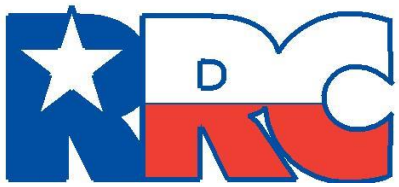
# TEXAS LP-GAS EXAMINATION STUDY GUIDE

## Service and Installation Employee Level



**RAILROAD COMMISSION OF TEXAS**

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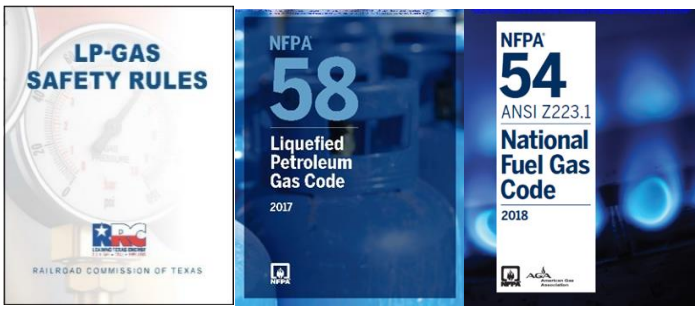
# LP-GAS EXAMINATION STUDY GUIDE
# EMPLOYEE-LEVEL
# Service and installation

## Who should use this guide?

You should use this guide if you plan to take the Railroad Commission's employee-level qualifying examination to perform LP-gas service and installation activities. The service and installation certification qualifies you to perform all LP-gas activities related to stationary systems, including containers, appliances, and stationary engines.

The service and installation certification does not qualify you to fill containers or operate an LP-gas transport.

## What books do I need?




This examination tests your knowledge of the laws and standards that apply to Service and Installation operations in Texas. These laws and standards are found in three books:

*LP-Gas Safety Rules* (Texas Railroad Commission)
*NFPA 58 Liquefied Petroleum Gas Code* (National Fire Protection Association, 2017)
NFPA 54 *National Fuel Gas Code* (National Fire Protection Association 2018)

## Where do I get these books?

You may download the current edition of the Railroad Commission's *LP-Gas Safety Rules* in PDF format free online at www.rrc.texas.gov. If you need printed copies, they may be purchased for $10.00, tax included, by calling the Railroad Commission's publications office at (512) 463-7309.

You may also order NFPA manuals online at www.nfpa.org; click on "Codes and Standards."

## Sections and Topics

Before you take this examination, you should know the definitions found in this study guide and the contents of the sections of the codes and standards listed below. The actual examination questions may not cover all of the listed sections and topics.

## Terms and Definitions

NOTE: The list below is not exhaustive. You are responsible for knowing all the terms and definitions that apply to the LP-gas activities you will perform, as well as the rules and standards highlighted in this guide.

NOTE: Informal terms that are sometimes used in the propane industry instead of formal technical terms are given in brackets.

### Railroad Commission *LP-Gas Safety Rules*

NOTE: Section (§) 9.402(c) of the LP-Gas Safety Rules states, "The Commission does not adopt language in any NFPA rule, chart, figure, or table pertaining to any LP-gas container having a water capacity of one gallon (4.2 pounds LP-gas capacity) or less."

***Alternative Fuel Safety (AFS).*** The RRC department responsible for LP-Gas training and inspection.
***LP-Gas Safety Rules, §9.2(1)***

***LP Gas Safety Rules.*** The rules adopted by the Railroad Commission in the Texas Administrative Code, Title 16, Part 1, Chapter 9, including any NFPA or other documents adopted by reference. The official text of the Commission's rules is that which is on file with the Secretary of State's office and available at www.sos.state.tx.us or through the Commission's web site
***LP-Gas Safety Rules, §9.2(22)***

***Rules examination.*** The Commission's written examination that measures an examinee's working knowledge of Chapter 113 of the Texas Natural Resources Code and/or the current LP-Gas Safety Rules.
***LP-Gas Safety Rules, §9.2(41)***

## *NFPA 58 (2017)*

**2 psi Regulator System.** An LP-Gas vapor delivery system that combines a First-stage regulator, a 2 psi service regulator, and a Line pressure regulator(s).
***NFPA 58, §3.3.74.9***

**2 psi Service Regulator** A pressure regulator for LP-Gas vapor service designed to reduce first-stage regulator outlet pressure to a nominal 2 psig.
***NFPA 58, §3.3.74.10***

***ASME.*** American Society of Mechanical Engineers.
***NFPA 58, §3.3.6***

***Container.*** Any vessel, including cylinders, tanks, portable tanks, and cargo tanks, used for the transporting, or storing of LP-Gases.
***NFPA 58, §3.3.14***

***Container Appurtenances.*** Devices installed in container openings for safety, control, or operating purposes. [Examples include pressure-relief devices; shutoff valves, backflow check valves, excess-flow valves and internal valves; liquid level gauges; pressure gauges; and plugs].
***NFPA 58, §3.3.15***

***DOT.*** U.S. Department of Transportation.
***NFPA 58, §3.3.24***

***Excess-Flow Valve (or Excess-Flow Check Valve).*** A valve designed to close when the liquid or vapor passing through it exceeds a prescribed † ow rate
Fixed Liquid level gauge.
***NFPA 58, §3.3.85.3***

***Fixed Maximum Liquid Level Gauge*** ["bleeder valve," "outage gauge," "spitter valve," "spew gauge"]. A fixed liquid level gauge that indicates the liquid level at which the container is filled to its maximum permitted filling limit.
***NFPA 58, §3.3.34.2***

***First-Stage Regulator.*** A pressure regulator for LP-Gas vapor service designed to reduce pressure from the container to 10 psig or less.
***NFPA 58, §3.3.74.2***

***Flexible Connector.*** A short [not exceeding 60 inches overall length] fixed piping system component that is fabricated from a flexible material and equipped with connections at both ends.
***NFPA 58, §3.3.28***

***Flexible Hose Connector.*** A component fabricated from LP-Gas hose that is made from a material that is compatible with LP-Gas
***NFPA 58, §3.3.28.1***

***Flexible Metallic Connector.*** A component fabricated from metallic material that provides liquid and vapor LP-Gas confinement and is provided with connections on both ends
***NFPA 58, §3.3.28.2***

***Integral Two-Stage Regulator***. A pressure regulator for LP-Gas vapor service that combines a high-pressure regulator and a second-stage regulator into a single unit.
***NFPA 58, § 3.3.74.5***

***Leak Check.*** An operation performed on a gas piping system to verify that the system does not leak.
***NFPA 58, § 3.3.42***

***Liquefied Petroleum Gas (LP-Gas).*** Any material having a vapor pressure not exceeding that allowed for commercial propane that is composed predominantly of the following hydrocarbons, either by themselves (except propylene) or as mixtures: propane, propylene, butane (normal butane or isobutane), and butylenes.
***NFPA 58, §3.3.43***

***NFPA.*** National Fire Protection Association.
***NFPA 58, §3.3.53***

***Pressure Relief Device*** ["popoff valve"]. A device designed to open to prevent a rise of internal pressure in excess of a specified value.
***NFPA 58, §3.3.65***

***Pressure Test.*** An operation performed to verify the gastight integrity of gas piping following its installation or medication.
***NFPA 58, §3.3.66***

***Second-Stage Regulator.*** A pressure regulator for LP-Gas vapor service designed to reduce first-stage regulator outlet pressure to the pressure required at the point of delivery.
***NFPA 58, §3.3.74.7***

***Sources of Ignition.*** Devices or equipment that, because of their modes of use or operation, are capable of providing sufficient thermal energy to ignite flammable LP-Gas vapor–air mixtures when introduced into such a mixture or when such a mixture comes into contact with them, and that will permit propagation of flame away from them.
***NFPA 58, §3.3.78***

***Single Stage Regulator***. A pressure regulator for LP-Gas vapor service designed to reduce pressure from the container to 1.0 psig or less.
***NFPA 58, §3.3.74.8***

***Two Stage Regulator System.*** An LP-Gas vapor delivery system that combines a first-stage regulator and a second-stage regulator(s) or utilizes a separate integral two-stage regulator
***NFPA 58, §3.3.74.11***

***Water Capacity*** ["WC"]. The amount of water at 60°F (16°C) required to fill a container.
***NFPA 58, §3.3.90***

**NFPA 54 (2018)**

***Appliance.*** Any device that utilizes gas as a fuel or raw material to produce light, heat, power, refrigeration, or air conditioning.
***NFPA 54, §3.3.5***

***Appliance Shutoff Valve.*** A valve located in the piping system, used to shut off individual equipment.
***NFPA 54, §3.3.99.1***

***Btu.*** Abbreviation for British thermal unit, which is the quantity of heat required to raise the temperature of 1 pound of water 1 degree Fahrenheit (equivalent to 1055 joules).
***NFPA 54, §3.3.16***

***Controls.*** Devices designed to regulate the gas, air, water, or electrical supply to an appliance. These may be manual or automatic.
***NFPA 54, §3.3.24***

***Clothes Drier.*** An appliance used to dry wet laundry by the means of heat

***Clothes Drier Type 1.*** Primarily used in family living environment. May or may not be coin operated for public use.

***Clothes Drier Type 2*** Used in business with direct intercourse of the function with the public. May or may not be operated by public or hired attendant. May or may not be coin-operated.

