pressure in pipelines shall be located at and vented to a safe outdoor location.

Provisions shall be provided for automatically shutting off the supply of the gas–air mixture in the event of rupture.

#### **A.7.11.6(3)**

This is particularly applicable after a disc has burst.

### **7.13 Electrical Circuits.**

~~Electrical circuits shall not utilize gas piping or components as conductors.~~

~~Exception: Low voltage (50 V or less) control circuits, ignition circuits, and electronic flame detection device circuits shall be permitted to make use of piping or components as a part of an electric circuit.~~

#### **7.13.1**

Electrical circuits at greater than 50 V shall not utilize gas piping or components as conductors.

#### **7.13.2**

~~Low voltage (50 V or less) control~~Control circuits, ignition circuits, and electronic flame detection device circuits operating at 50 V or less shall be permitted to ~~make use of~~ piping or components as a part of an electric circuit.

#### **8.1.1.11\***

Prior to pressure testing, the interior of the pipe shall be cleared of all foreign material.

#### **8.1.1.8**

~~Under no circumstances shall a valve~~Valves in a line shall not be used as a bulkhead between gas in one section of the piping system and test medium in an adjacent section, unless a double block and bleed valve system is installed.

#### **8.1.3.1**

Pipe joints, including welds, other than covered or concealed pipe end joints that have been previously tested in accordance with this code, 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.~~

#### **8.3.2.1\* Purging Procedure.**

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

1. The piping shall be both purged with fuel gas and shall discharged to the outdoors.
2. The piping shall be both purged with fuel gas and shall discharged to the indoors or outdoors through an appliance burner not located in a combustion chamber that is. ~~Such burner shall be provided with a continuous source of ignition.~~
3. The piping shall be both purged with fuel gas and shall discharged 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 both purged with fuel gas that is discharged to the indoors or outdoors, and at the point of discharge, ~~shall be~~ monitored with a listed combustible gas detector in accordance with 8.3.2.2 ~~until. Purging shall be stopped when~~ fuel gas is detected.
5. The piping shall be purged by the gas supplier in accordance with written procedures.

#### 9.1.2 Added or Converted Appliances.

When additional or replacement appliances or equipment ~~is-are~~ installed, or an appliance is converted to gas from another fuel, the location in which the appliances or equipment ~~is-are~~ to be operated shall be checked to verify the following:

1. Air for combustion and ventilation is provided where required, in accordance with the provisions of Section 9.3 ~~and, or Where~~ where existing facilities are ~~not inadequate, they-the existing facilities shall be~~ upgraded to meet Section 9.3 specifications.
2. The installation components and appliances meet the clearances to the combustible material provisions of 9.2.2 ~~by determining. It shall be determined~~ that the installation and operation of the additional or replacement appliances do not render the remaining appliances unsafe for continued operation.
3. The venting system is constructed and sized in accordance with the provisions of Chapter 12 ~~or, Where~~ where the existing venting system, ~~is not adequate, does not comply with Chapter 12, it shall be~~ upgraded to comply with Chapter 12.

#### 9.1.18 Bleed Lines for Diaphragm-Type Valves.

Bleed lines shall comply with the following requirements:

1. Diaphragm-type valves shall be equipped to convey bleed gas to the outdoors or into the combustion chamber adjacent to a continuous pilot.
2. In the case of bleed lines leading outdoors, means shall be employed to prevent water from entering this piping and also to prevent blockage of vents by insects and foreign matter.
3. Bleed lines shall not terminate in the appliance flue or exhaust system.
4. ~~In the case of Where~~ bleed lines ~~entering enter~~ the combustion chamber, ~~the bleed line shall be located so the bleed gas is readily ignited by the pilot and the heat liberated thereby does not adversely affect the normal operation of the safety shutoff system. The terminus of the bleed line shall be securely held in a fixed position relative to the pilot. For manufactured gas, the need for a flame arrester in the bleed line piping shall be determined.~~ all of the following shall apply:
  - a) The bleed line shall be located so the bleed gas is readily ignited by the pilot and the heat liberated thereby does not adversely affect the normal operation of the safety shutoff system.
  - b) The terminus of the bleed line shall be securely-secured held in a fixed position relative to the pilot.
  - c) ~~Where~~ For manufactured gas is used, the need for a flame arrester in the bleed line piping shall be determined.
- 4.5. A bleed line(s) from a diaphragm-type valve and a vent line(s) from an appliance pressure regulator shall ~~not-neither~~ be connected to a common manifold terminating in a combustion chamber. ~~Bleed lines shall not nor~~ terminate in positive-pressure-type combustion chambers.

### 9.3.1.1

Air for combustion, ventilation, and dilution of flue gases for appliances installed in buildings shall be obtained by application of one of the methods covered in 9.3.2 through 9.3.6. ~~Where the requirements of 9.3.2 are not met, outdoor air shall be introduced in accordance with methods covered in 9.3.3 through 9.3.6.~~

~~Exception No. 1: This provision shall not apply to direct vent appliances.~~

~~Exception No. 2: Type 1 clothes dryers that are provided with make-up air in accordance with 10.4.4.~~

#### 9.3.1.1.1

Where the requirements of 9.3.2 are not met, and the appliance is not a direct-vent appliance or a Type 1 clothes dryer that is provided with make-up air in accordance with 10.4.4, outdoor air shall be introduced in accordance with methods covered in 9.3.3 through 9.3.6.

### 9.3.2.2

Where the air infiltration rate of a structure is known and is 0.6 ACH or lower, the minimum required volume shall be determined as follows:

1. For appliances other than fan assisted, calculate using the following equation:  
[9.3.2.2a]
2. For fan-assisted appliances, calculate using the following equation:  
[9.3.2.2b]  
where:  
I<sub>other</sub> = all appliances other than fan-assisted input (Btu/hr)  
I<sub>fan</sub> = fan-assisted appliance input (Btu/hr)  
ACH = air change per hour (percent of volume of space exchanged per hour, expressed as a decimal)
3. ~~For purposes of these calculations, an infiltration rate greater than 0.60 ACH shall not be used in Equations 9.3.2.2a and 9.3.2.2b.~~

### 9.3.8.1

Ducts shall be constructed of galvanized steel or a material having equivalent corrosion resistance, strength, and rigidity.

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

#### 9.3.8.2

Within dwellings units, unobstructed stud and joist spaces shall be permitted ~~not be prohibited from to~~ conveying combustion air, provided that not more than one fireblock is removed.

### 9.3.8.7

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The remaining space surrounding a chimney liner, gas vent, special gas vent, or plastic piping installed within a masonry, metal, or ~~factory-factory~~-built chimney shall not be used to supply combustion air.

~~Exception: Direct vent appliances designed for installation in a solid fuel-burning fireplace where installed in accordance with the manufacturer's installation instructions.~~

### **9.3.8.8**

Direct-vent appliances designed for installation in a solid-fuel-burning fireplace shall be permitted to be installed in the remaining space surrounding a chimney liner where installed in accordance with the manufacturer's installation instructions.

### **9.6.1 Connecting Appliances and Equipment.**

Appliances and equipment shall be connected to the building piping in compliance with 9.6.5 through 9.6.7 by one of the following:

1. Rigid metallic pipe and fittings.
2. Semirigid metallic tubing and metallic fittings other than ~~Aluminum-aluminum~~ alloy tubing shall not be used in exterior locations.
3. A One connector for gas appliances listed in accordance with ANSI Z21.24/CSA 6.10, *Connectors for Gas Appliances*, where ~~The connector shall be~~ used in accordance with the manufacturer's installation instructions and located shall be in the same room as the appliance. Only one connector shall be used per appliance.
4. A One connector for outdoor gas appliances and manufactured homes listed in accordance with ANSI Z21.75/CSA 6.27, *Connectors for Outdoor Gas Appliances and Manufactured Homes*. Only one connector shall be used per appliance.
5. One length of CSST where installed to connect appliances fixed in place in accordance with the manufacturer's installation instructions and ~~CSST shall not be~~ directly routed into a metallic appliance enclosure where the appliance is connected to a metallic vent that terminates above a roofline. CSST shall connect only to appliances that are fixed in place.
6. Listed nonmetallic gas hose connectors in accordance with 9.6.2.
7. Unlisted gas hose connectors for use in laboratories and educational facilities in accordance with 9.6.3.

### **9.6.1.5\* 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 in accordance with ANSI Z21.24/CSA 6.10, *Connectors for Gas Appliances* in accordance with the following:

(1) A connector shall be listed for the application in accordance with ANSI Z21.24/CSA 6.10, *Connectors for Gas Appliances*.

(2) The connector shall be installed in accordance with the tube heater installation instructions.

(3) The connector shall be installed in the same room as the appliance.

(4) Only one connector shall be used per appliance.

~~(A)~~

~~The connector shall be installed in accordance with the tube heater installation instructions and shall be in the same room as the appliance.~~

~~(B)~~

~~Only one connector shall be used per appliance.~~

### 9.6.2 Use of Nonmetallic Gas Hose Connectors.

Listed gas hose connectors shall be used in accordance with the manufacturer's installation instructions and as follows:

1. ~~Indoor.~~ Indoor gas hose connectors shall be both used only to connect laboratory, shop, and ironing appliances requiring mobility during operation and installed in accordance with the following:
  - a. An appliance shutoff valve shall be installed where the connector is attached to the building piping.
  - b. The connector shall be both of minimum length and ~~shall~~ not exceed 6 ft (1.8 m).
  - c. The connector shall ~~not neither~~ be concealed ~~and shall not nor~~ extend from one room to another or pass through wall partitions, ceilings, or floors.
2. ~~Outdoor.~~ Where outdoor gas hose connectors are used to connect portable outdoor appliances, the connector shall be both listed in accordance with ANSI Z21.54/CSA 8.4, *Gas Hose Connectors for Portable Outdoor Gas-Fired Appliances*, and installed in accordance with the following:
  - a. An appliance shutoff valve, a listed quick-disconnect device, or a listed gas convenience outlet shall be installed where the connector is attached to the supply piping and in such a manner so as to prevent the accumulation of water or foreign matter.
  - b. ~~This~~ The connection in 9.6.2(a) shall be made only in the outdoor area where the appliance is to be used.

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#### 9.6.5.1

The shutoff valve shall be located within 6 ft (1.8 m) of the appliance it serves except as permitted in 9.6.5.2 or 9.6.5.3.

##### ~~(A)~~ 9.6.5.1.1

~~Where a connector is used, the valve shall be installed upstream of the connector. A union or flanged connection shall be provided downstream from the valve to permit removal of appliance controls.~~

##### 9.6.5.1.2

A union or flanged connection shall be provided downstream from the valve to permit removal of appliance controls.

~~(B)~~ **9.6.5.1.3**

Shutoff valves serving decorative appliances in a fireplace shall not be located within the fireplace firebox except where the valve is listed for such use.

**9.6.5.2**

Shutoff valves serving appliances installed in vented fireplaces and ventless firebox enclosures shall not be required to be located within 6 ft (1.8 m) of the appliance where such valves are readily accessible and permanently identified. ~~The piping from the shutoff valve to within 6 ft (1.8 m) of the appliance shall be designed, sized, installed, and tested in accordance with Chapters 5, 6, 7, and 8.~~

**9.6.5.3**

The piping from the shutoff valve to within 6 ft (1.8 m) of the appliance shall be designed, sized, installed, and tested in accordance with Chapters 5, 6, 7, and 8.

~~9.6.5.4~~ **9.6.5.43**

Where installed at a manifold, the appliance shutoff valve shall be ~~located within 50 ft (15 m) of the appliance served and shall be readily accessible and permanently identified. The piping from the manifold to within 6 ft (1.8 m) of the appliance shall be designed, sized, installed, and tested in accordance with Chapters 5, 6, 7, and 8.~~ all of the following:

- (1) Located within 50 ft (15 m) of the appliance served
- (2) Readily accessible
- (3) Permanently identified

**9.6.5.5**

The piping from the manifold to within 6 ft (1.8 m) of the appliance shall be designed, sized, installed, and tested in accordance with Chapters 5, 6, 7, and 8.

**10.3.4 Assembly and Installation.**

A central heating boiler or furnace shall be installed in accordance with the manufacturer's instructions in one of the following manners:

1. On a floor of noncombustible construction with noncombustible flooring and surface finish and with no combustible material against the underside thereof
2. On fire-resistive slabs or arches having no combustible material against the underside thereof
- ~~2.3.~~ Appliances listed for installation on a combustible floor.
- ~~3.4.~~ Installation on a floor protected in an approved manner.

~~Exception No. 1: Appliances listed for installation on a combustible floor.~~

~~Exception No. 2: Installation on a floor protected in an approved manner.~~

### **10.7.2\* Prohibited Installations.**

Vented gas fireplaces, ~~other than direct-vent gas fireplaces~~, shall not be installed in bathrooms or bedrooms unless the bedroom or bathroom has the required volume in accordance with 9.3.2.

*Exception: Direct vent gas fireplaces.*

### **10.9.2 Clearances.**

Duct furnaces shall be installed with clearances of at least 6 in. (150 mm) between adjacent walls, ceilings, and floors of combustible material, and the furnace draft hood, ~~and shall comply with the following:~~

- ~~1. Duct furnaces listed for installation at lesser clearances shall be installed in accordance with the manufacturer's installation instructions.~~
- ~~2. The clearance shall not interfere with combustion air and accessibility.~~

#### **10.9.2.1**

Duct furnaces listed for installation at lesser clearances shall be installed in accordance with the manufacturer's installation instructions.

#### **10.9.2.2**

The clearance shall not interfere with combustion air and accessibility.

#### **10.9.7.1**

~~Where a duct furnace is installed in conjunction with a refrigeration coil, the blower shall have capacity to overcome the external static resistance imposed by the duct system, the furnace, the cooling coil, and the air throughput necessary for heating or cooling, whichever is greater. A duct furnace shall not be installed in conjunction with a refrigeration coil where circulation of cooled air is provided by the blower.~~

*Exception: Where the blower has sufficient capacity to overcome the external static resistance imposed by the duct system, the furnace, and the cooling coil and the air throughput necessary for heating or cooling, whichever is greater.*

#### **10.9.7.2**

Duct furnaces used in conjunction with cooling appliances shall be installed in parallel with, or on the upstream side of, cooling coils to avoid condensation within heating elements. ~~With a parallel flow arrangement, the dampers or other means used to control the flow of air shall be sufficiently tight to prevent any circulation of cooled air through the unit.~~

*Exception: Where the duct furnace has been specifically listed for downstream installation.*

### **10.9.7.3**

~~With a~~Where parallel flow arrangement is used, either the dampers or other means used to control the flow of air shall be ~~sufficiently tight~~ tight so as to prevent any circulation of cooled air through the unit.

### **10.9.7.4**

~~Where the duct~~Duct furnace ~~listed for downstream installations shall be permitted~~ has been specifically listed for downstream installation.

## **10.10.2 Installation.**

~~The installation of floor furnaces shall comply with the following requirements:~~

- ~~1. Floor furnaces shall be installed in accordance with the manufacturers' installation instructions.~~
- ~~2. Thermostats controlling floor furnaces shall not be located in a room or space that can be separated from the room or space in which the register of the floor furnace is located.~~

### **10.10.2.1**

Floor furnaces shall be installed in accordance with the manufacturers' installation instructions.

### **10.10.2.2**

Thermostats controlling floor furnaces shall not be located in a room or space that can be separated from the room or space in which the register of the floor furnace is located.

## **10.14.2.2 Open-Flame Type.**

~~Clearance~~ Open-flame-type appliances shall comply with the following:

- ~~1. Unlisted open-flame illuminating appliances installed outdoors shall have clearances from combustible material not less than that specified in Table 10.14.2.2. The distance from ground level to the base of the burner shall be a minimum of 7 ft (2.1 m) where installed within 2 ft (0.6 m) of walkways. Lesser clearances shall be permitted to be used where acceptable to the authority having jurisdiction.~~
- ~~1.2.~~ The distance from ground level to the base of the burner shall be a minimum of 7 ft (2.1 m) where installed within 2 ft (0.6 m) of walkways or lower where approved.
- ~~2.3.~~ Unlisted open-flame illuminating appliances installed outdoors shall be equipped with a limiting orifice or other limiting devices that maintain a flame height consistent with the clearance from combustible material, as given in Table 10.14.2.2.
- ~~3.4.~~ Appliances designed for flame heights in excess of 30 in. (760 mm) shall be both approved. ~~Such appliances shall be and~~ equipped with a safety shutoff device or automatic ignition.
- ~~4.5.~~ The clearance to combustible materials from unlisted open-flame illuminating appliances installed indoors shall be approved. ~~Clearances to combustible material from unlisted open-flame illuminating appliances shall be approved.~~

## **10.16.3 Clearance.**

The installation of infrared heaters shall meet the ~~following~~ clearance requirements: in 10.16.3.1 and 10.16.3.2.

- ~~1. Listed heaters shall be installed with clearances from combustible material in accordance the manufacturer's installation instructions.~~
- ~~2.1. Unlisted heaters shall be installed in accordance with clearances from combustible material acceptable to the authority having jurisdiction.~~
- ~~3. In locations used for the storage of combustible materials, signs shall be posted to specify the maximum permissible stacking height to maintain required clearances from the heater to the combustibles.~~

#### 10.16.3.1

Clearance from combustible materials to unlisted heaters shall be approved.

#### 10.16.3.2

~~In locations~~ Locations used for the storage of combustible materials, ~~signs~~ shall have signs be posted to specify the maximum permissible stacking height to maintain required clearances from the heater to the combustibles.

#### **10.19.3 Clearance.**

~~The installation of pool heaters shall meet the following requirements:~~ The clearances Clearances shall not interfere with combustion air, draft hood or vent terminal clearance and relief, and or accessibility for servicing.

~~(1) The clearances shall not interfere with combustion air, draft hood or vent terminal clearance and relief, and accessibility for servicing.~~

~~(2) A pool heater shall be installed in accordance with the manufacturer's installation instructions.~~

#### **10.21.2\* Installation in Bathrooms and Bedrooms** ~~Prohibited Installations.~~

Unvented room heaters ~~shall not be~~ installed in bathrooms or bedrooms shall comply with 10.21.2.1 and 10.21.2.2.

~~Exception No. 1: Where approved, one listed wall-mounted, unvented room heater equipped with an oxygen depletion safety shutoff system shall be permitted to be installed in a bathroom, provided that the input rating does not exceed 6000 Btu/hr (1760 W/hr) and combustion and ventilation air is provided as specified in 10.1.2.~~

~~Exception No. 2: Where approved, one listed wall-mounted unvented room heater equipped with an oxygen depletion safety shutoff system shall be permitted to be installed in a bedroom, provided that the input rating does not exceed 10,000 Btu/hr (2930 W/hr) and combustion and ventilation air is provided as specified in 10.1.2.~~

#### 10.21.2.1



Where approved, one listed, wall-mounted, unvented room heater equipped with an oxygen depletion safety shutoff system shall be permitted to be installed in a bathroom, provided that the input rating does not exceed 6000 Btu/hr (1760 W/hr) and combustion and ventilation air is provided as specified in 10.1.2.

#### **10.21.2.2**

Where approved, one listed, wall-mounted, unvented room heater equipped with an oxygen depletion safety shutoff system shall be permitted to be installed in a bedroom, provided that the input rating does not exceed 10,000 Btu/hr (2930 W/hr) and combustion and ventilation air is provided as specified in 10.1.2.

#### **12.3.2 Appliances Not Required to Be Vented.**

The following appliances shall not be required to be vented:

1. Listed ranges
2. Built-in domestic cooking units listed and marked for optional venting
3. Listed hot plates
4. Listed Type 1 clothes dryers exhausted in accordance with Section 10.4
5. A single listed booster-type (automatic instantaneous) water heater, when designed and used solely for the sanitizing rinse requirements of a dishwashing machine, provided ~~that the appliance is installed with the draft hood in place and unaltered, if a draft hood is required, in a commercial kitchen having a mechanical exhaust system [Where installed in this manner, the draft hood outlet shall not be less than 36 in. (910 mm) vertically and 6 in. (150 mm) horizontally from any surface other than the appliance.]~~ the following criteria are met:
  - a. ~~That~~ the appliance ~~is~~ shall be installed with the draft hood in place and unaltered, if a draft hood is required, in a commercial kitchen having a mechanical exhaust system.
  - a-b. ~~The~~ draft hood outlet shall not be less than 36 in. (910 mm) vertically and 6 in. (150 mm) horizontally from any surface other than the appliance.
- ~~5-6.~~ Listed refrigerators
- ~~6-7.~~ Counter appliances
- ~~7-8.~~ Room heaters listed for unvented use
- ~~8-9. Direct-Direct-gas--~~ fired make-up air heaters
- ~~9-10.~~ Other appliances listed for unvented use and not provided with flue collars
- ~~10-11.~~ Specialized appliances of limited input such as laboratory burners or gas lights

#### **12.6.1.3\***

Masonry chimneys shall be both built and installed in accordance with NFPA 211 and lined with one of the following:

1. Approved clay flue lining
2. A chimney lining system listed and labeled in accordance with UL 1777, *Chimney Liners*
3. Other approved material that resists corrosion, erosion, softening, or cracking from vent gases at temperatures up to 1800°F (982°C)

~~Exception: Masonry chimney flues lined with a chimney lining system specifically listed for use with listed appliances with draft hoods, Category I appliances, and other appliances listed for use with Type B vents shall be permitted. The liner shall be installed in accordance with the liner manufacturer's installation instructions. 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."~~

#### **12.6.1.4**

Masonry chimney flues lined with a chimney lining system specifically listed for use with listed appliances with draft hoods, Category I appliances, and other appliances listed for use with Type B vents shall be permitted.

##### **12.6.1.4.1**

A permanent identifying label shall be attached at the point where the connection is to be made to the liner.

##### **12.6.1.4.2**

The label ~~referenced in 12.6.1.4.1~~ shall read "This chimney liner is for appliances that burn gas only. Do not connect to solid\_ or ~~liquid-liquid-fuel-~~burning appliances or incinerators."

#### **12.6.3.1**

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 in accordance with one of the following methods:

1. ~~Those~~The methods listed in Chapter 13 ~~shall be used~~.
2. The effective areas of the vent connector and chimney flue of a venting system serving a single appliance with a draft hood shall be not less than the area of the appliance flue collar or draft hood outlet or greater than seven times the draft hood outlet area.
3. The effective area of the chimney flue of a venting system serving two appliances with draft hoods 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 or greater than seven times the smaller draft hood outlet area.
4. Chimney venting systems using mechanical draft shall be sized in accordance with engineering methods.
5. ~~Other engineering~~Engineering methods ~~shall be used~~.

#### **12.6.8.1**

The remaining space surrounding a chimney liner, gas vent, special gas vent, or plastic piping installed within a masonry chimney shall not be used to vent another appliance.

~~Exception: The insertion of another liner or vent within the chimney as provided in this code and the liner or vent manufacturer's instructions.~~

#### **12.6.8.2**

The insertion of another liner or vent shall be permitted within the chimney as provided in this code and the liner or vent manufacturer's instructions.

#### **12.6.8.3~~2~~**

The remaining space surrounding a chimney liner, gas vent, special gas vent, or plastic piping installed within a masonry, metal, or factory-built chimney flue shall not be used to supply combustion air.

*Exception: Direct vent appliances designed for installation in a solid fuel-burning fireplace where installed in accordance with the manufacturer's installation instructions.*

#### **12.6.8.4**

Direct-vent appliances designed for installation in a ~~solid-solid~~-fuel-burning fireplace shall be permitted where installed in accordance with the manufacturer's installation instructions.

### **12.7.2 Installation.**

The installation of gas vents shall meet the following requirements:

- ~~1.—Gas vents shall be installed in accordance with the manufacturer's installation instructions.~~
- ~~2.—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.~~
- ~~3.—Gas vents installed within masonry chimneys shall be installed in accordance with 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."~~
- ~~4.—Screws, rivets, and other fasteners shall not penetrate the inner wall of double-wall gas vents, except at the transition from the appliance draft hood outlet, flue collar, or single-wall metal connector to a double-wall vent.~~

#### **12.7.2.1**

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.

#### **12.7.2.2**

Gas vents installed within masonry chimneys shall be installed in accordance with the manufacturer's installation instructions.

##### **12.7.2.2.1**

Gas vents installed within masonry chimneys shall be identified with a permanent label installed at the point where the vent enters the chimney.

##### **12.7.2.2.2**

The label shall contain the following language: "This gas vent is for appliances that burn gas. Do not connect to solid- or ~~liquid-liquid~~-fuel-burning appliances or incinerators."

### **12.7.2.3**

Screws, rivets, and other fasteners shall not penetrate the inner wall of double-wall gas vents, except at the transition from the appliance draft hood outlet, flue collar, or single-wall metal connector to a double-wall vent.

### **12.7.3 Gas Vent Termination.**

~~The termination of gas vents shall comply with the following requirements:~~

- ~~1.—A gas vent shall terminate in accordance with one of the following:
  - ~~1.—Gas vents that are 12 in. (300 mm) or less in size and located not less than 8 ft (2.4 m) from a vertical wall or similar obstruction shall terminate above the roof in accordance with Figure 12.7.3 and Table 12.7.3.~~
  - ~~2.—Gas vents that are over 12 in. (300 mm) in size or are located less than 8 ft (2.4 m) from a vertical wall or similar obstruction shall terminate not less than 2 ft (0.6 m) above the highest point where they pass through the roof and not less than 2 ft (0.6 m) above any portion of a building within 10 ft (3.0 m) horizontally.~~
  - ~~3.—Industrial appliances as provided in 12.3.4.~~
  - ~~4.—Direct vent systems as provided in 12.3.5.~~
  - ~~5.—Appliances with integral vents as provided in 12.3.6.~~
  - ~~6.—Mechanical draft systems as provided in 12.4.3.~~
  - ~~7.—Ventilating hoods and exhaust systems as provided in 12.4.4.~~~~
- ~~2.—A Type B or a Type L gas vent shall terminate at least 5 ft (1.5 m) in vertical height above the highest connected appliance draft hood or flue collar.~~
- ~~3.—A Type B-W gas vent shall terminate at least 12 ft (3.7 m) in vertical height above the bottom of the wall furnace.~~
- ~~4.—A gas vent extending through an exterior wall shall not terminate adjacent to the wall or below eaves or parapets, except as provided in 12.3.5 and 12.4.3.~~
- ~~5.—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.~~
- ~~6.—All gas vents shall extend through the roof flashing, roof jack, or roof thimble and terminate with a listed cap or listed roof assembly.~~
- ~~7.—A gas vent shall terminate at least 3 ft (0.9 m) above a forced air inlet located within 10 ft (3.0 m).~~

### **12.7.3.1**

A gas vent shall terminate in accordance with one of the following:

1. Gas vents that are 12 in. (300 mm) or less in size and located not less than 8 ft (2.4 m) from a vertical wall or similar obstruction shall terminate above the roof in accordance with Figure 12.7.3 and Table 12.7.3.
2. Gas vents that are over 12 in. (300 mm) in size or are located less than 8 ft (2.4 m) from a vertical wall or similar obstruction shall terminate not less than 2 ft (0.6 m) above the highest

point where they pass through the roof and not less than 2 ft (0.6 m) above any portion of a building within 10 ft (3.0 m) horizontally.