***Direct Vent Appliances.*** Appliances that are constructed and installed so that all air for combustion is derived directly from the outdoors and all flue gases are discharged to the outdoors.

***NFPA 54, §3.3.5.3***

***Flue Gases.*** Products of combustion plus excess air in appliance flues or heat exchangers.
***NFPA 54, §3.3.49.1***

***Gas Appliance Pressure Regulator.*** A pressure regulator for controlling pressure to the appliance manifold.
***NFPA 54, §3.3.84.2***

***Gas Vent.*** A passageway composed of listed factory-built components assembled in accordance with the manufacturer's installation instructions for conveying vent gases from appliances or their vent connectors to the outdoors.

***Labeled.*** Equipment or materials to which has been attached a label, symbol, or other identifying mark of an organization that is acceptable to the authority having jurisdiction and concerned with product evaluation, that maintains periodic inspection of production of labeled equipment or materials, and by whose labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner.
***NFPA 54, §3.2.4***

***Listed.*** Equipment, materials, or services included in a list published by an organization that is acceptable to the authority having jurisdiction and concerned with evaluation of products or services, that maintains periodic inspection of production of listed equipment or materials or periodic evaluation of services, and whose listing states that either the equipment, material, or service meets appropriate designated standards or has been tested and found suitable for a specified purpose.
***NFPA 54, §3.2.5***

***Non-displaceable Valve Member.*** A valve member that cannot be moved from its seat by a force applied to the handle or to any exterior portion of the valve.
***NFPA 54, §3.3.100.1***

***Orifice.*** The opening in a cap, spud, or other device whereby the flow of gas is limited and through which the gas is discharged to the burner.
***NFPA 54, §3.3.71***

***Pipe.*** Rigid conduit used to convey fuel gas or other fluids
***NFPA 54, §3.3.75***

***Piping System.*** All piping, valves, and fittings from the outlet of the point of delivery from the supplier to the outlets of the equipment shutoff valves.
***NFPA 54, §3.3.95.6***

***Pressure Test.*** An operation performed to verify the gastight integrity of gas piping following its installation or modification.
***NFPA 58, §3.3.66***

***Quick-Disconnect Device.*** A hand-operated device that provides a means for connecting and disconnecting an appliance or an appliance connector to a gas supply and that is equipped with an automatic means to shut off the gas supply when the device is disconnected.
***NFPA 54, §3.3.28.3***

***Regulator Vent.*** The opening in the atmospheric side of the regulator housing permitting the in and out movement of air to compensate for the movement of the regulator diaphragm.
***NFPA 54, §3.3.105.3***

***Safety Shutoff Device.*** A device that will shut off the gas supply to the controlled burner(s) in the event the source of ignition fails. This device can interrupt the flow of gas to main burner(s) only or to pilot(s) and main burner(s) under its supervision.
***NFPA 54, §3.3.28.4***

***Type 1 Clothes Dryer***. Primarily used in family living environment. May or may not be coin-operated for public use.
**NFPA 54, §3.3.19.1**

***Type 2 Clothes Dryer.*** Used in business with direct intercourse of the function with the public. May or may not be operated by public or hired attendant. May or may not be coin-operated.
***NFPA 54, §3.3.19.2***

***Type B Gas Vent.*** A vent for venting listed gas appliances with draft hoods and other Category I appliances listed for use with Type B gas vents.
***NFPA 54, §3.3.53.3***

***Type B-W Gas Vent.*** A gas vent for venting listed wall furnaces.
***NFPA 54, §3.3.53.4***

***Type L Gas Vent.*** A vent for venting appliances listed for use with Type L vents and appliances listed for use with Type B gas vents.
***NFPA 54, §3.3.53.5***

***Unvented Room Heater.*** An unvented, self-contained, freestanding, nonrecessed, fuel-gas-burning appliance for furnishing warm air by gravity or fan circulation to the space in which installed, directly from the heater without duct connection.
***NFPA 54, §3.3.56.6***

***Vent Connector.*** The pipe or duct that connects a fuel-gas-burning appliance to a vent or chimney.
***NFPA 54, §3.3.101***

***Venting.*** Removal of combustion products as well as process fumes to the outer air.
***NFPA 54, §3.3.103***

## Sample Question 1

A clothes drier is an appliance used to dry wet laundry by the means of ____.

A. energy
B. heat
C. gas
D. friction

***Answer on last page.***

# Key Topics

NOTE: The list below is not exhaustive. You are responsible for knowing all the facts, rules, standards and procedures that apply to the LP-gas activities you will perform, as well as the rules and standards highlighted in this guide.

As you study the applicable codes and standards, pay special attention to the facts, rules and procedures related to the following key topics. When you take the examination, read each question very carefully.

## *ADMINISTRATIVE RULES* - GENERAL REQUIREMENTS

### Company License

No person may engage in any LP-gas activity until that person has obtained a license from the Commission authorizing the LP-gas activities.
***LP-Gas Safety Rules, §9.7(a)***

Licensees, registered manufacturers, company representatives, and operations supervisors at each outlet shall have copies of all current licenses and/or manufacturer registrations and certificates for employees at that location available for inspection during regular business hours.
***LP-Gas Safety Rules, §9.7(c)***

### Application for a New Certificate

An applicant for a new certificate shall:
(1) file with AFS a properly completed LPG Form 16 and the applicable nonrefundable rules examination fee specified in §9.10 of this title (relating to Rules Examination); pass the applicable rules examination with a score of at least 75%
(2) pass the applicable rules examination with a score of at least 75%; and
(3) complete any required training and/or AFT in §9.51 and §9.52 of this title.
***LP-Gas Safety Rules, §9.8(c)***

## Certificate Renewal

Certificate holders shall remit the nonrefundable $35 annual certificate renewal fee to AFS on or before May 31 of each year. Individuals who hold more than one certificate shall pay only one annual renewal fee.

(1) Failure to pay the nonrefundable annual renewal fee by the deadline shall result in a lapsed certificate
(A) To renew a lapsed certification, the individual must pay the nonrefundable $35 annual renewal fee plus a nonrefundable $20 late-filing fee.
(B) If an individual's certificate lapses or expires, that individual shall immediately cease performance of any LP-gas activities authorized by the certificate.
(C) If an individual's certificate has been expired for more than two years from May 31 of the year in which the certificate lapsed, that individual shall comply with the requirements in §9.8 of this title (relating to Requirements and Application for a New Certificate) or §9.13 of this title.
***LP-Gas Safety Rules, §9.9(c)***

Continuing education. A certificate holder shall complete at least eight hours of continuing education every four years as specified in this subsection.
(1) Upon fulfillment of this requirement, the certificate holder's next continuing education deadline shall be four years after the May 31 following the date of the most recent class the certificate holder has completed, unless the course was completed on May 31, in which case the deadline shall be four years from that date.
***LP-Gas Safety Rules, §9.52(b)***

## Rules Examination

Failure of any exam shall immediately disqualify the individual from performing any LP-gas related activities covered by the exam which is failed, except for activities covered by a separate exam which the individual has passed.
***LP-Gas Safety Rules, §9.10(f)***

## Trainees

A licensee or ultimate consumer may employ an individual as a trainee for a period not to exceed 45 calendar days without that individual having successfully completed the rules examination

The trainee shall be directly and individually supervised at all times by an individual who has successfully completed the Commission's rules examination for the areas of work being performed by the trainee.
***LP-Gas Safety Rules, §9.12***

## Qualified Personnel

Persons whose duties fall within the scope of this code shall be provided with training that is consistent with the scope of their job activities and that includes proper handling and emergency response procedures.
***NFPA 58, §4.4.1***

Refresher training shall be provided at least every 3 years.
***NFPA 58, §4.4.3***

Initial and subsequent refresher training shall be documented.
***NFPA 58, §4.4.4***

Transfer of LP-Gas to and from a container shall be accomplished only by qualified individuals trained in proper handling and operating procedures.
***NFPA 58, §7.2.2.1***

At least one qualified person shall remain in attendance at the transfer operation from the time connections are made until the transfer is completed, shutoff valves are closed, and lines are disconnected.
***NFPA 58, §7.2.1.2***

Public access to areas where LP-Gas is stored and transferred shall be prohibited except where necessary for the conduct of normal business activities.
***NFPA 58, §7.2.3.1***

### Sample Question 2

Certificate holders shall remit the nonrefundable $35 annual certificate renewal fee to AFS on or before _____ of each year

A. January 1
B. May 31
C. December 31
D. the date the certificate was issued

***Answer on last Page***

## Container Installation

(a) All appurtenances and equipment placed into LP-gas service shall be listed by a nationally recognized testing laboratory such as Underwriters Laboratory (UL), Factory Mutual (FM), or American Gas Association (AGA) unless:
(1) it is specifically prohibited for use by another section of the rules in this chapter;
(2) there is no test specification or procedure developed by the testing laboratory for the appurtenance or equipment; or
(3) it is used and in compliance with any NFPA standard adopted by the Commission.
***LP-Gas Safety Rules, §9.126***

Containers shall be designed, fabricated, tested, and marked (or stamped) in accordance with the regulations of the U.S. Department of Transportation (DOT 49 CFR); Federal Aviation Administration (FAA 14 CFR); the ASME Code, Section VIII, "Rules for the Construction of Unfired Pressure Vessels"
***NFPA 58, §5.2.1.1***