3. ~~Gas vents for Industrial-industrial~~ appliances shall be as provided in 12.3.4.
4. ~~Gas vents for Direct-direct-vent~~ systems shall be as provided in 12.3.5.
5. ~~Gas vents for Appliances-appliances~~ with integral vents shall be as provided in 12.3.6.
6. ~~Gas vents for Mechanical-mechanical~~ draft systems shall be as provided in 12.4.3.
7. ~~Gas vents for Ventilating-ventilating~~ hoods and exhaust systems shall be as provided in 12.4.4.

#### **12.7.3.2**

A Type B or a Type L gas vent shall terminate at least 5 ft (1.5 m) in vertical height above the highest connected appliance draft hood or flue collar.

#### **12.7.3.3**

A Type B-W gas vent shall terminate at least 12 ft (3.7 m) in vertical height above the bottom of the wall furnace.

#### **12.7.3.4**

A gas vent extending through an exterior wall shall not terminate adjacent to the wall or below eaves or parapets, except as provided in 12.3.5 and 12.4.3.

#### **12.7.3.5**

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.

#### **12.7.3.6**

All gas vents shall extend through the roof flashing, roof jack, or roof thimble and terminate with a listed cap or listed roof assembly.

#### **12.7.3.7**

A gas vent shall terminate at least 3 ft (0.9 m) above a forced air inlet located within 10 ft (3.0 m).

#### **12.7.4 Size of Gas Vents.**

Venting systems shall be sized and constructed in accordance with 12.7.4.1 through 12.7.4.3 ~~and the appliance manufacturer's instructions.~~

#### **12.8.4.4**

Minimum clearances from single-wall metal pipe to combustible material shall be in accordance with Table 12.8.4.4 ~~unless the installation instructions of a listed appliance or connector specify different clearances, in which case the listed clearances apply. Reduced clearances from single-wall metal pipe to combustible material shall be as specified for vent connectors in Table 10.2.4.~~

Table 12.8.4.4 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 appliance with draft hoods and appliance listed for use with Type B gas vents	As listed	As listed	6 in.	As listed
Residential boilers and furnaces with listed gas conversion burner and with draft hood	6 in.	6 in.	9 in.	As listed
Residential appliances listed for use with Type L vents	Not permitted	As listed	9 in.	As listed
Listed gas-fired toilets	Not permitted	As listed	As listed	As listed
Unlisted residential appliances with draft hood	Not permitted	6 in.	9 in.	As listed
Residential and low-heat appliances other than those above	Not permitted	9 in.	18 in.	As listed
Medium-heat appliance	Not permitted	Not permitted	36 in.	As listed

For SI units, 1 in. = 25.4 mm.

~~Note: These clearances shall apply unless the installation instructions of a listed appliance or connector specify different clearances, in which case the listed clearances shall apply.~~

#### 12.8.4.5

Reduced clearances from single-wall metal pipe to combustibles shall be as specified for vent connectors in Table 10.2.4.

#### 12.9.1

The clearance for through-the-wall ~~direct~~ direct-vent and non-~~direct~~ direct-vent terminals other than the combustion air intake of a direct-vent appliance shall be in accordance with Table 12.9.1 and Figure 12.9.1.

~~Exception: The clearances in Table 12.9.1 shall not apply to the combustion air intake of a direct vent appliance.~~

#### 12.9.3

Vent systems for Category IV appliances that terminate through an outside wall of a building and discharge flue gases perpendicular to the adjacent wall shall be located not less than 10 ft (3 m) horizontally from an operable opening in an adjacent building except for vent terminals that are 2 ft (0.6 m) or more above or 25 ft (7.6 m) or more below operable openings.

~~Exception: This shall not apply to vent terminals that are 2 ft (0.6 m) or more above or 25 ft (7.6 m) or more below operable openings.~~

#### 12.11.2.2

Where the vent connector used for an appliance having a draft hood or a Category I appliance is located in, or passes through, an unconditioned area, attic, or crawl space, that portion of the vent connector shall be listed Type B, Type L, or listed vent material having equivalent insulation qualities.

~~Exception: Single-wall metal pipe located within the exterior walls of the building and located in an unconditioned area other than an attic or a crawl space having a local 99 percent winter design temperature of 5°F (-15°C) or higher.~~

### **12.11.2.3**

Single-wall metal pipe located within the exterior walls of the building and located in an unconditioned area other than an attic or a crawl space having a local 99 percent winter design temperature of 5°F (-15°C) or higher.

### **12.11.2.3**

Vent connectors for residential-type appliances shall comply with the following:

1. Vent connectors for listed appliances having draft hoods, appliances having draft hoods and equipped with listed conversion burners, and Category I appliances that are not installed in attics, crawl spaces, or other unconditioned areas shall be one of the following:
  - a) Type B or Type L vent material
  - b) Galvanized sheet steel not less than 0.018 in. (0.46 mm) thick
  - c) Aluminum (1100 or 3003 alloy or equivalent) sheet not less than 0.027 in. (0.69 mm) thick
  - d) Stainless steel sheet not less than 0.012 in. (0.31 mm) thick
  - e) Smooth interior wall metal pipe having resistance to heat and corrosion equal to or greater than that of 12.11.2.3(1)(b), 12.11.2.3(1)(c), or 12.11.2.3(1)(d)
  - f) A listed vent connector
2. Vent connectors shall not be covered with insulation.

~~Exception: Listed insulated vent connectors shall be installed in accordance with the manufacturer's installation instructions.~~

### **12.11.2.4**

Vent connectors, other than listed insulate vent connectors, shall not be covered with insulation.

### **12.11.2.5**

Vent connectors for medium-heat appliances shall be both constructed of factory-built, medium-heat chimney sections or steel of a thickness not less than that specified in Table 12.11.2.5 and ~~shall~~ comply with the following:

1. A steel vent connector for an appliance with a vent gas temperature in excess of 1000°F (538°C) measured at the entrance to the connector is shall be lined with medium-duty fire brick or the equivalent.
2. The lining is shall be at least 2 1/2 in. (64 mm) thick for a vent connector having a diameter or greatest cross-sectional dimension of 18 in. (460 mm) or less.

3. The lining ~~is~~ shall be at least 4 1/2 in. (110 mm) thick laid on the 4 1/2 in. (110 mm) bed for a vent connector having a diameter or greatest cross-sectional dimension greater than 18 in. (460 mm).
4. ~~Where factory~~ Factory-built chimney sections are installed, they shall be joined together in accordance with the chimney manufacturer's instructions.

#### 12.11.5 Clearance.

Minimum clearances from vent connectors to combustible material shall be either in accordance with Table 12.8.4.4 or reduced where the combustible material shall be permitted to be reduced where the combustible material is protected as specified for vent connectors in Table 10.2.4.

~~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 10.2.4.~~

#### 12.11.8 Slope.

~~A vent connector shall be installed without any dips or sags and shall slope upward toward the vent or chimney at least 1/4 in./ft (20 mm/m).~~

~~Exception: Vent connectors attached to a mechanical draft system installed in accordance with appliance and the draft system manufacturers' instructions.~~

##### 12.11.8.1

~~A vent~~ Vent connectors attached to natural draft appliances shall be installed without any dips or sags and shall slope upward toward the vent or chimney at least 1/4 in./ft (20 mm/m).

##### 12.11.8.2

Vent connectors attached to a mechanical draft system shall be installed in accordance with both the appliance and the draft system manufacturers' instructions.

#### 12.13.1 Appliances Requiring Draft Hoods.

Vented appliances other than the following shall be installed with draft hoods:

- (1) Dual oven-type combination ranges
- (2) ~~Direct-~~ vent appliances
- (3) ~~Fan-~~ assisted combustion system appliances
- (4) ~~Appliances~~ requiring chimney draft for operation
- (5) ~~Single-~~ firebox boilers equipped with conversion burners with inputs greater than 400,000 Btu/hr (117 kW)
- (6) ~~Appliances~~ equipped with blast, power, or pressure burners that are not listed for use with draft hoods
- (7) ~~Appliances~~ designed for ~~mechanical forced~~ venting

##### 12.13.2.1



If a draft hood is not supplied by the appliance manufacturer where one is required, a draft hood shall be installed, ~~be of a listed or approved type, and, in the absence of other instructions, 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.~~ as follows:

(1) Be of a listed or approved type

(2) The same size as the appliance flue collar in the absence of other instructions.

### **12.13.2.2**

Where a draft hood is required with a conversion burner, it shall be of a listed or approved type.

### **13.1.2 Vent Downsizing.**

Where the vent size determined from the tables is smaller than the appliance draft hood outlet or flue collar, the use of the smaller size shall be permitted, provided that the installation complies with all of the following ~~requirements:~~

1. The total vent height (H) is at least 10 ft (3 m).
2. Vents for appliance draft hood outlets or flue collars 12 in. (300 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 in. (300 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 in. (100 mm) in diameter and the following applies: A ~~3 in. (80 mm) diameter vent shall not be connected to a 4 in. (100 mm) diameter draft hood outlet. This provision shall not apply to fan-assisted appliances.~~
- a. A 3 in. (80 mm) diameter vent ~~is~~ shall not ~~be~~ connected to a 4 in. (100 mm) diameter draft hood outlet.
  - a.b. This provision ~~is~~ shall not ~~apply~~ applicable to fan-assisted appliances.

### **13.1.18 Height Entries.**

Where the actual height of a vent falls between entries in the height column of the applicable table in Table 13.1(a) through Table 13.1(g), ~~either of the following shall be used:~~

1. Interpolation
2. The lower appliance input rating shown in the ~~Table 13.1(a) through Table 13.1(g) table~~ entries for FAN Max and NAT Max column values, ~~and the higher appliance input rating for the FAN Min column values~~

### **13.2.30 Height Entries.**

Where the actual height of a vent falls between entries in the height column of the applicable table in Table 13.2(a) through Table 13.2(j), either of the following shall be used:

1. Interpolation

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2. The lower appliance input rating shown in the [Table 13.2\(a\) through Table 13.2\(j\)](#)~~table~~ entries, for FAN Max and NAT Max column values; and the higher appliance input rating for the FAN Min column values



## Second Revision No. 33-NFPA 54-2022 [ Detail ]

5.8 Overpressure Protection ~~Devices~~.

### Submitter Information Verification

**Committee:** NFG-AAA

**Submittal Date:** Tue Nov 01 14:24:53 EDT 2022

### Committee Statement

**Committee Statement:** The title of 5.8 is being revised so that 5.8.3. is titled differently.

**Response Message:** SR-33-NFPA 54-2022



## Second Revision No. 34-NFPA 54-2022 [ Detail ]

### 12.3.2

The following appliances shall not be required to be vented:

- (1) Listed ranges
- (2) Built-in cooking units listed and marked for optional venting
- (3) Listed hot plates
- (4) Listed Type 1 clothes dryers exhausted in accordance with Section 10.4
- (5) A single listed booster-type (automatic instantaneous) water heater, when designed and used solely for the sanitizing rinse requirements of a dishwashing machine, provided that the appliance is installed with the draft hood in place and unaltered, if a draft hood is required, in a commercial kitchen having a mechanical exhaust system ~~[Where installed in this manner, the draft hood outlet shall not be less than 36 in. (910 mm) vertically and 6 in. (150 mm) horizontally from any surface other than the appliance.](see 12.3.2.1)~~
- (6) Listed refrigerators
- (7) Counter appliances
- (8) Room heaters listed for unvented use
- (9) Direct gas-fired make-up air heaters
- (10) Other appliances listed for unvented use and not provided with flue collars
- (11) Specialized appliances of limited input such as laboratory burners or gas lights

#### 12.3.2.1

Where an appliance is installed as stated in 12.3.2(5), the draft hood outlet shall not be less than 36 in. (910 mm) vertically and 6 in. (150 mm) horizontally from any surface other than the appliance.

## Submitter Information Verification

**Committee:** NFG-AAA

**Submittal Date:** Wed Dec 14 11:49:44 EST 2022

## Committee Statement

**Committee Statement:** This revision was developed by NFPA staff for editorial purposes, in accordance with 4.4.9.6.2 and 4.4.9.6.3 of the Regulations Governing the Development of NFPA Standards ([www.nfpa.org/regs](http://www.nfpa.org/regs)).

Paranthetical text is considered supplemental information and the section is being revised so that it complies with the manual of style.

**Response Message:** SR-34-NFPA 54-2022



## Second Revision No. 20-NFPA 54-2022 [ Section No. 1.1.1.2 ]

### 1.1.1.2

This code shall not apply to the following items:

- (1) Portable LP-Gas appliances and equipment of all types that are not connected to a fixed fuel piping system
- (2) Installation of appliances such as brooders, dehydrators, dryers, and irrigation equipment used for agricultural purposes
- (3) Raw material (feedstock) applications except for piping to special atmosphere generators
- (4) Oxygen–fuel gas cutting and welding systems
- (5) Industrial gas applications using such gases as acetylene and acetylenic compounds, hydrogen, ammonia, carbon monoxide, oxygen, and nitrogen
- (6) Petroleum refineries, pipeline compressor or pumping stations, loading terminals, compounding plants, refinery tank farms, and natural gas processing plants
- (7) Large integrated chemical plants or portions of such plants where flammable or combustible liquids or gases are produced by chemical reactions or used in chemical reactions
- (8) LP-Gas installations at utility gas plants
- (9)\* Liquefied natural gas (LNG) installations systems

#### A.1.1.1.2(9)

Fuel gas systems not related to the LNG processes such as those used for building heating or cooking installed within LNG facilities are under the scope of NFPA 54. Industrial fuel gas systems that are also normally designed under NFPA 54 are also under the scope of NFPA 54.

- (10) Fuel gas piping in electric utility power plants
- (11) Proprietary items of equipment, apparatus, or instruments such as gas generating sets, compressors, and calorimeters
- (12) LP-Gas equipment for vaporization, gas mixing, and gas manufacturing
- (13) LP-Gas piping for buildings under construction or renovations that is not to become part of the permanent building piping system — that is, temporary fixed piping for building heat
- (14) Installation of LP-Gas systems for railroad switch heating
- (15) Installation of LP-Gas and compressed natural gas (CNG) systems on vehicles
- (16) Gas piping, meters, gas pressure regulators, and other appurtenances used by the serving gas supplier in distribution of gas, other than undiluted LP-Gas
- (17) Building design and construction, except as specified herein
- (18) Fuel gas systems on recreational vehicles manufactured in accordance with NFPA 1192
- (19) Fuel gas systems using hydrogen as a fuel
- (20) Construction of appliances

## Submitter Information Verification

**Committee:** NFG-AAA

**Submittal Date:** Tue Oct 25 09:04:14 EDT 2022

## Committee Statement

**Committee Statement:** LNG Installation refers to everything inside the fence line of an LNG facility while systems covers the LNG process systems (liquefaction, regasification, etc.) and permits the use of NFPA 54 for design of systems typically designed under NFPA 54.

**Response Message:** SR-20-NFPA 54-2022

[Public Comment No. 3-NFPA 54-2022 \[Section No. 1.1.1.2\]](#)



## Second Revision No. 1-NFPA 54-2022 [ Section No. 2.3 ]

### 2.3 Other Publications.

#### 2.3.1 ASME Publications.

American Society of Mechanical Engineers, Two Park Avenue, New York, NY 10016-5990, (800) 843-2763. [www.asme.org](http://www.asme.org)

ANSI/ASME B1.20.1, *Pipe Threads, General Purpose, Inch*, 2013 (R2018).

ANSI/ASME B16.1, *Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250*, 2020.

ANSI/ASME B16.5, *Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard*, 2020.

ANSI/ASME B16.20, *Metallic Gaskets for Pipe Flanges: Ring-Joint, Spiral-Wound and Jacketed*, 2017.

ANSI/ASME B16.21, *Nonmetallic Flat Gaskets for Pipe Flanges*, ~~2016~~ 2021 .

ANSI/ASME B16.24, *Cast Copper Alloy Pipe Flanges and Flanged Fittings: Classes 150, 300, 600, 900, 1500, and 2500*, ~~2016~~ 2021 .

ANSI/ASME B16.33, *Manually Operated Metallic Gas Valves for Use in Gas Piping Systems up to 175 psi (Sizes NPS 1/2 through NPS 2)*, 2012 (R2017).

ANSI/ASME B16.42, *Ductile Iron Pipe Flanges and Flanged Fittings: Classes 150 and 300*, ~~2016~~ 2021 .

ANSI/ASME B16.44, *Manually Operated Metallic Gas Valves for Use in Above Ground Piping Systems up to 5 psi*, 2012 (R2017).

ANSI/ASME B16.47, *Large Diameter Steel Flanges: NPS 26 through NPS 60 Metric/Inch Standard*, 2020.

ANSI/ASME B36.10M, *Welded and Seamless Wrought Steel Pipe*, 2018.

### 2.3.2 ASTM Publications.

ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, (610) 832-9585. [www.astm.org](http://www.astm.org)

ASTM A53, *Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless*, 2020 2022 .

ASTM A106, *Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service*, 2019a.

ASTM A254, *Standard Specification for Copper-Brazed Steel Tubing*, 2012, reaffirmed 2019.

ASTM A268, *Standard Specification for Seamless and Welded Ferritic and Martensitic Stainless Steel Tubing for General Service*, 2020 2022 .

ASTM A269, *Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service*, 2015a, reaffirmed 2019.

ASTM A312, *Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes*, 2021.

ASTM B88, *Standard Specification for Seamless Copper Water Tube*, 2020.

ASTM B210, *Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes*, 2019a.

ASTM B241, *Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube*, 2016.

ASTM B280, *Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service*, 2020.

ASTM D2513, *Standard Specification for Polyethylene (PE) Gas Pressure Pipe, Tubing, and Fittings*, 2020.

ASTM E136, *Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C*, 2019a.

ASTM E2652, *Standard Test Method for Behavior of Materials in a Tube Furnace with a Cone-shaped Airflow Stabilizer, at 750°C*, 2018.

ASTM F1973, *Standard Specification for Factory Assembled Anodeless Risers and Transition Fittings in Polyethylene (PE) and Polyamide 11 (PA11) and Polyamide 12 (PA12) Fuel Gas Distribution Systems*, 2013, reaffirmed 2018 2021 .

ASTM F2509, *Standard Specification for Field-Assembled Anodeless Riser Kits for Use on Outside Diameter Controlled Polyethylene Gas Distribution Pipe and Tubing*, 2015, reaffirmed 2019.

ASTM F2945, *Standard Specification for Polyamide 11 Gas Pressure Pipe, Tubing, and Fittings*, 2018.



**2.3.3** CSA Group Publications.

CSA Group, 178 Rexdale Boulevard, Toronto, ON M9W 1R3, Canada, (216) 524-4990.  
[www.csagroup.org](http://www.csagroup.org)

~~CSA/ ANSI/ CSA-FC 1 FC 1:21/CSA 22.2 NO. 62282-3-100:21~~ , *Fuel Cell Technologies — Part 3-100: Stationary Fuel Cell Power Systems — Safety (Adopted IEC 62282-3-100:2019, second edition, 2019-2, with Canadian and U.S. deviations)* , 2014, ~~reaffirmed 2018~~ 2021 .

ANSI/CSA NGV 5.1, *Residential Fueling Appliances*, 2016, reaffirmed 2020.

ANSI/CSA NVG 5.2, *Vehicle Fueling Appliances (VFA)*, 2017, reaffirmed 2021 .

~~CSA/ ANSI LC 1/CSA 6.26~~ , *Fuel Gas Piping Systems Using Corrugated Stainless Steel Tubing (CSST)* , 2018 2019 .

~~CSA/ ANSI LC 4/CSA 6.32~~ , *Press-Connect Metallic Fittings for Use in Fuel Gas Distribution Systems*, 2012, ~~reaffirmed 2016~~ 2022 .

~~CSA/ ANSI Z21.1/CSA 1.1~~ , *Household Cooking Gas Appliances*, 2018 2019 .

ANSI Z21.5.1/CSA 7.1, *Gas Clothes Dryers, Volume I, Type 1 Clothes Dryers*, 2017.

ANSI Z21.5.2/CSA 7.2, *Gas Clothes Dryers, Volume II, Type 2 Clothes Dryers*, 2016, reaffirmed 2021 .

ANSI Z21.8, *Installation of Domestic Gas Conversion Burners*, 1994, reaffirmed 2017.

~~CSA/ ANSI Z21.10.1/CSA 4.1~~ , *Gas Water Heaters, Volume I, Storage Water Heaters with Input Ratings of 75,000 Btu per Hour or Less*, 2019.

~~CSA/ ANSI Z21.10.3/CSA 4.3~~ , *Gas Water Heaters, Volume III, Storage Water Heaters with Input Ratings Above 75,000 Btu per Hour, Circulating or Instantaneous* , 2019.

~~CSA/ ANSI Z21.11.2~~ , *Gas-Fired Room Heaters— , Volume II, Unvented Room Heaters*, 2019.

~~CSA/ ANSI Z21.13/CSA 4.9~~ , *Gas-Fired Low-Pressure Steam and Hot Water Boilers*, 2017 2022 .

ANSI Z21.15/CSA 9.1, *Manually operated gas valves for appliances, appliance connector valves and hose end valves*, 2009, reaffirmed 2014 2019 .

~~CSA/ ANSI Z21.18/CSA 6.3~~ , *Gas Appliance Pressure Regulators*, 2019.

~~CSA/ ANSI Z21.19/CSA 1.4~~ , *Refrigerators Using Gas Fuel*, 2014 2019 .

ANSI Z21.22/CSA 4.4, *Relief Valves for Hot Water Supply Systems*, 2015, reaffirmed 2020.

~~CSA/ ANSI Z21.24/CSA 6.10~~ , *Connectors for Gas Appliances*, 2015, ~~reaffirmed 2020~~ 2022 .

ANSI Z21.40.1/CSA 2.91, *Gas-Fired Heat Activated Air Conditioning and Heat Pump Appliances*, 1996, reaffirmed 2017 2022 .

ANSI Z21.40.2/CSA 2.92, *Gas-Fired, Work Activated Air Conditioning Air-Conditioning and Heat Pump Appliances (Internal Combustion)*, 1996, reaffirmed 2017 2022 .

ANSI Z21.41/CSA 6.9, *Quick-Disconnect Devices for Use with Gas Fuel Appliances*, 2014, reaffirmed 2019.

~~CSA/ ANSI Z21.47/CSA 2.3~~ , *Gas-Fired Central Furnaces*, 2021.

ANSI Z21.50/CSA 2.22, *Vented Decorative Gas Appliances*, 2019.

~~CSA/ ANSI Z21.54/CSA 8.4~~ , *Gas Hose Connectors for Portable Outdoor Gas-Fired Appliances*, 2019.

~~CSA/ ANSI Z21.56/CSA 4.7~~ , *Gas-Fired Pool Heaters*, 2017 2019 .

ANSI Z21.58/CSA 1.6, *Outdoor Cooking Gas Appliances*, 2018 2022 .

ANSI Z21.60/CSA 2.26, *Decorative Gas Appliances for Installation in Solid-Fuel Burning Fireplaces*, 2017, reaffirmed 2021 .

ANSI Z21.69/CSA 6.16, *Connectors for Movable Gas Appliances*, 2015, reaffirmed 2020.

ANSI Z21.75/CSA 6.27, *Connectors for Outdoor Gas Appliances and Manufactured Homes*, 2016, reaffirmed 2021.

ANSI Z21.80/CSA 6.22, *Line Pressure Regulators*, 2019.

ANSI Z21.86/CSA 2.32, *Vented Gas-Fired Space Heating Appliances*, 2016, reaffirmed 2021 .  
CSA/ANSI Z21.88/CSA 2.33, *Vented Gas Fireplace Heaters*, 2017 2019 .

ANSI Z21.89/CSA 1.18, *Outdoor Cooking Specialty Gas Appliances*, 2017.

ANSI Z21.90/CSA 6.24, *Gas Convenience Outlets and Optional Enclosures*, 2019.

ANSI Z21.93/CSA 6.30, *Excess Flow Valves for Natural and LP-Gas with Pressures Up to 5 psig*, 2017, reaffirmed 2022 .

ANSI Z21.97/CSA 2.41, *Outdoor Decorative Gas Appliances*, 2017.

ANSI Z83.4/CSA 3.7, *Non-Recirculating Direct Gas-Fired Heating and Forced Ventilation Appliances for Commercial and Industrial Application*, 2017, reaffirmed 2022 .

ANSI Z83.8/CSA 2.6, *Gas Unit Heaters, Gas Packaged Heaters, Gas Utility Heaters, and Gas-Fired Duct Furnaces*, 2016, reaffirmed 2021 .

ANSI Z83.11/CSA 1.8, *Gas Food Service Equipment*, 2016, ~~reaffirmed 2021~~ .

ANSI Z83.18, *Recirculating Direct Gas-Fired Heating and Forced Ventilation Appliances for Commercial and Industrial Application*, 2017, reaffirmed 2021.

ANSI Z83.19/CSA 2.35, *Gas-Fired High-Intensity Infrared Heaters*, 2017, reaffirmed 2021 .

ANSI Z83.20/CSA 2.34, *Gas-Fired Tubular and Low-Intensity Infrared Heaters*, 2016, reaffirmed 2021 .

ANSI Z83.26/CSA 2.27, *Gas-Fired Outdoor Infrared Patio Heaters*, 2020.

#### **2.3.4** MSS Publications.

Manufacturers Standardization Society (MSS) of the Valve and Fittings Industry, 127 Park Street, NE, Vienna, VA 22180-4602, (703) 281-6613. [www.msshq.org](http://www.msshq.org)

ANSI/MSS SP-58, *Pipe Hangers and Supports — Materials, Design, Manufacture, Selection, Application, and Installation*, 2018.