Containers installed outside of buildings, whether of the portable type replaced on a cylinder exchange basis or permanently installed and refilled at the installation, shall be located with respect to the adjacent containers, important building, group of buildings, or line of adjoining property that can be built upon, in accordance with Table 6.4.1.1, Table 6.5.1.2, 6.4.1.2 through 6.4.1.3, 6.4.3, 6.4.4.1 through 6.4.4.4, and 6.5.3.6 through 6.5.3.11.
***NFPA 58, §6.4.1.1***

**Table 6.4.1.1 Separation Distances Between Containers, Important Buildings, and Line of Adjoining Property That Can Be Built Upon**

| Water Capacity per Container | | Minimum Distances | | | | | |
|---|---|---|---|---|---|---|---|
| | | Mounded or Underground Containers[a] | | Aboveground Containers | | Between Containers[b] | |
| gal | m³ | ft | m | ft | m | ft | m |
| <125[c] | <0.5[c] | 10 | 3 | 0[d] | 0[d] | 0 | 0 |
| 125–250 | 0.5–1.0 | 10 | 3 | 10 | 3 | 0 | 0 |
| 251–500 | >1.0–1.9 | 10 | 3 | 10 | 3 | 3 | 1 |
| 501–2,000 | >1.9–7.6 | 10 | 3 | 25[c] | 7.6 | 3 | 1 |
| 2,001–30,000 | >7.6–114 | 50 | 15 | 50 | 15 | 5 | 1.5 |
| 30,001–70,000 | >114–265 | 50 | 15 | 75 | 23 | | |
| 70,001–90,000 | >265–341 | 50 | 15 | 100 | 30 | ¼ of sum of | |
| 90,001–120,000 | >341–454 | 50 | 15 | 125 | 38 | diameters of | |
| 120,001–200,000 | >454–757 | 50 | 15 | 200 | 61 | adjacent | |
| 200,001–1,000,000 | >757–3,785 | 50 | 15 | 300 | 91 | containers | |
| >1,000,000 | >3,785 | 50 | 15 | 400 | 122 | | |

The 25 ft. minimum distance from aboveground 501-2000 gal. ASME containers to a building or the 501-2000 gal. ASME containers to a building or the line of adjoining property that can be built upon shall be reduced to 10 ft. for a single container of 1200 gal. or less where such container is at least 25 ft. from any other LP-Gas container of more than125 gal. water capacity.
***NFPA 58, §6.4.1.3***

The distance measured in any direction from the point of discharge of a container pressure relief valve, vent of a fixed maximum liquid level gauge on a container, and the container filling connection to exterior sources of ignition, openings into direct-vent (sealed combustion system) appliances, and mechanical ventilation air intakes shall be in accordance with Table 6.4.4.3.
***NFPA 58, §6.4.4.4***

**Table 6.4.4.3 Separation Distance Between Container Pressure Relief Valve and Building Openings**

| Container Type | Exchange or Filled on Site at Point of Use | Distance Horizontally from Relief Valve Discharge to Opening Below Discharge | | Discharge from Relief Valve, Vent Discharge, and Filling Connection to Exterior Source of Ignition, Openings into Direct-Vent Appliances, and Mechanical Ventilation Air Intakes | |
|---|---|---|---|---|---|
| | | ft | m | ft | m |
| Cylinder | Exchange | 3 | 0.9 | 5 | 1.5 |
| Cylinder | Filled on site at the point of use | 3 | 0.9 | 10 | 3.0 |
| ASME | Filled on site at the point of use | 5 | 1.5 | 10 | 3.0 |

Pressure relief devices on the following ASME containers shall be so installed that any gas released is vented away from the container upward and unobstructed to the open air:
(1) Containers of 125 gal (0.5 m3) or more water capacity installed in stationary service
(2) Portable storage containers
(3) Portable tanks
(4) Cargo tanks
***NFPA 58, §6.9.2.3***

Combustible materials shall not accumulate or be stored within 10 ft. of a container.
***NFPA 58, §6.5.3.3***

The minimum horizontal separation between aboveground LP-gas containers and aboveground tanks containing liquids having flash points below 200°F shall be 20 ft.
***NFPA 58, §6.5.3.6***

An aboveground LP-Gas container shall not be located within 6 ft. of a vertical plane beneath overhead electric power lines that are over 600 volts.
***NFPA 58, §6.5.3.13***

Horizontal ASME containers designed for permanent installation in stationary service above ground shall be placed on masonry or other noncombustible structural supports located on concrete or masonry foundations with the container supports. Containers shall not be in contact with the soil.
***NFPA 58, §6.8.3.1 (with changes from) LP-Gas Safety Rules, §9.403***

***Flexible Connectors.***

Flexible connectors shall be installed in accordance with the manufacturer's instructions.
***NFPA 58, §6.11.6.1***

Hose shall be prohibited between the first-stage and second-stage regulator except during temporary use.
***NFPA 58, §6.11.6.2***

Flexible metallic connectors shall not exceed 5 ft in overall length when used with liquid or vapor piping on stationary containers of 2000 gal water capacity or less
***NFPA 58, §6.11.6.3***

***Underground Containers.***

Distances for all underground and mounded ASME containers shall be measured from the container surface.
***NFPA 58, §6.4.2.2***

(A) Containers installed in areas with no vehicular traffic shall be installed at least 6 in. below grade.
(B) At installations within 10 ft of a public vehicular thoroughfare or designated parking location, a noninterchangeable underground container shall be installed 18 in. below grade or vehicular barrier protection shall be provided
(J) Prior to burial, the container shall be visually examined for damage to the coating. Damaged areas shall be repaired with a coating recommended for underground service and with the existing coating.
(K) Containers shall be set level and shall be surrounded by earth or sand firmly tamped in place.
(M) Backfill shall be free of rocks and abrasives.
***NFPA 58, §6.8.6.1***

***Corrosion Protection.***

ASME containers installed underground, partially underground, or as mounded installations shall incorporate provisions for cathodic protection and shall be coated with a material recommended for the service that is applied in accordance with the coating manufacturer's instructions.
***NFPA 58, §5.2.1.11***

A corrosion protection system shall be installed on new installations of underground steel containers, unless technical justification is provided to and is approved by the authority having jurisdiction. The corrosion protection system shall include the following:
(1) A container coating complying with 5.2.1.11
(2) A cathodic protection system that consists of a surficial anode(s) or an impressed current anode
(3) A means to test the performance of the cathodic protection system in accordance with 6.19.3
***NFPA 58, §6.8.6.1 (I)***

(a) In addition to NFPA 58 requirements, steel containers and steel piping systems installed underground, partially underground, or as mounded installations on or after March 1, 2014, shall include a corrosion protection system
(b) Cathodic protection systems installed on or after March 1, 2014 shall be monitored by every licensee servicing the container in accordance with NFPA 58, §6.19.3.1 through 6.19.3.3. Such licensees shall document the test results.
(c) The licensee shall retain documentation of test results in accordance with §9.4 of this title (relating to Records).
(d) Steel containers and piping systems installed underground, partially underground, or as mounded installations on or after March 1, 2014, shall not be filled unless a cathodic protection system is installed in accordance with this section.
***LP-Gas Safety Rules, §9.116***

Sacrificial anodes shall be tested in accordance with the following schedule.
(1) Upon installation of the cathodic protection system, unless prohibited by climatic conditions, in which case testing shall be done within 180 days after the installation of the system.
(2) For continued verification of the effectiveness of the system, 12 to 18 months after the initial test.
(3) Upon successful verification testing and in consideration of previous test results, periodic follow-up testing shall be performed at intervals not to exceed 36 months.
(4) Systems failing a test shall be repaired as soon as practical unless climatic conditions prohibit this action, in which case the repair shall be made not more than 180 days thereafter. The testing schedule shall be restarted.
(5) Documentation of the results of the two most recent tests shall be retained.
***NFPA 58, §6.19.3.2***

***Installing Stationary DOT Cylinders***

Cylinders shall be installed only aboveground and shall be set upon a firm foundation of concrete, masonry, or metal and be firmly secured against displacement.
***NFPA 58, §6.8.2.1 (with changes from) LP-Gas Safety Rules, §9.403***

The cylinder shall not be in contact with the soil.
***NFPA 58, §6.8.2.2***

Flexibility shall be provided in the connecting piping.
***NFPA 58, §6.8.2.3***

Where flexible connectors are used, they shall comply with 6.11.6.
***NFPA 58, §6.8.2.4***

***Container Nameplates***

LP-gas shall not be introduced into an ASME container unless the container is equipped with an original nameplate or at least one of the nameplates defined in this subsection permanently attached to the container.
**(1)** Commission identification nameplate
**(2)** Duplicate nameplate
**(3)** Modification nameplate
**(4)** Replacement nameplate
***LP-Gas Safety Rules, §9.129(a)***

Nameplates on stationary ASME containers built prior to September 1, 1984, shall include at least the following legible information:
**(1)**Name of container manufacturer,
**(2)**Manufacturer's serial number,
**(3)**Container's working pressure,
**(4)**Container's water capacity, and
**(5)**the ASME Code symbol.
***LP-Gas Safety Rules, §9.129(d)***