### 2.3.5 UL Publications.

Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096. [www.ul.com](http://www.ul.com)

UL 103, *Factory-Built Chimneys for Residential Type and Building Heating Appliances*, 2010, revised 2017 2021 .

UL 353, *Limit Controls*, 1994.

UL 378, *Draft Equipment*, 2006, revised 2013.

UL 441, *Gas Vents*, 2019.

UL 467, *Grounding and Bonding Equipment*, 2013 2022 .

UL 641, *Type L Low-Temperature Venting Systems*, 2010, revised 2018.

UL 651, *Schedule 40 and 80 Rigid PVC Conduit and Fittings*, 2011, revised 2019 2022 .

UL 959, *Medium Heat Appliance Factory-Built Chimneys*, 2010, revised 2019.

UL 1738, *Venting Systems for Gas Burning Appliances, Categories II, III and IV*, 2010, revised 2021.

UL 1777, *Chimney Liners*, 2015, revised 2019.

UL 2158A, *Clothes Dryer Transition Ducts*, 2013, revised 2017 2021 .

UL 2561, *1400 Degree Fahrenheit Factory-Built Chimneys*, 2016, revised 2018.

UL 2989, *Outline of Investigation for Tracer Wire*, 2017.

UL 60730-2-6, *Automatic Electrical Controls for Household and Similar Use; Part 2: Particular Requirements for Automatic Electrical Pressure Sensing Controls Including Mechanical Requirements*, 2016, revised 2021 .

### 2.3.6 US Government Publications.

US Government Publishing Office, 732 North Capitol Street, NW, Washington, DC 20401-0001. [www.gpo.gov](http://www.gpo.gov)

Title 49, Code of Federal Regulations, Part 192, "Transportation of Natural and Other Gas by Pipeline: Minimum Federal Standards."

### 2.3.7 Other Publications.

*Merriam-Webster's Collegiate Dictionary*, 11th edition, Merriam-Webster, Inc., Springfield, MA, 2003 2020 .

## Submitter Information Verification

**Committee:** NFG-AAA

**Submission Date:** Mon Sep 26 15:51:59 EDT 2022

## Committee Statement

**Committee Statement:** Reference standards are being updated.

**Response Message:** SR-1-NFPA 54-2022



## Second Revision No. 6-NFPA 54-2022 [ Section No. 2.4 ]

### 2.4 References for Extracts in Mandatory Sections.

NFPA 31, *Standard for the Installation of Oil-Burning Equipment*, 2016 2020 edition.

NFPA 70<sup>®</sup>, *National Electrical Code*<sup>®</sup>, 2017 2023 edition.

NFPA 88A, *Standard for Parking Structures*, 2019 2023 edition.

NFPA 90A, *Standard for the Installation of Air-Conditioning and Ventilating Systems*, 2018 2024 edition.

NFPA 101<sup>®</sup>, *Life Safety Code*<sup>®</sup>, 2018 2021 edition.

NFPA 501, ~~*Standard on Manufactured Housing*, 2017 edition.~~

NFPA 5000<sup>®</sup>, *Building Construction and Safety Code*<sup>®</sup>, 2018 2021 edition.

### Submitter Information Verification

**Committee:** NFG-AAA

**Submittal Date:** Wed Sep 28 13:56:30 EDT 2022

### Committee Statement

**Committee Statement:** Extracts are being updated to the latest edition year and revised to reflect those extracts no longer being extracted.

**Response Message:** SR-6-NFPA 54-2022



## Second Revision No. 21-NFPA 54-2022 [ Section No. 3.3.4.4.1 ]

### 3.3.4.4.1\* Baking and Roasting Oven.

An oven primarily intended for volume food preparation that is composed of one or more sections or units of the following types: (1) cabinet oven, an oven having one or more cavities heated by a single burner or group of burners; (2) reel-type oven, an oven employing trays that are moved by mechanical means; or (3) sectional oven, an oven composed of one or more independently heated cavities .

#### A.3.3.4.4.1 Baking and Roasting Oven.

The types of baking and roasting ovens are as follows:

- (1) Cabinet oven— an oven having one or more cavities heated by a single burner or group of burners
- (2) Reel -type oven— an oven employing trays that are moved by mechanical means
- (3) Sectional oven— an oven composed of one or more independently heated cavities

### Submitter Information Verification

**Committee:** NFG-AAA

**Submittal Date:** Tue Oct 25 09:45:29 EDT 2022

### Committee Statement

**Committee Statement:** Examples are being moved to the annex to clean up the definition.

**Response Message:** SR-21-NFPA 54-2022

Public Comment No. 4-NFPA 54-2022 [Section No. 3.3.4.4.1]



## Second Revision No. 22-NFPA 54-2022 [ Section No. 3.3.4.5 ]

### **3.3.4.5** Household Cooking Appliance.

An appliance for ~~domestic~~ food preparation, providing at least one function of (1) top or surface cooking, (2) oven cooking, or (3) broiling.

### Submitter Information Verification

**Committee:** NFG-AAA

**Submittal Date:** Tue Oct 25 09:48:42 EDT 2022

### Committee Statement

**Committee Statement:** As the term being defined is inherently a residential appliance the revised definition remains clear.

**Response Message:** SR-22-NFPA 54-2022

[Public Comment No. 15-NFPA 54-2022 \[Section No. 3.3.4.5 \[Excluding any Sub-Sections\]\]](#)



## Second Revision No. 2-NFPA 54-2022 [ Section No. 3.3.11 ]

### 3.3.11 Bonding Jumper.

A ~~reliable~~ conductor ~~to ensure~~ that ensures the required electrical conductivity between metal parts required to be electrically connected. [70: , 400 2023 ]

### Submitter Information Verification

**Committee:** NFG-AAA

**Submittal Date:** Tue Sep 27 16:23:13 EDT 2022

### Committee Statement

**Committee Statement:** Extracts are being updated to match the extract document.

**Response Message:** SR-2-NFPA 54-2022





## Second Revision No. 3-NFPA 54-2022 [ Section No. 3.3.33 ]

### 3.3.33 Effective Ground-Fault Current Path.

An intentionally constructed, low impedance electrically conductive path designed and intended to carry current ~~under~~ during ground-fault ~~conditions~~ events from the point of a ground fault on a wiring system to the electrical supply source and that facilitates the operation of the overcurrent protective device or ground-fault detectors. [70: , 100 2023 ]

### Submitter Information Verification

**Committee:** NFG-AAA

**Submittal Date:** Tue Sep 27 16:24:57 EDT 2022

### Committee Statement

**Committee Statement:** Extracts are being updated to match the extract document.

**Response Message:** SR-3-NFPA 54-2022



## Second Revision No. 23-NFPA 54-2022 [ Section No. 3.3.56.7 ]

### 3.3.56.7 Water Heater.

An appliance for supplying hot water for domestic or commercial purposes .

### Submitter Information Verification

**Committee:** NFG-AAA

**Submittal Date:** Tue Oct 25 10:07:49 EDT 2022

### Committee Statement

**Committee Statement:** The purpose of the heated water is irrelevant to definition.

**Response Message:** SR-23-NFPA 54-2022

[Public Comment No. 6-NFPA 54-2022 \[Section No. 3.3.56.7\]](#)



## Second Revision No. 5-NFPA 54-2022 [ Section No. 3.3.64 ]

### 3.3.64\* Manufactured Home.

A structure, transportable in one or more sections, that, in ~~the~~ traveling mode, is 8 body-ft (2.4 m) or more in width or 40 body-ft (12.2 m) or more in length or, ~~that~~ on site, is 320 ft<sup>2</sup> (29.7 m<sup>2</sup>) or more, is built on a permanent chassis, is designed to be used as a dwelling with or without a permanent foundation, ~~—~~ whether or not connected to the utilities, ~~—~~ and includes plumbing, heating, air-conditioning, and electrical systems contained therein. ~~Such terms shall include any structure that meets all the requirements of this paragraph except the size requirements and with respect to which the manufacturer voluntarily files a certification required by the regulatory agency. Calculations used to determine the number of square feet in a structure are based on the structure's exterior dimensions, include all expandable rooms, cabinets, and other projections containing interior space, but do not include bay windows.~~  
[ 501, 2017 ]

#### A.3.3.64 Manufactured Home.

~~Such terms~~ Manufactured homes shall include any structure that meets all the requirements of this paragraph conditions stated in 3.3.64 except the those for size requirements and with respect to which the manufacturer voluntarily files a certification required by the regulatory agency. Calculations used to determine the number of square feet in a structure are based on the structure's exterior dimensions, ~~include~~ including all expandable rooms, cabinets, and other projections containing interior space, but ~~do not include~~ including bay windows.

## Submitter Information Verification

Committee: NFG-AAA

Submittal Date: Wed Sep 28 11:55:39 EDT 2022

## Committee Statement

Committee Statement: There is no definition of manufactured home in NFPA 501 and as such the extract is being removed.

Response Message: SR-5-NFPA 54-2022



## Second Revision No. 4-NFPA 54-2022 [ Section No. 3.3.65.1 ]

### 3.3.65.1\* Combustible (Material).

A material that, in the form in which it is used and under the conditions anticipated, will ignite and burn; a material that does not meet the definition of noncombustible or limited combustible . [ 101,2015 2021 ]

### Submitter Information Verification

**Committee:** NFG-AAA

**Submittal Date:** Wed Sep 28 11:50:28 EDT 2022

### Committee Statement

**Committee Statement:** Extracted material is being updated to match the extracted document.

**Response Message:** SR-4-NFPA 54-2022



## Second Revision No. 24-NFPA 54-2022 [ Section No. 3.3.85.3 ]

### 3.3.85.3 Line Pressure Regulator.

A pressure regulator placed in a gas line between the service regulator and the appliance regulator shutoff valve .

### Submitter Information Verification

**Committee:** NFG-AAA

**Submittal Date:** Tue Oct 25 10:33:11 EDT 2022

### Committee Statement

**Committee Statement:** The scope of piping in NFPA 54 covers the piping from the point of deliver to the appliance shutoff valve.

**Response Message:** SR-24-NFPA 54-2022

[Public Comment No. 37-NFPA 54-2022 \[Section No. 3.3.85.3\]](#)



## Second Revision No. 10-NFPA 54-2022 [ Section No. 5.5.9.1.3 ]

### 5.5.9.1.3

Non-ferrous Nonferrous flanges shall be in accordance with ANSI/ASME B16.24, Cast Copper Alloy Pipe Flanges and Flanged Fittings: Classes 150, 300, 600, 900, 1500, and 2500 except listed components using aluminum flange connections constructed in accordance with the dimensional specifications of ANSI/ASME B16 .5, Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard , or ANSI/ASME B16.1, Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250 .

### Submitter Information Verification

**Committee:** NFG-AAA

**Submittal Date:** Mon Oct 24 11:28:49 EDT 2022

### Committee Statement

**Committee Statement:** This paragraph requires that listed components using aluminum flanges to be constructed to have flat face flange connections according a standard that applies to copper. Many listed components today use aluminum flanges, and they are made with either B16.1 (flat face) or ASME B16.5 (raised face) flanges. Additionally, the paragraph is in conflict with UL 429 for safety shutoff valves. UL 429 allows for aluminum flange connections to be ASME B16.1 (flat face) or ASME B16.5 (raised face), and this reflects also what the industry is doing today for listed components.

**Response Message:** SR-10-NFPA 54-2022

[Public Comment No. 24-NFPA 54-2022 \[Section No. 5.5.9.1.3\]](#)



## Second Revision No. 11-NFPA 54-2022 [ Section No. 5.5.10.5 ]

### 5.5.10.5\*

When flanges are separated and before gaskets are replaced, the following shall be met:

- (1) Flange faces shall be cleaned.
- (2) Flange surfaces shall be inspected for pitting, corrosion, and other surface defects.
- (3) Flanges that contain pitting, corrosion, and other surface defects on faces shall be repaired or replaced.

### A.5.5.10.5

ASME PCC-1, *Guidelines for Pressure Boundary Bolted Flanged Joint Connections* , contains information and guidelines for evaluating flange face defects.

## Submitter Information Verification

**Committee:** NFG-AAA

**Submittal Date:** Mon Oct 24 11:50:07 EDT 2022

## Committee Statement

**Committee Statement:** Flanges need to be cleaned prior to inspection in order to have an accurate inspection and there was no requirement to clean the flange prior to inspection or replacement. Annex material is being added to add a guidance document on how to inspect flanges.

**Response Message:** SR-11-NFPA 54-2022

[Public Comment No. 17-NFPA 54-2022 \[New Section after 5.5.10.5\]](#)

[Public Comment No. 16-NFPA 54-2022 \[Section No. 5.5.10.5\]](#)



## Second Revision No. 12-NFPA 54-2022 [ Section No. 5.6.3.2 ]

### 5.6.3.2

Where flexible connectors are used to connect a gas meter to downstream piping at manufactured homes in manufactured\_ home parks and mobile homes in mobile-home parks , the meter shall be supported by a post or bracket placed in a firm footing or by other means providing equivalent support.

## Submitter Information Verification

**Committee:** NFG-AAA

**Submission Date:** Mon Oct 24 13:13:51 EDT 2022

## Committee Statement

**Committee Statement:** A mobile home is a prefabricated structure, built in a factory on a permanently attached chassis. Mobile homes are permanently or semi-permanently in one place, but can be moved, and may be required to move from time to time for legal reasons.