Nameplates on stationary ASME containers built on or after September 1, 1984, shall be stainless steel and permanently attached by continuous fusion welding around the perimeter of the nameplate, and shall be stamped or etched with the following:
1) Service for which the container is designed (e.g., underground, aboveground, or both)
(2) Name and address of container supplier or trade name of container
(3) Water capacity of container in pounds or U.S. gallons
(4) MAWP in pounds per square inch
(5) Wording that reads "This container shall not contain a product that has a vapor pressure in excess of ___ psig at 100°F" (see Table 5.2.4.2)
(6) Outside surface area in square feet
(7) Year of manufacture
(8) Shell thickness and head thickness
(9) OL (overall length), OD (outside diameter), and HD (head design)
(10) Manufacturer's serial number
(11) ASME Code symbol
(12) Minimum design metal temperature ___°F at MAWP____ psi
(13) Type of construction "W"
(14) Degree of radiography "RT-___"
***LP-Gas Safety Rules, §9.129(e), NFPA 58, §5.2.8.3(c)***

Where the container is buried, mounded, insulated, or otherwise covered so the nameplate is obscured, a duplicate nameplate shall be installed in a clearly visible and accessible location.
***LP-Gas Safety Rules, §9.129(h)***

***Painting Containers***

Aboveground containers shall be painted.
***NFPA 58, §6.8.1.4***

ASME containers, except vaporizers, shall be painted white or aluminum, or any other heat-reflective color (such as light green, light blue, etc.). Darker, heat-absorbing colors (such as black, navy blue, etc.) shall not be permitted.
***LP-Gas Safety Rules, §9.141. (a)(1)***

**Sample Question 3**

The cylinder shall not be in contact with _____.

A. Masonry
B. Metal
C. Soil
D. Concrete

***Answer on last page***

## *Piping and Tubing Materials*

Piping, tubing, fittings, and valves used to supply utilization equipment within the scope of NFPA 54 shall comply with that code.
***NFPA 58, §5.11.1.2***

Pipe shall be wrought iron or steel (black or galvanized), brass, copper, polyamide or polyethylene:
Wrought iron, ASTM B 36.10M
Steel pipe, ASTM A 53
Steel pipe, ASTM A 106
Brass pipe, ASTM B 43
Copper pipe, ASTM B 42
Polyamide ASTM F2945/ Polyethylene, ASTM D 2513
***NFPA 58, §5.11.3.1***

Cast-iron pipe shall not be used.
***NFPA 54, §5.6.2.1***

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*
***NFPA 54, §5.6.2.2***

Copper tubing shall comply with standard Type K or Type L of ASTM B88, *Standard Specification Copper Water Tube,* or ASTM B280, *Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service*.
***NFPA 54, §5.6.3.4***

Corrugated stainless steel tubing shall be listed in accordance with ANSI LC 1/CSA 6.26, *Fuel Gas Piping Systems Using Corrugated Stainless-Steel Tubing.*
***NFPA 54, §5.6.3.6***

Tubing shall be steel, stainless steel, brass, copper, polyamide or polyethylene:
Steel tubing, ASTM A 539
Brass tubing, ASTM B 135
Copper tubing, ASTM B 88 or B 280
Polyamide ASTM F2945
Polyethylene, ASTM D 2513
Corrugated Stainless Steel Tubing, ANSI 6.26
***NFPA 58, §5.11.3.2***

Fittings shall be steel, brass, copper, malleable iron, or ductile (nodular) iron.
***NFPA 58, §5.11.4***

Joints in polyamide and polyethylene pipe and polyethylene tubing shall be made by: heat fusion, compression-type mechanical fittings, factory-assembled transition fittings
***NFPA 58, §5.11.5.1***

(A) Outdoor LP-Gas liquid or vapor metallic piping systems shall have no pressure limitations.
(B) Outdoor underground LP-Gas liquid or vapor polyamide piping systems shall have pressure limitations as defined by the design pressure of the piping being installed.
(C) Polyethylene piping systems shall be limited to the following:
(1) Vapor service not exceeding 30 psig
(2) Installation outdoors and underground
LP-Gas vapor at pressures exceeding 20 psig or LP-Gas liquid shall not be piped into any building. (with specific expectations)
(E)* Corrugated stainless steel piping systems shall be limited to vapor service not exceeding the listed pressure rating of the product.
***NFPA 58, §6.11.1.1***

## *Installation of Metallic Pipe, Tubing, and Fittings*

(a) In addition to the requirements of NFPA 54, Chapter 7, Gas Piping Installation, LP-gas piping shall be installed, altered, repaired, pressure tested, and leakage tested only by persons properly certified by the Commission pursuant to §9.10 and §9.13 of this title
(b) Licensees and registrants shall document and retain such documentation of all pressure and leakage tests pursuant to §9.4 of this title.
(c) When connecting to or supplying a new piping system with corrugated stainless steel tubing (CSST), the licensee or registrant shall verify the system is bonded.
(d) In addition to NFPA 58 §5.11.5, licensees and registrants shall retain written proof regarding any current certifications required by the manufacturer for installation and repair methods for CSST, polyethylene, and polyamide pipe and tubing, including heat-fusion
***LP-Gas Safety Rules, §9.308***

Metallic pipe joints shall be permitted to be threaded, flanged, welded, press-connected, or brazed.
***NFPA 58, §6.11.3.5***

Metallic tubing joints shall be flared or brazed.
***NFPA 58, §6.11.3.6***

Aboveground piping shall be supported and protected against physical damage by vehicles.
***NFPA 58, §6.11.3.10***

The portion of aboveground piping in contact with a support or a corrosion-causing substance shall be protected against corrosion.
***NFPA 58, §6.11.3.11***

Piping installed aboveground shall be securely supported and located where it will be protected from physical damage. Where passing through an exterior wall, the piping shall also be protected from corrosion by coating or wrapping with an inert material approved for such applications. The piping shall be sealed around its circumference at the point of the exterior penetration to prevent the entry of water, insects, and rodents. Where piping is encased in a protective pipe sleeve, the annular spaces between the gas piping and the sleeve and between the sleeve and the wall opening shall be sealed.
***NFPA 54, §7.2.1***

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.
***NFPA 54, §7.1.2***

Underground piping systems shall be installed with a minimum of 12 in. of cover.
(A) The minimum cover shall be increased to 18 in. if external damage to the pipe or tubing from external forces is likely to result.
(B) Where a minimum of 12 in. of cover cannot be provided, the pipe shall be installed in conduit or bridged (shielded)
***NFPA 54, §7.1.2.1***

LP-Gas piping systems shall not be used as a grounding electrode.
***NFPA 58, §6.11.3.15***

Underground metallic piping, tubing, or both that convey LP-Gas from an underground, partially buried, or mounded gas storage container shall be provided with dielectric fittings installed above ground and outdoors at the building to electrically isolate it from the aboveground portion of the fixed piping system that enters a building.
***NFPA 58, §6.11.3.16 (with changes from) LP-Gas Safety Rules, §9.403***

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,
(A) Pipe lighter than Schedule 40 shall be connected using press-connect fittings, flanges, brazing, or welding.
***NFPA 54, §5.6.7.1***

The maximum operating pressure for any piping systems located inside buildings shall not exceed 5 psi (34 kPa) unless one or more of the following conditions are met:
(1) The piping joints are welded or brazed.
(2) The piping joints are flanged and all pipe-to-flange connections are made by welding or brazing.
(3) The piping is located in a ventilated chase or otherwise enclosed for protection against accidental gas accumulation.
(4) The piping is located inside buildings or separate areas of buildings used exclusively for one of the following: (a) Industrial processing or heating (b) Research (c) Warehousing (d) Boiler or mechanical rooms
(5) The piping is a temporary installation for buildings under construction.
(6) The piping serves appliances or equipment used for agri- cultural purposes.
(7) The piping system is an LP-Gas piping system with an operating pressure greater than 20 psi and complies with NFPA 58.
***NFPA 54, §5.5.4***

***Plastic Piping***

Plastic piping shall be installed outdoors, underground only.
***NFPA 54, §7.1.7.1***

Anodeless risers shall comply with the following:
(1) Factory-assembled anodeless risers shall be recommended by the manufacturer for the gas used and shall be leak tested by the manufacturer in accordance with written procedures.
(2) Service head adapters and field-assembled anodeless risers incorporating service head adapters shall be recommended by the manufacturer for the gas used and shall be design-certified to meet the requirements of Category I of ASTM D2513, Standard Specification for Polyethylene (PE) Gas Pressure Pipe, Tubing, and Fittings, and 49 CFR 192.281(e). The manufacturer shall provide the user qualified installation instructions as prescribed by 49 CFR 192.283(b).
(3) The use of plastic pipe, tubing, and fittings in undiluted LP-Gas piping systems shall be in accordance with NFPA 58.
***NFPA 54, §5.6.4.3***

Polyethylene and polyamide pipe and tubing shall be buried as follows:
(1) With a minimum of 12 in. of cover
(2) With a minimum of 18 in. of cover if external damage to the pipe or tubing is likely to result
(3) With piping installed in conduit or bridged (shielded) if a minimum of 12 in. of cover cannot be provided
***NFPA 58, §6.11.4.2***

Assembled anodeless risers shall be used to terminate underground polyamide and polyethylene fixed piping systems above ground.
(A) The horizontal portion of risers shall be buried at least 12 in. below grade, and the casing material used for the risers shall be protected against corrosion in accordance with Section 6.19.
***NFPA 58, §6.11.4.3***

Field-assembled risers shall be supplied only in kit form with all necessary hardware for installation.
(A) Field-assembled risers shall comply with the following:
(1) They shall be design certified.
(2) They shall be sealed and pressure tested by the installer.
(3) They shall be assembled and installed in accordance with the riser manufacturer's instructions.
***NFPA 58, §6.11.4.4***

An electrically continuous corrosion-resistant tracer wire (minimum AWG 14) or tape shall be buried with the polyamide or polyethylene pipe to facilitate locating the pipe.
(A) One end of the tracer wire shall be brought above ground at a building wall or riser.
(B) The tracer wire or tape shall not be in direct contact with the polyamide or polyethylene pipe.
***NFPA 58, §6.11.4.6***

**Sample Question 4**

Plastic piping shall be installed _____ only.

A. outdoors
B. underground
C. indoors
D. Both A and B

***Answer on last page.***

## *Gas Pressure Regulators*

A two-stage regulator system, an integral two-stage regulator, or a 2 psi regulator system shall be required on all fixed piping systems that serve 1⁄2 psig appliance systems [normally operated at 11 in. water column pressure].
***NFPA 58, §6.10.2.1***

Single-stage regulators shall not be installed in fixed piping systems on or after February 1, 2001, except for Installations covered in 6.10.2.4.
***NFPA 58, §6.11.3.16 (with changes from) LP-Gas Safety Rules, §9.403***

Regulators connected to single container permanent installations shall be installed with one of the following methods:
(1) Attached to the vapor service valve using metallic pipe, tubing, fittings, or adapters that do not exceed 60 in. in total length.
(2) Attached to the vapor service valve with a single flexible metallic connector
***NFPA 58, §6.10.1.1(A)***

All regulators for outdoor installations shall be designed, installed, or protected so their operation will not be affected by the elements (freezing rain, sleet, snow, ice, mud, or debris).
***NFPA 58, §6.10.1.4***

The point of discharge from the required pressure relief device on regulated equipment installed outside of buildings or occupiable structures in fixed piping systems shall be located not less than 3 ft horizontally away from any building or occupiable structure opening below the level of discharge, and not beneath or inside any building or occupiable structure unless this space is not enclosed for more than 50 percent of its perimeter.
***NFPA 58, §6.10.1.5***

The point of discharge shall also be located not less than 5 ft. in any direction away from any source of ignition, openings into direct-vent appliances, or mechanical ventilation air intakes.
***NFPA 58, §6.10.1.6***

The discharge of the regulator vent shall be above the highest probable water level.
***NFPA 58, §6.8.6.1(H)***

A line gas pressure regulator or gas equipment pressure regulator, shall be installed where the gas supply pressure exceeds the maximum allowable inlet pressure of the appliance served.
***NFPA 54, §5.8.1***

Line pressure regulators shall be Listed where the outlet pressure is set to 2 psi or less.
***NFPA 54, §5.8.2***

The gas pressure regulator shall be accessible for servicing.
***NFPA 54, §5.8.3***

Pressure regulators shall be protected against physical damage.
***NFPA 54, §5.8.4***

## Sample Question 5

Regulator point of discharge shall also be located not less than ____ft. in any direction away from any source of ignition, openings into direct-vent appliances, or mechanical ventilation air intakes

A. 1
B. 2
C. 3
D. 5
E. 10

***Answer on last page***

# *Sizing and Installing Piping Systems*

***Sizing Piping Systems***

Gas piping systems shall be of such size and so installed as to provide a supply of gas sufficient to meet the maximum demand and supply gas to each appliance inlet at not less than the minimum supply pressure required by the appliance.
***NFPA 54, §5.4.1***

LP-Gas vapor piping systems shall be sized and installed to provide a supply of gas to meet the maximum demand of all gas utilization equipment.
***NFPA 58, §6.11.2.2***

When the pipe sizing method of 6.11.2.2 is used, Table 16.1(a) through (p), or other approved piping tables, shall be used to size piping systems.
***NFPA 58, §16.1***

The volumetric flow rate of gas to be provided shall be the sum of the maximum input of the appliances served.
***NFPA 54, §5.4.2.1***

The total connected hourly load shall be used as the basis for piping sizing, assuming all appliances are operating at full capacity simultaneously.
***NFPA 54, §5.4.2.3***

Where required by the authority having jurisdiction, a piping sketch or plan shall be prepared before proceeding with the installation. This plan shall show the proposed location of piping, the size of different branches, the various load demands, and the location of the point of delivery.
***NFPA 54, §5.1.1***

Where the pipe size is to be determined using any of the methods in 6.1.1 through 6.1.3, (Longest length, Branch length, or Hybrid pressure methods) the diameter of each pipe segment shall be obtained from the pipe sizing tables in Section 6.2 or Section 6.3 or from the sizing equations in Section 6.4.
***NFPA 54, §6.1***

*Longest Length Method*-The pipe size of each section of gas piping shall be determined using the longest length of piping from the point of delivery to the most remote outlet and the load of the section.
***NFPA 54, §6.1.1***

*Branch Length Method*- Pipe shall be sized as follows:
(1) Pipe size of each section of the longest pipe run from the point of delivery to the most remote outlet shall be deter- mined using the longest run of piping and the load of the section.
(2) The pipe size of each section of branch piping not previously sized shall be determined using the length of piping from the point of delivery to the most remote outlet in each branch and the load of the section
***NFPA 54, §6.1.2***

*Hybrid Pressure*- The pipe size for each section of higher pressure gas piping shall be determined using the longest length of piping from the point of delivery to the most remote line pressure regulator. The pipe size from the line pressure regulator to each outlet shall be determined using the length of piping from the regulator to the most remote outlet served by the regulator
***NFPA 54, §6.1.3***

***Piping Installation***

A licensee shall not connect an LP-gas container or cylinder to a piping installation made by a person who is not licensed to make such installation, except that connection may be made to piping installed by an individual on that individual's single family residential home. A licensee may connect to piping installed by an unlicensed person provided the licensee has verified that the piping is free of leaks and has been installed according to the rules of this chapter, and filed with AFS a completed LPG Form 22, identifying the unlicensed person who installed the LP-gas piping.
***LP-Gas Safety Rules, §9.134***

CSST piping systems shall be installed in accordance with this code and the manufacturer's installation instructions.
***NFPA 54, §7.2.7***

Each aboveground portion of a gas piping system, other than CSST, that is likely to become energized shall be electrically continuous and bonded to an effective ground-fault current path. Gas piping, other than CSST, shall be considered to be bonded when it is connected to appliances that are connected to the appliance grounding conductor of the circuit supplying that appliance.
***NFPA 54, §7.12.1***

CSST gas piping systems, and gas piping systems containing one or more segments of CSST, shall be electrically continuous and bonded to the electrical service grounding electrode system or, where provided, lightning protection grounding electrode system.
***NFPA 54, §7.12.2***

The bonding jumper shall connect to a metallic pipe, pipe fitting, or CSST fitting.
***NFPA 54, §7.12.2.1***

CSST listed with an arc resistant jacket or coating system, shall be electrically continuous and bonded to an effective ground fault current path. Where any CSST component of a piping system does not have an arc-resistant jacket or coating system, the bonding requirements of 7.12.2 shall apply. Arc-resistant jacketed CSST shall be considered to be bonded when it is connected to appliances that are connected to the appliance grounding conductor of the circuit supplying that appliance.
***NFPA 54, §7.12.3***

Gas piping shall not be used as a grounding conductor or electrode.
***NFPA 54, §7.12.4***

Gas pipe, tubing, and fittings shall be clear and free from cutting burrs and defects in structure or threading and shall be thoroughly brushed and chip and scale blown. Defects in pipe, tubing, and fittings shall not be repaired. Defective pipe, tubing, and fittings shall be replaced.
***NFPA 54, §5.6.5***

Pipe with threads that are stripped, chipped, corroded, or otherwise damaged shall not be used. Where a weld opens during the operation of cutting or threading, that portion of the pipe shall not be used.
***NFPA 54, §5.6.6.2***

Thread joint compounds (pipe dope) shall be resistant to the action of LP-gas or to any other chemical constituents of the gases to be used in the piping.
***NFPA 54, §5.6.6.4***

Gas piping inside any building shall not be installed in or through a clothes chute, chimney or gas vent, dumbwaiter, elevator shaft, or air duct, other than combustion air ducts.
***NFPA 54, §7.2.5***

Outlets shall not be located behind doors.
***NFPA 54, §7.7.1.2***

Outlets shall be located far enough from floors, walls, patios, slabs, and ceilings to permit the use of wrenches without straining, bending, or damaging the piping.
***NFPA 54, §7.7.1.3***

The unthreaded portion of gas piping outlets shall extend not less than 1 in. through finished ceilings or indoor or outdoor walls.
***NFPA 54, §7.7.1.4***

The unthreaded portion of gas piping outlets shall extend not less than 2 in. above the surface of floors or outdoor patios or slabs.
***NFPA 54, §7.7.1.5***

Each outlet, including a valve, 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.
***NFPA 54, §7.7.2.1***

A hydrostatic relief valve or a device providing pressure-relieving protection shall be installed in each section of piping and hose in which liquid LP-Gas can be **isolated between shutoff valves**, so as to relieve the pressure that could develop from the trapped liquid to a safe atmosphere or product-retaining section.
***NFPA 54, §6.15***

**Sample Question 6**

CSST piping systems shall be installed in accordance with NFPA code and _____?