Manufactured homes are built entirely in the factory under a federal building code administered by (HUD). Manufactured homes may be single or multi-section and are transported to the site and installed on a permanent foundation and are not moveable.

**Response Message:** SR-12-NFPA 54-2022

[Public Comment No. 27-NFPA 54-2022 \[Section No. 5.6.3.2\]](#)





## Second Revision No. 13-NFPA 54-2022 [ Section No. 5.8.3.1 ]

### 5.8.3.1

Overpressure protection devices shall be one of the following:

- (1) Pressure relief valve.
- (2) Monitor regulator.
- (3) Series regulator installed upstream from the line regulator and set to continuously limit the pressure on the inlet of the line regulator ~~to the maximum values specified by 5.8.2.1 or less.~~
- (4) Automatic shutoff device installed in series with the line pressure regulator ~~and set to shut off when the pressure on the downstream piping system reaches the maximum values specified by 5.8.2.1 or less.~~ This device shall be and designed so that it will remain closed until manually reset.

### Submitter Information Verification

**Committee:** NFG-AAA

**Submittal Date:** Mon Oct 24 13:56:08 EDT 2022

### Committee Statement

**Committee Statement:** 5.8.3.1 (3) is revised to delete reference 5.8.2.1 which is applicable and does not need to be restated. 5.8.3.1 (4) is revised to delete reference to 5.8.2.1 as 5.8.2.1 does not need to be restated.

See Global SR 32 for related revisions on multi-requirement renumbering.

**Response Message:** SR-13-NFPA 54-2022

[Public Comment No. 28-NFPA 54-2022 \[Section No. 5.8.3.1\]](#)



## Second Revision No. 15-NFPA 54-2022 [ Section No. 5.8.9 ]

### 5.8.9 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 reduction~~ of relief capacity.

### Submitter Information Verification

**Committee:** NFG-AAA

**Submittal Date:** Mon Oct 24 14:17:11 EDT 2022

### Committee Statement

**Committee Statement:** Reduction of relief capacity is the concern when sizing fittings, pipe, and openings between the system and pressure relieving devices. The term hammering is being removed as it is unclear what the term is referring to and if sized correctly hammering is not a concern.

**Response Message:** SR-15-NFPA 54-2022

[Public Comment No. 32-NFPA 54-2022 \[Section No. 5.8.9\]](#)



## Second Revision No. 29-NFPA 54-2022 [ Section No. 5.14 ]

Global SR-31

### 5.14 Pressure Regulator and Pressure Control Venting.

The venting of the atmospheric side of diaphragms in ~~line-pressure~~line-pressure regulators, ~~gas-appliance~~gas-appliance regulators, and gas-pressure-limit controls shall be in accordance with all of the following:

- (1) An independent vent pipe to the outdoors, sized in accordance with the device manufacturer's instructions, shall be provided where the location of a device is such that a discharge of fuel gas will cause a hazard.
- (2) ~~For devices other than appliance~~Independent vents for multiple regulators, vents shall not be required to be independent where the vents are connected to a common manifold designed in accordance with engineering methods to minimize backpressure in the event of diaphragm failure and such design is approved.
- (3) A regulator and vent limiting means combination listed in accordance with ANSI Z21.80/CSA 6.22, *Line Pressure Regulators*, shall not be required to be vented to the outdoors.
- (4) A listed gas appliance regulator factory equipped with a ~~vent limiting~~vent-limiting device ~~is~~shall not be required to be vented to the outdoors.
- (5) A listed gas pressure limit control that is factory equipped with a ~~vent limiting~~vent-limiting device and in accordance with UL 353, *Limit Controls*, or UL 60730-2-6, *Automatic Electrical Controls for Household and Similar Use, Part 2*, shall not be required to be vented to the outdoors.
- (6) Materials for vent piping shall be in accordance with Section 5.5.
- (7) The vent terminus shall be designed to prevent the entry of water, insects, and other foreign matter that could cause blockage.
- (8) Vent piping shall be installed to minimize static loads and bending moments placed on the regulators and gas pressure control devices.
- (9) Vents shall terminate not less than 3 ft (0.9 m) from a possible source of ignition.
- (10) At locations where a vent termination could be submerged during floods or snow accumulations, ~~an antiflood-type breather vent fitting shall be installed, or the vent terminal shall be located above the height of the expected flood waters or snow.~~one of the following shall apply:
  - (a) An antiflood-type breather vent fitting shall be installed.
  - (b) The vent terminal shall be located above the height of the expected flood waters or snow.
- (11) Vent piping from pressure regulators and gas pressure controls shall not be connected to a common manifold that serves a bleed line from a diaphragm-type gas valve.

### Submitter Information Verification

**Committee:** NFG-AAA

**Submittal Date:** Tue Oct 25 13:59:29 EDT 2022

## Committee Statement

**Committee Statement:** Appliance regulators are part of appliances, which are outside the scope of NFPA 54. Reference to appliance regulator venting is deleted from the Code.

See Global SR 31 for changes to 5.14(10)

**Response Message:** SR-29-NFPA 54-2022

[Public Comment No. 38-NFPA 54-2022 \[Section No. 5.14\]](#)



## Second Revision No. 30-NFPA 54-2022 [ Section No. 9.1.8.2 ]

### 9.1.8.2\*

At the locations selected for installation of appliances and equipment, the dynamic and static load-carrying capacities of the building structure shall be checked to determine whether they are adequate able to carry the additional loads. ~~The appliances and equipment shall be supported and shall be connected to the piping so as not to exert undue stress on the connections.~~

#### A.9.1.8.2

The installation of new, replacement, or retrofit appliances can result in unanticipated static or dynamic loads that were not considered by the original building design. This problem often occurs when older equipment or appliances are replaced by new equipment or appliances that are physically larger or heavier. Examples of this include new, more energy efficient rooftop units that are heavier and taller (affecting roof snow loads in northern climates), larger and heavier water heaters, boilers, cooking equipment or other appliances.

This information is intended to be a reminder to the AHJ and the installer that the structural capabilities should be considered whenever changes to equipment and appliance sizes or locations within a building are changed. The services of a licensed or registered design professional might be needed to provide the analysis required by 9.1.8.2 .

### Submitter Information Verification

**Committee:** NFG-AAA

**Submission Date:** Tue Oct 25 14:21:37 EDT 2022

### Committee Statement

**Committee Statement:** Guidance is being added on when to seek outside help when evaluating structural integrity of the building when installing or replacing appliances.

See SR 31 for break out of multiple requirements.

**Response Message:** SR-30-NFPA 54-2022



## Second Revision No. 16-NFPA 54-2022 [ Section No. 9.1.21 ]

### 9.1.21 Protection Installation of Outdoor Appliances.

~~Appliances not listed for outdoor installation but installed outdoors shall be provided with protection to the degree that the environment requires. Appliances listed for outdoor installation shall be permitted to be installed without protection in accordance with the manufacturer's installation instructions .~~

## Submitter Information Verification

**Committee:** NFG-AAA

**Submittal Date:** Mon Oct 24 17:13:05 EDT 2022

## Committee Statement

**Committee Statement:** Appliances need to be listed for outdoor installation as there are a number of considerations (wind, rain, etc.) that are necessary for safe outdoor installation and the listing standards take these into consideration.

**Response Message:** SR-16-NFPA 54-2022

[Public Comment No. 22-NFPA 54-2022 \[Section No. 9.1.21\]](#)



## Second Revision No. 17-NFPA 54-2022 [ Section No. 10.11.2 ]

### 10.11.2 Clearance for Listed Appliances.

~~Floor-mounted food service appliances, such as ranges for hotels and restaurants, deep fat fryers, unit broilers, kettles, steam cookers, steam generators, and baking and roasting ovens, shall be installed at least 6 in. (150 mm) from combustible material except that at least a 2 in. (50 mm) clearance shall be maintained between a draft hood and combustible material. Floor-mounted food service appliances listed for installation at lesser clearances shall be installed in accordance with the manufacturer's installation instructions. Appliances designed and marked "For use only in noncombustible locations" shall not be installed elsewhere.~~

#### 10.11.2.1\*

~~Floor-mounted food service appliances shall be installed at least 6 in. (150 mm) from combustible material except that with at least a 2 in. (50 mm) clearance shall be maintained provided between a draft hood and combustible material.~~

#### A.10.11.2.1

~~Floor- Examples of floor- mounted food service appliances, such as include ranges for hotels and restaurants, deep fat fryers, unit broilers, kettles, steam cookers, steam generators, and baking and roasting ovens.~~

#### 10.11.2.2

Floor-mounted food service appliances listed for installation at lesser clearances shall be installed in accordance with the manufacturer's installation instructions.

#### 10.11.2.3

Appliances designed and marked "For use only in noncombustible locations." shall not be installed elsewhere.

## Submitter Information Verification

**Committee:** NFG-AAA

**Submission Date:** Tue Oct 25 08:10:45 EDT 2022

## Committee Statement

- Committee Statement:**
1. The requirements is separated into 3 paragraphs, as they are separate requirements
  2. The list of floor-mounted food service appliances is relocated to Annex A as lists are never complete, and belong in Annex A.
  3. The requirement for clearance between a draft hood and combustible material is revised that the clearance be provided, rather than maintained. It is not the responsibility of the installer to maintain this distance into the future, rather to ensure that is exists at the time of installation.

**Response Message:** SR-17-NFPA 54-2022

[Public Comment No. 14-NFPA 54-2022 \[Section No. 10.11.2\]](#)





## Second Revision No. 18-NFPA 54-2022 [ Section No. 10.17.2 ]

### 10.17.2 Protection Above Domestic Units.

~~Domestic open-top broiler units shall be provided with a metal ventilating hood not less than 0.0122 in. (0.3 mm) thick with a clearance of not less than 1/4 in. (6 mm) between the hood and the underside of combustible material or metal cabinets. A clearance of at least 24 in. (610 mm) shall be maintained between the cooking top and the combustible material or metal cabinet, and the hood shall be at least as wide as the open-top broiler unit and centered over the unit. Domestic open-top broiler units incorporating an integral exhaust system and listed for use without a ventilating hood shall not be required to be provided with a ventilating hood if installed in accordance with 10.13.3.3 (1).~~

#### 10.17.2.1

Domestic open-top broiler units shall be provided with a metal ventilating hood not less than 0.0122 in. (0.3 mm) thick with a clearance of not less than 1/4 in. (6 mm) between the hood and the underside of combustible material or metal cabinets.

#### 10.17.2.2

A clearance of at least 24 in. (610 mm) shall be maintained between the cooking top and the combustible material or metal cabinet.

#### 10.17.2.3

The hood shall be at least as wide as the open-top broiler unit and centered over the unit.

#### 10.17.2.4

Domestic open-top broiler units incorporating an integral exhaust system and listed for use without a ventilating hood shall not be required to be provided with a ventilating hood if installed in accordance with 10.13.3.4(1) ~~10.13.3.3(1)~~.

## Submitter Information Verification

**Committee:** NFG-AAA

**Submittal Date:** Tue Oct 25 08:33:05 EDT 2022

## Committee Statement

**Committee Statement:** The requirement is separated into 4 separate paragraphs as there are 4 different requirements

**Response Message:** SR-18-NFPA 54-2022

[Public Comment No. 11-NFPA 54-2022 \[Section No. 10.17.2\]](#)



## Second Revision No. 25-NFPA 54-2022 [ Section No. 11.6 ]

### 11.6\* Checking the Draft.

~~Draft hood-equipped~~ Draft- hood-equipped appliances shall be checked to verify that there is no draft hood spillage after 5 minutes of main burner operation under the following conditions:

- (1) ~~The building or structure envelope is complete and intact, and all openings to the outdoors are closed .~~
- (2) All combustion air systems and openings are in place.
- (3) All air-exhausting appliances, power-vented appliances, and exhaust fans are operating.
- (4) All air-moving equipment used for heating, cooling, or ventilation is operating.
- (5) The draft hood spillage test is conducted only after all of the conditions in 11.6(1) through 11.6(4) are established.

### Submitter Information Verification

**Committee:** NFG-AAA

**Submittal Date:** Tue Oct 25 10:59:53 EDT 2022

### Committee Statement

**Committee Statement:** The revisions provide a more complete set of circumstances that could impact the accuracy and usefulness of a draft test. The new considerations include the impacts of exhaust fan and air handler operations and the state of the building completion and configuration.