A. manufacturer's installation instructions
B. CSST universal installation standards
C. Code of federal regulations
D. Boiler pressure vessel code

***Answer on last page***

## *Inspection and Pressure Testing of Piping Systems*

**Pressure Test**

Prior to acceptance and initial operation, all piping installations shall be visually inspected and pressure tested to determine that the materials, design, fabrication, and installation practices comply with the requirements of this code.
***NFPA 54, §8.1.1.1***

Inspection shall consist of visual examination, during or after manufacture, fabrication, assembly, or pressure tests.
***NFPA 54, §8.1.1.2***

The test medium shall be air, nitrogen, carbon dioxide, or an inert gas. Oxygen shall not be used as a test medium.
***NFPA 54, §8.1.2***

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.
***NFPA 54, §8.1.3.3***

Where the piping system is connected to appliances or equipment designed for operating pressures of less than the test pressure, such appliances or equipment shall be isolated from the piping system by disconnecting them and capping the outlet(s).
***NFPA 54, §8.1.3.4***

Where the piping system is connected to appliances or equipment designed for operating pressures equal to or greater than the test pressure, such appliances and equipment shall be isolated from the piping system by closing the individual appliance shutoff valve(s).
***NFPA 54, §8.1.3.5***

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.
***NFPA 54, §8.1.4.1***

The test pressure to be used shall be no less than 11⁄2 times the proposed maximum working pressure, but not less than 3 psi
***NFPA 54, §8.1.4.2***

Test duration shall be not less than 1⁄2 hour for each 500 ft3 of pipe volume or fraction thereof. When testing a system having a volume less than 10 ft3 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.
***NFPA 54, §8.1.4.3***

Where leakage or other defects are located, the affected portion of the piping system shall be repaired or replaced and retested.
***NFPA 54, §8.1.5.3***

## *Appliance Installation Requirements*

When additional or replacement appliances or equipment is installed or an appli- ance is converted to gas from another fuel, the location in which the appliances or equipment is 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.
(2) The installation components and appliances meet the clearances to combustible material provisions of 9.2.2. 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.
***NFPA 54, §9.1.2***

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 instruction.
***NFPA 54, §9.1.3***

Appliances in residential garages and in adjacent spaces that open to the garage and are not part of the living space of a dwelling unit shall be installed so that all burners and burner ignition devices are located not less than 18 in. above the floor unless listed as flammable vapor ignition resistant.
***NFPA 54, §9.1.10.1***

Such appliances shall be located or protected so they are not subject to physical damage by a moving vehicle.
***NFPA 54, §9.1.10.2***

Where appliances are installed in a separate, enclosed space having access only from outside of the garage, such appliances shall be permitted to be installed at floor level, providing the required combustion air is taken from the exterior of the garage.
***NFPA 54, §9.1.10.3***

Appliances shall be so supported and so connected to the piping as not to exert undue strain on the connections.
***NFPA 54, §9.1.17***

Where the gas supply pressure is higher than the pressure the appliance is designed to operate at, a gas appliance pressure regulator shall be installed.
***NFPA 54, §9.1.18***

All appliances shall be located with respect to building construction and other equipment so as to permit access to the appliance. Sufficient clearance shall be maintained to permit cleaning of heating surfaces; the replacement of filters, blowers, motors, burners, controls, and vent connections; the lubrication of moving parts where necessary; the adjustment and cleaning of burners and pilots; and the proper functioning of explosion vents, if provided. For attic installation, the passageway and servicing area adjacent to the appliance shall be floored.
***NFPA 54, §9.2.1***

***Combustion and Ventilation Air***

The required volume of indoor air shall be determined by the:
(1) Standard Method
(2) Known Air Infiltration Rate (KAIR) Method
Except that where the air infiltration rate is known to be less than 0.40 ACH, the KAIR shall be used.
***NFPA 54, §9.3.2***

The minimum required volume shall be 50 $ft^3$ per 1000 Btu/hour.
***NFPA 54, §9.3.2.1***

Openings used to connect indoor spaces shall be sized and located in accordance with the following: Each opening shall have a minimum free area of 1 $in^2$/1000 Btu/hr. of the total input rating of all appliances in the space but not less than 100 $in^2$ One permanent opening shall commence within 12 in. of the top of the enclosure and one permanent opening shall commence within 12 in. of the bottom of the enclosure. The minimum dimension of air openings shall not be less than 3 in.
***NFPA 54, §9.3.2.3***

Two permanent openings, within 12 in. of the top of the enclosure and one commencing within 12 in. of the bottom. Of the enclosure shall be provided. The openings shall communicate directly or by ducts with the outdoors.
(1) Vertical ducts, each opening shall have a minimum free area of 1 $in^2$/4000 Btu/hr
(2) Horizontal ducts, shall have free area of 1 $in^2$/2000 Btu/hr. of total input rating of all appliances.
***NFPA 54, §9.3.3.1***

One permanent opening, commencing within 12 in. of the top of the enclosure, shall be provided. The appliance shall have clearances of at least 1 in. from the sides and back and 6 in. 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 1 $in^2$/3000 Btu/hr. of the total input rating of all appliances
***NFPA 54, §9.3.3.2***

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
***NFPA 54, §9.3.7.1***

Screens shall not be smaller than 1⁄4 in. mesh.
***NFPA 54, §9.3.7.2***

Ducts shall be constructed of galvanized steel or a material having equivalent corrosion resistance, strength, and rigidity.
***NFPA 54, §9.3.8.1***

Ducts shall terminate in an unobstructed space, allowing free movement of combustion air to the appliances.
***NFPA 54, §9.3.8.2***

Ducts shall serve a single space.
***NFPA 54, §9.3.8.3***

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.
***NFPA 54, §9.3.8.4***

Ducts shall not be screened where terminating in an attic space.
***NFPA 54, §9.3.8.5***

Horizontal upper combustion air ducts shall not slope downward toward the source of combustion air.
***NFPA 54, §9.3.8.6***

Combustion air intake openings located on the exterior of the building shall have the lowest side of the combustion air intake openings located at least 12 in. above the adjoining grade level.
***NFPA 54, §9.3.8.8***

An attic in which an appliance is installed shall be accessible through an opening and passageway at least as large as the largest component of the appliance, and not less than 22 in. × 30 in.
***NFPA 54, §9.5.1***

***Appliance Installation***

Appliances and equipment shall be connected to the building piping in compliance by one of the following:
(1) Rigid metallic pipe and fittings.
(2) Semirigid metallic tubing and metallic fittings. Aluminum alloy tubing shall not be used in exterior locations.
(3) A listed connector in compliance with ANSI Z21.24/CSA 6.10, Connectors for Gas Appliances. The connector shall be used in accordance with the manufacturer's installation instructions and shall be in the same room as the appliance. Only one connector shall be used per appliance.
(4) A listed connector in compliance with ANSI Z21.75/CSA 6.27, Connectors for Outdoor Gas Appliances and Manufactured Homes. Only one connector shall be used per appliance.
(5) CSST where installed in accordance with the manufacturer's installation instructions. 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
***NFPA 54, §9.6.1***

Materials addressed in 9.6.1(2) through (6) shall not be installed through an opening in an appliance housing, cabinet, or casing, unless the tubing or connector is protected against damage.
***NFPA 54, §9.6.1.2***

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 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 of minimum length and shall not exceed 6 ft
(c) The connector shall not be concealed and shall not extend from one room to another or passthrough wall partitions, ceilings, or floors.
(2) *Outdoor*. Where outdoor gas hose connectors are used to connect portable outdoor appliances, the connector shall be listed in accordance with ANSI Z21.54, 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 connection shall be made only in the outdoor area where the appliance is to be used.
***NFPA 54, §9.6.2***

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.
***NFPA 54, §9.6.4.4***

Each appliance connected to a piping system shall have an accessible, approved manual shutoff valve with a non-displaceable 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.
***NFPA 54, §9.6.5***

The shutoff valve shall be located within 6 ft of the appliance it serves
(A) 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.
(B) 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.
***NFPA 54, §9.6.5.1***

Shutoff valves serving appliances installed in vented fireplaces and ventless firebox enclosures shall not be required to be located within 6 ft of the appliance where such valves are readily accessible and permanently identified.
***NFPA 54, §9.6.5.2***

Where installed at a manifold, the appliance shutoff valve shall be located within 50 ft of the appliance served and shall be readily accessible and permanently identified.
***NFPA 54, §9.6.5.3***

Appliances can be connected to the building piping by means of a listed gas convenience outlet, in conjunction with a listed appliance connector, used in accordance with the manufacturer's installation instructions.
***NFPA 54, §9.6.7***

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. Illuminating appliances, gas ranges, clothes dryers, decorative appliances for installation in vented fireplaces, gas fire- places, and outdoor cooking appliances shall not be required to be so equipped.
***NFPA 54, §9.6.8***

***Appliance Venting***

Venting systems shall be designed and constructed to convey all flue and vent gases to the outdoors.
***NFPA 54, §12.1***

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) Listed dishwasher instantaneous hot water heaters
(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
***NFPA 54, §12.3.2***

A venting system shall satisfy the draft requirements of the appliance in accordance with the manufacturer's instructions.
***NFPA 54, §12.4.1***

A chimney for residential-type or low-heat appliances shall extend at least 3 ft. above the highest point where it passes through a roof of a building and at least 2 ft. higher than any portion of a building within a horizontal distance of 10 ft.
***NFPA 54, §12.6.2.1***

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.
***NFPA 54, §12.7.2***

(1) A gas vent shall terminate in accordance with one of the following:
(a) Gas vents that are 12 in. or less in size and located not less than 8 ft from a vertical wall or similar obstruction shall terminate above the roof in accordance with Figure 12.7.3 and Table 12.7.3.
(b) Gas vents that are over 12 in. in size or are located less than 8 ft from a vertical wall or similar obstruction shall terminate not less than 2 ft above the highest point where they pass through the roof and not less than 2 ft above any portion of a building within 10 ft horizontally.
(2) A Type B or a Type L gas vent shall terminate at least 5 ft 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 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.
***NFPA 54, §12.7.3***

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.
***NFPA 54, §12.11.7***

A vent connector shall be supported for the design and weight of the material employed to maintain clearances and prevent physical damage and separation of joints.
***NFPA 54, §12.11.9***

**Sample Question 7**

Where installed at a manifold, the appliance shutoff valve shall be located within _____ ft of the appliance served.

A. 3
B. 5
C. 6
D. 25
E. 50

***Answer on last page***

## *Installation of Specific Appliances*

***Bedrooms or Bathrooms***

Appliances shall not be installed so their combustion, ventilation, and dilution air are obtained only from a bedroom or bathroom unless they have the required volume in accordance with 9.3.2. (50 $ft^3$/1000 Btu/hr.)
***NFPA 54, §10.1.2***

Central heating furnace and low-pressure boiler installations in bedrooms or bathrooms shall comply with one of the following:
(1) Be installed in a closet located in the bedroom or bathroom, with a weather-stripped solid door with a self-closing device, and all combustion air shall be obtained from the outdoors.
(2) Be of the direct vent type.
***NFPA 54, §10.3.1***

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 a self-closing device, and all combustion air shall be obtained from the outdoors.
(2) Water heater shall be of the direct vent type.
***NFPA 54, §10.27.1***

***Clothes Dryers***

The installation of clothes dryers shall comply with the following requirements:
(1) Listed Type 1 clothes dryers shall be installed with a minimum clearance of 6 in. 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) Listed Type 2 clothes dryers shall be installed with clearances of not less than 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.
(3) Unlisted clothes dryers shall be installed with clearances to combustible material of not less than 18 in. Combustible floors under unlisted clothes dryers shall be protected in an approved manner
***NFPA 54, §10.4.1***

Type 1 and Type 2 clothes dryers shall be exhausted to the outdoors.
***NFPA 54, §10.4.2***

A clothes dryer exhaust duct shall not be connected into any vent connector, gas vent, chimney, crawl space, attic, or other similar concealed space.
***NFPA 54, §10.4.4.1***

Ducts for exhausting clothes dryers shall not be assembled with screws or other fastening means that extend into the duct and that would catch lint and reduce the efficiency of the exhaust system.
***NFPA 54, §10.4.4.2***

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 ANSI/UL 2158A, and installed in accordance with the clothes dryer manufacturer's installation instructions.
***NFPA 54, §10.4.4.3***

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. thick
***NFPA 54, §10.4.5.2***

Type 2 dryers shall be equipped with lint-controlling means.
***NFPA 54, §10.4.5.3***

Exhaust ducts for unlisted Type 2 clothes dryers shall be installed with a minimum clearance of 6 in. from adjacent combustible material.
***NFPA 54, §10.4.5.4***

Where ducts pass through walls, floors, or partitions, the space around the duct shall be sealed with noncombustible material.
***NFPA 54, §10.4.5.5***

All clothes dryers installed for multiple-family or public use shall be equipped with approved safety shutoff devices and shall be installed as specified for a Type 2 clothes dryer.
***NFPA 54, §10.4.5.6***

***Decorative Appliances for Fireplaces***

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.
***NFPA 54, §10.6.2***

Vented gas fireplaces shall not be installed in bathrooms or bedrooms unless the appliance is listed and the bedroom or bathroom has the required volume in accordance with 9.3.2.
***NFPA 54, §10.7.1***

The installation of vented gas fireplaces shall comply with the following requirements:
(1) Listed 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.
(2) Unlisted vented gas fireplaces shall not be installed in or attached to combustible material and shall also comply with the following: (a) They shall have a clearance at the sides and rear of not less than 18 in.
***NFPA 54, §10.7.2***

***Duct Furnaces***

Listed duct furnaces shall be installed with clearances of at least 6 in. between adjacent walls, ceilings, and floors of combustible material and the furnace draft hood and shall comply with the following:
(a) Furnaces listed for installation at lesser clearances shall be installed in accordance with the manufacturer's installation instructions.
(b) In no case shall the clearance be such as to interfere with combustion air and accessibility
***NFPA 54, §10.10.1***

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.
***NFPA 54, §10.10.4***

***Food Service Appliances***

Listed 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. from combustible material except that at least a 2 in. 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
***NFPA 54, §10.12.1***

Floor-mounted appliances with casters shall be listed for such construction and shall be installed in accordance with the manufacturer's installation instructions for limiting the movement of the appliance to prevent strain on the connection.
***NFPA 54, §10.12.6***

A vertical distance of not less than 48 in. shall be provided between the top of all food service hot plates and griddles and combustible material.
***NFPA 54, §10.13.1***

Listed floor-mounted and built-in household cooking appliances shall be installed in accordance with the manufacturer's installation instructions.
***NFPA 54, §10.14.1***

(1) Listed floor-mounted household cooking appliances, where installed on combustible floors, shall be set on their own bases or legs.
***NFPA 54, §10.14.2***

Household cooking appliances shall have a vertical clearance above the cooking top of not less than 30 in. to combustible material or metal cabinets. A minimum clearance of 24 in. is permitted when one of the following is installed:
(2) A metal ventilating hood of sheet metal not less than 0.0122 in. thick is installed above the cooking top with a clearance of not less than 1⁄4 in. 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 listed cooking appliance or microwave oven is installed over a listed cooking appliance and conforms to the terms of the upper appliance's manufacturer's installation instructions.
***NFPA 54, §10.14.2.1***

***Infrared Heaters***

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 vibrationisolating hangers.
***NFPA 54, §10.17.1***

Where unvented infrared heaters are used, natural or mechanical means shall be provided to supply and exhaust at least 4 $ft^3$/min/1000 Btu/hr. input of installed heaters.
***NFPA 54, §10.17.3.1***

Exhaust openings for removing flue products shall be above the level of the heaters.
***NFPA 54, §10.17.3.2***

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
***NFPA 54, §10.25.1***

***Outdoor Cooking Appliances***

Listed outdoor cooking appliances shall be installed in accordance with the manufacturer's installation instructions.
***NFPA 54, §10.19.1***

Unlisted outdoor cooking appliances shall be installed outdoors with clearances to combustible material of not less than 36 in. at the sides and back and not less than 48 in. at the front. In no case shall the appliance be located under overhead combustible construction.
***NFPA 54, §10.19.2***

***Pool Heaters***

A pool heater shall be located or protected so as to minimize accidental contact of hot surfaces by persons.
***NFPA 54, §10.20.1***

The installation of pool heaters shall meet the following requirements:
(1) In no case shall the clearances be such as to interfere with combustion air, draft hood or vent terminal clearance and relief, and accessibility for servicing.
(2) A listed pool heater shall be installed in accordance with the manufacturer's installation instructions.
(3) An unlisted pool heater shall be installed with a minimum clearance of 12 in. on all sides and the rear. A combustible floor under an unlisted pool heater shall be protected in an approved manner.
***NFPA 54, §10.20.2***

***Room Heaters***

Unvented room heaters shall not be installed in bathrooms or bedrooms.
Exception No. 1: Where approved by the authority having jurisdiction, 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 and combustion and ventilation air is provided as specified in 10.1.2.
Exception No. 2: Where approved by the authority having jurisdiction, 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 and combustion and ventilation air is provided as specified in 10.1.2.
***NFPA 54, §10.22.1***

Room heaters shall not be installed in the following occupancies:
(1) Residential board and care
(2) Health care
***NFPA 54, §10.22.3***

In addition to *NFPA 54, Chapter 10* room heaters in, schools, day care centers, foster homes, hotels, similar buildings, or rooms for temporary lodging. shall be vented and equipped with a safety shut-off device, shall not exceed 40,000 Btu, and shall be equipped with an oxygen depletion system.
***LP-Gas Safety Rules, §9.306***

***Wall Furnaces***

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.
***NFPA 54, §10.26.13***

Wall furnaces shall be located so as not to cause a hazard to walls, floors, curtains, furniture, or doors. other parts of the building.
***NFPA 54, §10.26.2***

***Water Heaters***

Unlisted water heaters shall be installed with a clearance of 12 in. on all sides and rear. Combustible floors under unlisted water heaters shall be protected in an approved manner.
***NFPA 54, §10.27.2.2***

A water heater installation shall be provided with overpressure protection by means of an approved, listed device 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.
***NFPA 54, §10.27.3***

## Sample Question 8

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 _____ Btu/hr and combustion and ventilation air is provided.