**Response Message:** SR-25-NFPA 54-2022

[Public Comment No. 33-NFPA 54-2022 \[Section No. 11.6\]](#)



## Second Revision No. 27-NFPA 54-2022 [ Section No. 12.3.2 [Excluding any Sub-Sections] ]

The following appliances shall not be required to be vented:

- (1) Listed ranges
- (2) Built-in domestic cooking units listed and marked for optional venting
- (3) Listed hot plates
- (4) Listed Type 1 clothes dryers exhausted in accordance with Section 10.4
- (5) A single listed booster-type (automatic instantaneous) water heater, when designed and used solely for the sanitizing rinse requirements of a dishwashing machine, provided that the appliance is installed with the draft hood in place and unaltered, if a draft hood is required, in a commercial kitchen having a mechanical exhaust system [~~Where installed in this manner, the draft hood outlet shall not be less than 36 in. (910 mm) vertically and 6 in. (150 mm) horizontally from any surface other than the appliance.~~] the following criteria are met (see 12.3.2.1 ):
  - (a) That the appliance is shall be installed with the draft hood in place and unaltered, if a draft hood is required, in a commercial kitchen having a mechanical exhaust system.
  - (b) The draft hood outlet shall not be less than 36 in. (910 mm) vertically and 6 in. (150 mm) horizontally from any surface other than the appliance.
- (6) Listed refrigerators
- (7) Counter appliances
- (8) Room heaters listed for unvented use
- (9) ~~Direct-gas-fired~~ Direct-gas-fired make-up air heaters
- (10) Other appliances listed for unvented use and not provided with flue collars
- (11) Specialized appliances of limited input such as laboratory burners or gas lights

### Submitter Information Verification

**Committee:** NFG-AAA

**Submittal Date:** Tue Oct 25 11:46:42 EDT 2022

### Committee Statement

**Committee Statement:**

Domestic is deleted because:

1. Domestic is not defined.
2. Domestic was used in the ANSI Z21 standards, but this is being replaced by "household".
3. The requirement is the same with or without "domestic"

See Global SR32 for related multi-requirement changes.

**Response Message:** SR-27-NFPA 54-2022

[Public Comment No. 12-NFPA 54-2022 \[Section No. 12.3.2 \[Excluding any Sub-Sections\]\]](#)



**Second Revision No. 19-NFPA 54-2022 [ Section No. A.5.3.2.1 ]**



**A.5.3.2.1**

Some older appliances do not have a nameplate. In this case Table A.5.3.2.1 or an estimate of the appliance input should be used. The input can be based on the following:

- (1) A rating provided by the manufacturer
- (2) The rating of similar appliances
- (3) Recommendations of the gas supplier
- (4) Recommendations of a qualified agency
- (5) A gas flow test
- (6) Measurement of the orifice size of the appliance

The requirement of 5.3.1 that the piping system provide sufficient gas to each appliance inlet must be complied with.

Table A.5.3.2.1 Approximate Gas Input for Typical Selected Appliances Used in Residential Occupancies

Appliance	Input Btu/hr (Approx.)
<b>Space Heating Units</b>	
<b><i>Warm air furnace</i></b>	
Single family	100,000
Multifamily, per unit	60,000
<b><i>Hydronic boiler</i></b>	
Single family	100,000
Multifamily, per unit	60,000
<b>Space and Water Heating Units</b>	
<b><i>Hydronic boiler</i></b>	
Single family	120,000
Multifamily, per unit	75,000
<b><i>Water Heating Appliances</i></b>	
Water heater, automatic storage 30 gal to 40 gal tank	35,000
Water heater, automatic storage 50 gal tank	50,000
<b><i>Water heater, automatic instantaneous</i></b>	
Capacity at 2 gal/min	142,800
Capacity at 4 gal/min	285,000
Capacity at 6 gal/min	428,400
Water heater, <del>domestic</del> , circulating or side-arm	35,000
<b>Cooking Appliances</b>	
Range, freestanding, <del>domestic</del>	65,000
Built-in oven or broiler unit, <del>domestic</del>	25,000
Built-in top unit, <del>domestic</del>	40,000
<b>Other Appliances</b>	
Refrigerator	3,000
Clothes dryer, Type 1 ( <del>domestic</del> )	35,000
Gas fireplace direct vent	40,000
Gas log	80,000
Barbecue	40,000
Gas light	2,500

## Submitter Information Verification

**Committee:** NFG-AAA

**Submittal Date:** Tue Oct 25 08:52:01 EDT 2022

## Committee Statement

**Committee Statement:** The title of the Table A.5.3.2.1 is revised to reflect the contents of the Table. The term "domestic" is not needed in the table as it provides no further information.

**Response Message:** SR-19-NFPA 54-2022

[Public Comment No. 13-NFPA 54-2022 \[Section No. A.5.3.2.1\]](#)



**Second Revision No. 26-NFPA 54-2022 [ Section No. A.9.3.2.2 ]**





**A.9.3.2.3**

See Table A.9.3.2.3(a) and Table A.9.3.2.3(b).

Table A.9.3.2.3(a) Known Air Infiltration Rate Method: Minimum Space Volume for Appliances Other than Fan-Assisted for Specified Infiltration Rates (*ACH*)

<b>Appliance Input (Btu/hr)</b>	<b>Space Volume (ft<sup>3</sup>)</b>		
	<b>0.25 ACH</b>	<b>0.30 ACH</b>	<b>0.35 ACH</b>
5,000	420	350	300
10,000	840	700	600
15,000	1,260	1,050	900
20,000	1,680	1,400	1,200
25,000	2,100	1,750	1,500
30,000	2,520	2,100	1,800
35,000	2,940	2,450	2,100
40,000	3,360	2,800	2,400
45,000	3,780	3,150	2,700
50,000	4,200	3,500	3,000
55,000	4,620	3,850	3,300
60,000	5,040	4,200	3,600
65,000	5,460	4,550	3,900
70,000	5,880	4,900	4,200
75,000	6,300	5,250	4,500
80,000	6,720	5,600	4,800
85,000	7,140	5,950	5,100
90,000	7,560	6,300	5,400
95,000	7,980	6,650	5,700
100,000	8,400	7,000	6,000
105,000	8,820	7,350	6,300
110,000	9,240	7,700	6,600
115,000	9,660	8,050	6,900
120,000	10,080	8,400	7,200
125,000	10,500	8,750	7,500
130,000	10,920	9,100	7,800
135,000	11,340	9,450	8,100
140,000	11,760	9,800	8,400
145,000	12,180	10,150	8,700
150,000	12,600	10,500	9,000
160,000	13,440	11,200	9,600
170,000	14,280	11,900	10,200
180,000	15,120	12,600	10,800
190,000	15,960	13,300	11,400
200,000	16,800	14,000	12,000
210,000	17,640	14,700	12,600
220,000	18,480	15,400	13,200

<b>Appliance Input (Btu/hr)</b>	<b>Space Volume (ft<sup>3</sup>)</b>		
	<b>0.25 ACH</b>	<b>0.30 ACH</b>	<b>0.35 ACH</b>
230,000	19,320	16,100	13,800
240,000	20,160	16,800	14,400
250,000	21,000	17,500	15,000
260,000	21,840	18,200	15,600
270,000	22,680	18,900	16,200
280,000	23,520	19,600	16,800
290,000	24,360	20,300	17,400
300,000	25,200	21,000	18,000

For SI units, 1 ft<sup>3</sup> = 0.028 m<sup>3</sup>, 1000 Btu/hr = 0.293 kW.

ACH: Air change per hour.

Table A.9.3.2.3(b) Known Air Infiltration Rate Method: Minimum Space Volume for Fan-Assisted Appliance, for Specified Infiltration Rates (**ACH**)

<b>Appliance Input (Btu/hr)</b>	<b>Required Volume (ft<sup>3</sup>)</b>		
	<b>0.25 ACH</b>	<b>0.30 ACH</b>	<b>0.35 ACH</b>
5,000	300	250	214
10,000	600	500	429
15,000	900	750	643
20,000	1,200	1,000	857
25,000	1,500	1,250	1,071
30,000	1,800	1,500	1,286
35,000	2,100	1,750	1,500
40,000	2,400	2,000	1,714
45,000	2,700	2,250	1,929
50,000	3,000	2,500	2,143
55,000	3,300	2,750	2,357
60,000	3,600	3,000	2,571
65,000	3,900	3,250	2,786
70,000	4,200	3,500	3,000
75,000	4,500	3,750	3,214
80,000	4,800	4,000	3,429
85,000	5,100	4,250	3,643
90,000	5,400	4,500	3,857
95,000	5,700	4,750	4,071
100,000	6,000	5,000	4,286
105,000	6,300	5,250	4,500
110,000	6,600	5,500	4,714
115,000	6,900	5,750	4,929
120,000	7,200	6,000	5,143
125,000	7,500	6,250	5,357
130,000	7,800	6,500	5,571

<b>Appliance Input (Btu/hr)</b>	<b>Required Volume (ft<sup>3</sup>)</b>		
	<b>0.25 ACH</b>	<b>0.30 ACH</b>	<b>0.35 ACH</b>
135,000	8,100	6,750	5,786
140,000	8,400	7,000	6,000
145,000	8,700	7,250	6,214
150,000	9,000	7,500	6,429
160,000	9,600	8,000	6,857
170,000	10,200	8,500	7,286
180,000	10,800	9,000	7,714
190,000	11,400	9,500	8,143
200,000	12,000	10,000	8,571
210,000	12,600	10,500	9,000
220,000	13,200	11,000	9,429
230,000	13,800	11,500	9,857
240,000	14,400	12,000	10,286
250,000	15,000	12,500	10,714
260,000	15,600	13,000	11,143
270,000	16,200	13,500	11,571
280,000	16,800	14,000	12,000
290,000	17,400	14,500	12,429
300,000	18,000	15,000	12,857

For SI units, 1 ft<sup>3</sup> = 0.028 m<sup>3</sup>, 1000 Btu/hr = 0.293 kW.

*ACH*: Air change per hour.

Meeting the requirements of the “known air infiltration rate method” is not a guarantee that the equipment will pass the Section 11.6 draft test with current tighter construction, remodeling, and weatherization methods. There are also factors related to building airflows and combustion air that cannot be quantified or predicted, including leakage of supply and return ducts in unconditioned spaces, multiple appliances operating at the same time, operation of exhaust fans, wind and weather conditions, and isolation of appliance areas from sources of combustion air by the closing of doors. This code is not a design manual and should not be considered as such. The formula used to determine the required indoor air volume is meant to provide you with the best guidance available at the time of publication of this edition of NFPA 54. Even tracer gas methods, for determining air infiltration rates, which require specialized equipment, can only determine rates of flow for the time and conditions when the test is conducted.

Air changes per hour (ACH) in this formula is the number of air changes that occur within the building by natural means (ACH NAT ). There are several methods to measure ACH, although many factors can affect this value, such as wind velocities, wind direction, barometric pressure, and the number and type of appliances installed and operated within the building.

Tracer gas methods have been developed to determine ACH. Such methods produce the most reliable values for ACH. However, these methods can be expensive and cumbersome, making them out of reach of most contractors or installers. Other published methods for estimating ACHs include ASHRAE estimating methods and those developed by the *Air Conditioning Contractors of America Manual J, Residential Load Calculations* , which includes tightness categories and estimated ACH for each category. The most prevalent technology in use today for evaluating air leakage characteristics associated with structures is through the use of blower door testing. This tool, called ACH 50 , provides a somewhat consistent and quantifiable means for arriving at the air leakage for a uniform depressurization of a building

compared to atmosphere—normally 50 pascals. This method has been successfully correlated to tracer-gas-measured natural air infiltration rates. ASHRAE 62.2 provides a method, called  $ACH_{NAT}$ , for converting  $ACH_{50}$  to an  $ACH$  value that reflects the actual number of air changes under normal conditions.

Many buildings constructed to current building and energy codes can achieve very low  $ACH_{NAT}$  values, which need a relatively large indoor volume for naturally drafted appliances. Designers, builders, installers, and inspectors should know that these kinds of values might need indoor air volumes that are greater than structures have available. In such cases, draft testing per Section 11.6 might fail. This could necessitate an alternate means of appliance venting, replacing the appliance, or other remedies for achieving the necessary combustion air other than using indoor air.

The following is intended to provide guidance on developing the  $ACH$  factor for use in the “known air infiltration rate” (see 9.3.2.2) method of providing combustion air. It supports converting commonly used  $ACH_{50}$  blower door air change measurements to estimated natural air infiltration rates.

ASHRAE 62.2, *Ventilation and Acceptable Indoor Air Quality in Residential Buildings*, provides an infiltration credit formula used with single-point blower door testing for estimating natural infiltration rates. Table A.9.3.2.2(C) represents one set of simplified ASHRAE method calculations for a single-story building for an  $ACH_{50}$  of 3. The formula should be used to calculate  $ACH_{NAT}$  for buildings with larger  $ACH_{50}$  leakage rates. A design professional should be consulted to validate calculations before they are used as the basis for providing combustion air.

$$Q_{50} = CFM_{50} \text{ blower door reading or } ACH_{50} \times \text{volume} / 60 \quad [A.9.3.2.3a]$$

$$ACH_{NAT} = .052 \times Q_{50} \times wsf \times (H / Hr)^Z \times 60 / \text{volume}$$

[A.9.3.2.3b]

where:

$wsf$  = Weather and shielding factor (from ASHRAE 62.2)

$H$  = Conditioned height above grade

$Hr$  = Reference height, 8.2 ft

$Z$  = .4

Table A.9.3.2.3(c)  $ACH_{50}$  to  $ACH_{NAT}$  Sample Calculations

$ACH_{NAT} = .052 \times Q_{50} \times wsf \times (H / Hr)^Z \times 60 / \text{volume}$			*
Single story			-
$ACH_{50}$	$Wsf \dagger$	$ACH_{nat}$	
3	.30	.05	
	.35	.06	
	.40	.07	
	.45	.08	
	.50	.08	
	.55	.09	
	.60	.10	
	.65	.10	
	.70	.10	
	.75	.10	
	.80	.10	

<u>.85</u>	<u>.15</u>
<u>.90</u>	<u>.15</u>
<u>.95</u>	<u>.15</u>
<u>1.00</u>	<u>.15</u>
<u>1.05</u>	<u>.175</u>
<u>1.10</u>	<u>.20</u>
<u>1.15</u>	<u>.20</u>

\*H/Hr was derived from an average of 10 ft. This made for a representative factor for facilities with 8 ft to 12 ft conditioned heights.