A. 6,000
B. 10,000
C. 20,000
D. 40,000

***Answer on last page***

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.
***NFPA 54, §10.29***

## *Placing Appliances in Operation*

**Leak Check**

Leak checks using fuel gas shall be permitted in piping systems that have been pressure tested
***NFPA 54, §8.2.1***

The leakage shall be located by means of an approved gas detector, a noncorrosive leak detection fluid, or other approved leak detection methods.
***NFPA 54, §8.1.5.2***

During the process of turning gas on into a system of new gas piping, the entire system shall be inspected to determine that there are no open fittings or ends and that all valves at unused outlets are closed and plugged or capped.
***NFPA 54, §8.2.2***

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.
***NFPA 54, §8.2.3***

Appliances and equipment shall not be placed in operation until after the piping system has been checked for leakage in accordance with 8.2.3, the piping system is purged in accordance with Section 8.3, and connections to the appliance are checked for leakage.
***NFPA 54, §8.2.4***

**Purging**

The piping system shall be purged in accordance with one or more of the following:
(1) The piping shall be purged with fuel gas and shall discharge to the outdoors.
(2) The piping shall be purged with fuel gas and shall discharge to the indoors or outdoors through an appliance burner not located in a combustion chamber. Such burner shall be provided with a continuous source of ignition.
(3) The piping shall be purged with fuel gas and shall discharge to the indoors or outdoors through a burner that has a continuous source of ignition and that is designed for such purpose.
(4) The piping shall be purged with fuel gas that is discharged to the indoors or outdoors, and the point of discharge shall be monitored with a listed combustible gas detector in accordance with 8.3.2.2. Purging shall be stopped when fuel gas is detected
***NFPA 54, §8.3.2.1***

After the piping system has been placed in operation, appliances and equipment shall be purged before being placed into operation.
***NFPA 54, §8.3.3***

**Placing Appliances in Operation**

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.
***NFPA 54, §11.1.1***

The input rate can be adjusted by either changing the size of a fixed orifice, changing the adjustment of an adjust- able orifice, or readjusting the appliance's gas pressure regulator outlet pressure (where a regulator is provided in the appliance)
***NFPA 54, §11.1.1.1***

The input rate shall be determined by one of the following:
(1) Checking burner input by using a gas meter
(2) Checking burner input by using manifold pressure and orifice size
***NFPA 54, §11.1.1.2***

Gas input ratings of appliances shall be used for elevations up to 2000 ft.
The input ratings of appliances operating at elevations above 2000 ft. shall be reduced in accordance with one of the following methods:
(1) 4% for each 1000 ft. above sea level
(2) As permitted by the AHJ
(3) De-rated per the manufacturer's instructions
***NFPA 54, §11.1.2***

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.
***NFPA 54, §11.2***

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 function properly to turn off the gas supply in the event of pilot outage or other improper operation, it shall be properly serviced or replaced with a new device.
***NFPA 54, §11.3***

Appliances supplied with means for automatic ignition shall be checked for proper operation within the parameters provided by the manufacturer. Any adjustments made shall be in accordance with the manufacturer's installation instructions.
***NFPA 54, §11.4***

All protective devices furnished with the appliance:
Limit control, fan control to blower, temperature and pressure relief valve, low-water cutoff device, manual operating features, shall be checked for proper operation within the parameters provided by the manufacturer.
***NFPA 54, §11.5***

Draft hood–equipped appliances shall be checked to verify that there is no draft hood spillage after 5 minutes of main burner operation
***NFPA 54, §11.6***

Operating instructions shall be furnished and shall be left in a prominent position near the appliance for the use of the consumer.
***NFPA 54, §11.7***

***Reported Leaks***

(a) Each licensee shall maintain a written procedure to be followed when any employee receives notification of a possible leak. The licensee shall ensure that all employees are familiar with the procedure and shall authorize employees to implement the procedure without management oversight. The written procedure shall be available to emergency response agencies as specified in NFPA 58, §6.29.2.
(b) The written procedures shall include the classification of the leak grade as defined in §9.2
***LP-Gas Safety Rules, §9.35***

LP-Gas Leak Classification

| Classification | Action Criteria | Examples |
|---|---|---|
| Grade 1 | Requires prompt action to protect life and property. The prompt action in some instances may require one or more of the following:<br>1. Implementation of company emergency plan<br>2. Evacuating premises<br>3. Blocking off an area<br>4. Rerouting traffic<br>5. Eliminating sources of ignition<br>6. Venting the area<br>7. Stopping the flow of gas by closing valves or other means<br>8. Notifying police and fire departments | 1. Any leak which, in the judgment of operating personnel at the scene, is regarded as an immediate hazard<br>2. Escaping gas that has ignited<br>3. Any indication of gas which has migrated into or under a building or into a tunnel<br>4. Any leak that can be seen, heard or felt and which is in a location that may endanger the general public or property |
| Grade 2 | Many Grade 2 leaks, because of their location and magnitude, can be scheduled for repair on a normal routine basis with periodic re-inspection as necessary.<br><br>Product may not be introduced into a container with a Grade 2 leak on a container appurtenance until the leak is repaired. | Any leak which, in the judgment of operating personnel at the scene, is NOT regarded as an immediate hazard shall be scheduled for repair, where no migration of gas into or under a building or into a tunnel is evident |

***School Leak Check***

A school district shall ensure that a leakage test is performed on each school LP-gas system as specified in this section.
(1) The leakage test shall be performed by an LP-gas licensee, an individual registered with the Commission pursuant to §9.13 of this title (relating to General Installers and Repairman Exemption), or an employee of the school district who is a certificate holder.
(2) If a leak is found in a school LP-gas system, the school district shall immediately remove the affected school district facility from LP-gas service until repairs are made and it passes a subsequent school LP-gas system leakage test. If an employee of a school district performs the initial test, then the subsequent test may not be performed by a school district employee.
(3) Each school district shall provide the district's supplier with a copy of the most current LP-Gas Form 30 as proof the school LP-gas system has been tested in accordance with this section.
(4) A school district shall retain LPG Form 30 specifying the date and result of the leakage test performed on each school LP-gas system for a minimum of five years from the date each test was performed. A school district shall make LPG Form 30 readily available for review by the Commission or its authorized representative upon request.
***LP-Gas Safety Rules, §9.41(b)***

School Leakage test requirements.
(1) The results of the leakage test for each building or structure shall be immediately documented on LPG Form 30.
(2) LP-gas shall be used as the test medium.
(3) Leakage test pressure shall not exceed normal operating pressure.
(4).Leakage test duration shall not be less than 30 minutes.
***LP-Gas Safety Rules, §9.41(c)***

## Sample Question 9

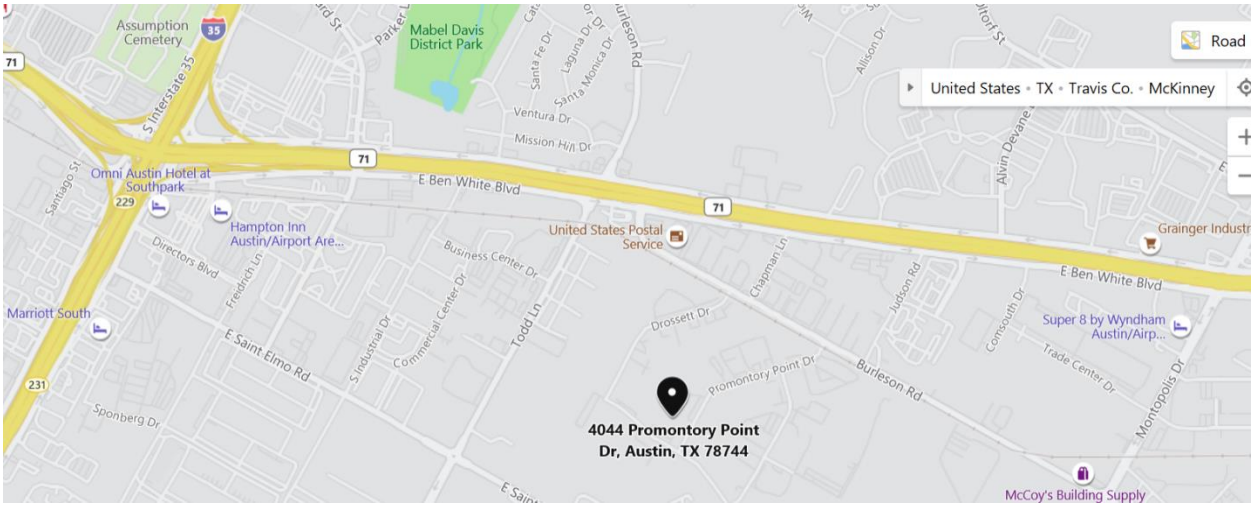
Each school district shall provide the district's supplier with a copy of the most current LP-Gas Form ____ as proof the school LP-gas system has been tested

A. 1
B. 16
C. 22
D. 30
E. 40

***Answer on last page***

# ALTERNATIVE FUELS TRAINING CENTER

# 4044 Promontory Point Austin Texas 78744





**Sample Question Answers**

1. B
2. B
3. C
4. D
5. D
6. A
7. E
8. A
9. D