† Created with selected weather shielding factors.

## Supplemental Information

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
ACH50_to_ACHnat_Table.docx	See attached Word document for new table.	

## Submitter Information Verification

**Committee:** NFG-AAA

**Submittal Date:** Tue Oct 25 11:35:43 EDT 2022

## Committee Statement

**Committee Statement:** The added text provides a method for converting ACH50, (which is commonly used in building tightness evaluations), to ACHNAT which is the parameter used in this code.

This additional text provides a better understanding of combustion air deficiencies and the determination of combustion air volume requirements based on the tightness of the building.

**Response Message:** SR-26-NFPA 54-2022

[Public Comment No. 34-NFPA 54-2022 \[Section No. A.9.3.2.2\]](#)



**Second Revision No. 28-NFPA 54-2022 [ Section No. G.5.2 ]**



**G.5.2** Test for Combustion Air and Vent Drafting for Natural Draft and Category I Appliances.



Combustion The following combustion air and vent draft procedures are for natural draft and category I appliances equipped with a draft hood and connected to a natural draft venting system. :

~~*Preparing for Inspection.* Close all exterior building doors and windows and all interior doors between the space in which the appliance is located and other spaces of the building that can be closed. Turn on any clothes dryer. Turn on any exhaust fans, such as range hoods and bathroom exhausts, so they will operate at maximum speed. Do not operate a summer exhaust fan. Close fireplace dampers and any fireplace doors.~~

~~*Placing the Appliance in Operation.* Place the appliance being inspected in operation. Adjust the thermostat or control so the appliance will operate continuously.~~

~~*Spillage Test.* Verify that all appliances located within the same room are in their standby mode and ready for operation. Follow lighting instructions for each appliance as necessary. Test for spillage at the draft hood relief opening as follows:~~

~~After 5 minutes of main burner operation, check for spillage using smoke.~~

~~Immediately after the first check, turn on all other fuel gas burning appliances within the same room so they will operate at their full inputs and repeat the spillage test.~~

~~Shut down all appliances to their standby mode and wait for 15 minutes.~~

~~Repeat the spillage test steps (a) through (c) on each appliance being inspected.~~

~~*Additional Spillage Tests:* Determine if the appliance venting is impacted by other door and air handler settings by performing the following tests:~~

~~Set initial test condition in accordance with G.5.2(1) .~~

~~Place the appliance(s) being inspected in operation. Adjust the thermostat or control so the appliance(s) will operate continuously.~~

~~Open the door between the space in which the appliance(s) is located and the rest of the building. After 5 minutes of main burner operation, check for spillage at each appliance using smoke.~~

~~Turn on any other central heating or cooling air handler fan that is located outside of the area where the appliances are being inspected. After 5 minutes of main burner operation, check for spillage at each appliance using smoke. The test should be conducted with the door between the space in which the appliance(s) is located and the rest of the building in the open and in the closed position.~~

~~Return doors, windows, exhaust fans, fireplace dampers, and any other fuel gas burning appliance to their previous conditions of use.~~

~~If spillage occurs during testing, the owner should be notified, be instructed as to which configuration of the home would lessen its impact, and arrange for corrective action by an HVAC or venting professional. Where it is believed that the venting system performance is inadequate, the owner should be notified that alternative vent sizing, design, or configuration is needed in accordance with Chapters 12 and 13 . Where it is believed that sufficient combustion air is not available, the owner should be notified that additional combustion air is needed in accordance with Section 9.3 .~~

- (1) Preparation for Testing. The following should be completed prior to testing:
  - (a) Close all exterior building doors and windows and other openings to the outdoors.
  - (b) Close solid-fuel burning appliances and fireplace dampers and combustion air controls.
  - (c) Remove or replace the forced-air heating/cooling system air filter.

- (d) Open heating/cooling supply air registers outside of the combustion appliance zone and close supply air registers within the combustion appliance. The combustion appliance zone is the room or space in which the appliance(s) to be tested is located.
  - (e) Close all interior doors except those to rooms that contain an exhaust fan or air exhausting appliance.
  - (f) Operate all exhaust fans, air exhausting appliances, and appliance mechanical draft exhausters at maximum capacity.
  - (g) Clean filters and exhaust terminals of air exhausting appliances.
  - (h) Do not operate summer exhaust fans.
- (2) Measuring Combustion Appliance Zone Pressure. The following should be completed to measure the combustion appliance zone pressure:
- (a) Set up a manometer to measure the combustion appliance zone pressure with reference to the outdoors.
  - (b) Obtain two combustion appliance zone pressure measurements (a total of two data points) with the heating/cooling system air handler(s) not operating as follows:
    - i. One with the entrance/exit doors to the combustion appliance zone room open
    - ii. One with the entrance/exit doors to the combustion appliance zone room closed
  - (c) Operate any heating/cooling system air handler at the maximum speed at which it is expected to operate.
  - (d) Obtain two combustion appliance zone pressure measurements (a total of 2 data points) as follows:
    - i. One with the entrance/exit doors to the combustion appliance zone room open
    - ii. One with the entrance/exit doors to the combustion appliance zone room closed
  - (e) The most negative pressure in the combustion appliance zone, referenced to the outdoors, should be considered to be the most negative depressurization case.
- (3) Placing the Appliance in Operation. The following should be completed to place the appliance in operation:
- (a) Configure the building in the identified most negative pressure referenced to the outdoors of the four data points recorded in G.5.2 (2)(b) and G.5.2 (2)(d).
  - (b) Verify that all appliances located within the same room are in their standby mode and ready for operation.
  - (c) Start with the lowest Btu input appliance in the space.
  - (d) Place the appliance being tested in operation. Adjust the thermostat or control so that the appliance will operate continuously.
  - (e) Test for spillage at the draft hood relief opening according to the appliance manufacturers' instructions. It is recommended, for personnel safety, to monitor ambient carbon monoxide (CO) levels in the space in which the testing is conducted. Do not test in an environment with more than 50 ppm (i.e., the OSHA 8-hour time-weighted average limit) for CO exposure. CO has cumulative effects, and multiple exposures can be dangerous. CO can cause headaches, dizziness, mental dullness, weakness, sleepiness, nausea, vomiting, unconsciousness, and death (see *Fire Protection Guide to Hazardous Materials*). Persons who exhibit such signs after exposure should seek medical attention immediately.
- (4) Draft Testing. If the manufacturer's instructions for draft spillage testing are not available, test as follows:
- (a) After 5 minutes of main burner operation, check for spillage using smoke or a mirror

for fogging.

- (b) Immediately after the first check, turn on all other fuel-gas-burning appliances that obtain combustion air from indoors so that they operate at their full inputs and repeat the spillage test for each appliance to make sure that there is no spillage as all appliances operate together.
- (5) After Appliance Testing is Complete. Return doors, windows, exhaust fans, heating/cooling system air handlers, fireplace dampers, and other fuel-gas-burning appliances to their previous conditions prior to preparation for testing.
- (6) Owner Warning, Draft Testing Failures. If spillage occurs during draft testing, the owner must be notified in writing, and the owner must be instructed to arrange for corrective action by an HVAC or venting professional before the systems are again operated.

## Supplemental Information

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
TG_Final_2-22_NFPA_54_Annex_G_5.2.docx	This is how the new 5.2 should look.	

## Submitter Information Verification

**Committee:** NFG-AAA

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## Committee Statement

**Committee Statement:** The rewrite provides more accurate and comprehensive method for draft testing. The proposed method provides a means to consider more variables such as the impact of door closure, duct leakage, and testing sequence.

**Response Message:** SR-28-NFPA 54-2022

[Public Comment No. 1-NFPA 54-2022 \[New Section after G.5.2\]](#)

[Public Comment No. 35-NFPA 54-2022 \[Chapter G\]](#)



## Second Revision No. 7-NFPA 54-2022 [ Section No. K.1.2.8 ]

### **K.1.2.8** UL Publications.

Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096. [www.ul.com](http://www.ul.com)

UL 651, *Schedule 40 and 80, Type EB and A Rigid PVC Conduit and Fittings*, 2011, revised 2019 2022 .

UL 795, *Commercial-Industrial Gas Heating Equipment*, 2016, revised ~~2020~~ 2022 .

### Submitter Information Verification

**Committee:** NFG-AAA

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### Committee Statement

**Committee Statement:** UL Standards are being updated to their latest revision years.

**Response Message:** SR-7-NFPA 54-2022



**Second Revision No. 8-NFPA 54-2022 [ Section No. K.2.2 ]**



**K.2.2** CSA Group Publications.

CSA Group, 178 Rexdale Boulevard, Toronto, ON M9W 1R3, Canada, (216) 524-4990.  
www.csagroup.org

ANSI/AGA NGV 3.1/CSA 12.3, *Fuel System Components for Compressed Natural Gas Powered Vehicles*, 2020.

AGA/CSA NGV 1, *Compressed Natural Gas Vehicle (NGV) Fueling Connection Devices*, 2017.

~~ANSI/CSA NGV 2~~ CSA/ANSI NGV 2, *Compressed Natural Gas Vehicle Fuel Containers*, 2019.

ANSI/LC 2A, *Direct Gas-Fired Circulating Heaters for Agricultural Animal Confinement Buildings*, 1998, reaffirmed 2020.

ANSI/LC 2, *Direct Gas-Fired Circulating Heaters for Agricultural Animal Confinement Buildings*, 1996, reaffirmed 2020.

ANSI Z21.12, *Draft Hoods*, 1990, reaffirmed 2020.

ANSI Z21.17/CSA 2.7, *Domestic Gas Conversion Burners*, 1998, reaffirmed ~~2014~~ 2019.

~~CSA/ANSI Z21.20/CSA C22.2 — No. 60730-2- — 5, Automatic Electrical Controls for Household and Similar Use — Part 2-5 : Particular Requirements for Automatic Electrical Burner Control Ignition Systems and Components~~, 2014, reaffirmed ~~2019~~ 2022.

CSA/ANSI Z21.21/CSA 6.5, Automatic Gas Valves for Gas Appliances, 2019.

CSA/ANSI Z21.23/CSA 6.6, Gas Appliance Thermostats, ~~2010, reaffirmed 2020~~ 2022.

ANSI Z21.35/CSA 6.8, *Pilot Gas Filters*, 2005, reaffirmed 2020.

ANSI Z21.40.4/CSA 2.94, *Performance Testing and Rating of Gas-Fired, Air-Conditioning and Heat Pump Appliances*, 1996, reaffirmed ~~2017~~ 2022.

ANSI Z21.42, *Gas-Fired Illuminating Appliances*, 2013, reaffirmed 2018.

ANSI Z21.57, *Recreational Vehicle Cooking Gas Appliances*, 2010, reaffirmed 2021.

ANSI Z21.58/CSA 1.6, *Outdoor Cooking Gas Appliances*, 2018.

ANSI Z21.61, *Gas-Fired Toilets*, ~~1983~~ 1993, reaffirmed 2013.

ANSI Z21.66/CSA 6.14, *Automatic Vent Damper Devices for Use with Gas-Fired Appliances*, 2015, reaffirmed 2020.

ANSI Z21.71, *Automatic Intermittent Pilot Ignition Systems for Field Installations*, 1993, reaffirmed ~~2016~~ 2021.

ANSI Z21.77/CSA 6.23, *Manually-Operated Piezo-Electric Spark Gas Ignition Systems and Components*, 2005, reaffirmed 2020.

ANSI Z21.78/CSA 6.20, *Combination Gas Controls for Gas Appliances*, 2010, reaffirmed 2020.

ANSI Z21.84, *Manually Lighted, Natural Gas Decorative Gas Appliances for Installation in Solid-Fuel Burning Appliances*, 2017, reaffirmed 2021.

ANSI Z21.87/CSA 4.6, *Automatic Gas Shutoff Devices for Hot Water Supply Systems*, 2007, reaffirmed ~~2016~~ 2021.

~~ANSI Z21.87/CSA 4.6, Automatic Gas Shutoff Devices for Hot Water Supply Systems ; 2007, reaffirmed 2016.~~

ANSI Z21.88/CSA 2.33, *Vented Gas Fireplace Heaters*, 2019.

CSA/ANSI Z21.91, Ventless Firebox Enclosures for Gas-Fired Unvented Decorative Gas Log-Type Room Heaters, 2020.

CSA/ANSI Z83.21/CSA C 22.2 No.168, Commercial Dishwashers, 2020.

### Submitter Information Verification

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### Committee Statement

**Committee Statement:** CSA standards are being updated to the latest revision year.

**Response Message:** SR-8-NFPA 54-2022



## Second Revision No. 9-NFPA 54-2022 [ Section No. K.2.3 ]

### **K.2.3** MSS Publications.

Manufacturers Standardization Society of the Valve and Fittings Industry, 127 Park Street, NE, Vienna, VA 22180-4602. [www.msshq.org](http://www.msshq.org)

MSS SP-6, *Standard Finishes for Contact Faces of Pipe Flanges and Connecting-End Flanges of Valves and Fittings, 2017-2021* .

### **Submitter Information Verification**

**Committee:** NFG-AAA

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### **Committee Statement**

**Committee Statement:** Reference standards are being updated to the latest edition year.

**Response Message:** SR-9-NFPA 54-2022