TEXAS CNG EXAMINATION STUDY GUIDE

Service & Installation Technician Employee Level

Railroad Commission of Texas

Rev 1.1

Notice

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This publication is not intended to be an exhaustive treatment of the subjects covered and should not be interpreted as precluding the use of other safety programs or procedures that comply with (1) applicable federal, state, and/or local code provisions, statutes, ordinances, and/or other regulations, including, but not limited to, the Railroad Commission of Texas' *Regulations for Compressed Natural Gas and Liquified Natural Gas* (16 Texas Administrative Code, Chapter 13) and codes adopted by the Railroad Commission of Texas, and/or (2) other industry standards and/or practices.

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CNG EXAMINATION STUDY GUIDE
Employee-LEVEL

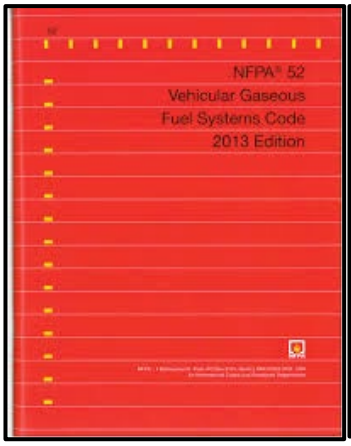
Service & Installation Technician
Employee Level

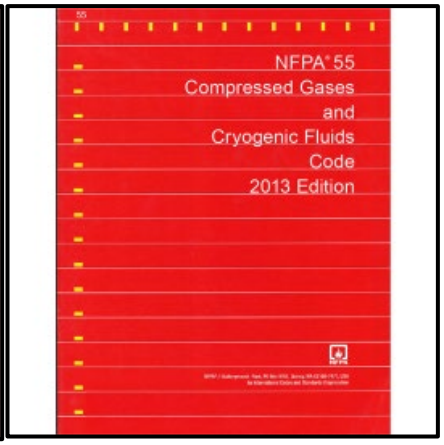
Who should use this guide?

You should use this guide if you plan to take the Railroad Commission's employee level qualifying examination to perform CNG installation and repair activities.
The Employee Level CNG Service & Installation Technician examination qualifies an individual to perform all CNG activities related to stationary CNG systems, including CNG containers, piping, and equipment.

NOTE: The Service and Installation examination does **NOT** authorize an individual to fill containers or operate a CNG transport.

What books do I need?





This examination tests your knowledge of the laws and standards that apply to Service & Installation Technician Employee Level operations in Texas.
These laws and standards are found in:

Regulations for Compressed Natural Gas and Liquified Natural Gas (Texas Railroad Commission)
NFPA 52, Vehicular Natural Gas Fuel Systems Code (2013 Edition)
NFPA 55, *Compressed Gases and Cryogenic Fluids Code* (2013 Edition)

Where do I get these books?

You may download or print the current edition of the Railroad Commission's Regulations for Compressed Natural Gas and Liquified Natural Gas in PDF format online at https://www.rrc.texas.gov/alternative-fuels/alternative-fuels-regulations. To order additional copies of the LP-Gas Safety Rules, please contact the Railroad Commission's Central Records Section at PublicSales@rrc.texas.gov or (512) 463-6882.

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 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 CNG activities you will perform, as well as the rules and standards highlighted in this guide.

Regulations for Compressed Natural Gas and Liquefied Natural Gas (2023)

ASME--American Society of Mechanical Engineers.
Regulations for CNG, §13.3(2)

Cascade storage system--Storage in multiple cylinders.
Regulations for CNG, §13.3(6)

CNG cylinder--A cylinder or other container designed for use or used as part of a CNG system.
Regulations for CNG, §13.3(11)

CNG system--A system of safety devices, cylinders, piping, fittings, valves, compressors, regulators, dryers, gauges, relief devices, vents, installation fixtures, and other CNG equipment intended for use or used in any building or public place by the general public, or used in conjunction with a motor vehicle or mobile fuel system fueled by CNG, and any system or facilities designed to be used or used in the compression, sale, storage, transportation for delivery, or distribution of CNG in portable CNG cylinders, but does not include natural gas facilities, equipment, or pipelines located upstream of the outlet of the natural gas meter.
Regulations for CNG, §13.3(12)

Commercial installation--Any CNG installation located on premises other than a single-family dwelling used as a residence, or a private agricultural installation, including but not limited to a retail business establishment, school, convalescent home, hospital, retail CNG cylinder filling/exchange operation, service station, forklift refueling facility, or private motor/mobile fuel cylinder filling operation.
Regulations for CNG, §13.3(13)

Company representative--The individual designated to the Commission by a license applicant or a licensee as the principal individual in authority and actively supervising the conduct of the licensee's CNG activities.
Regulations for CNG, §13.3(15)

Compressed natural gas is a mixture of hydrocarbons in gases and vapors consisting principally of methane.
Regulations for CNG, §13.3(16)

Dispensing installation--A CNG installation that dispenses CNG from any source by any means into fuel supply cylinders installed on vehicles or into portable cylinders.
Regulations for CNG, §13.3(20)

Licensed--Authorized by the Commission to perform CNG activities through the issuance of a valid license.
Regulations for CNG, §13.3(25)

Licensee--A person which has applied for and been granted a CNG license by the Commission.
Regulations for CNG, §13.3(26)

Mobile fuel container--A CNG container mounted on a vehicle to store CNG as the fuel supply for uses other than the engine to propel the vehicle, including use in an auxiliary engine.
Regulations for CNG, §13.3(29)

Mobile fuel system--A CNG system which supplies natural gas fuel to an auxiliary engine other than the engine used to propel the vehicle or for other uses on the vehicle.
Regulations for CNG, §13.3(30)

Motor fuel container--A CNG container mounted on a vehicle to store CNG as the fuel supply to an engine used to propel the vehicle.
Regulations for CNG, §13.3(31)

Motor fuel system--A CNG system to supply natural gas as a fuel for an engine used to propel the vehicle.
Regulations for CNG, §13.3(32)

Operations supervisor--The individual who is certified by the Commission to actively supervise a licensee's CNG activities and is authorized by the licensee to implement operational changes.
Regulations for CNG, §13.3(34)

Outlet--A site operated by a CNG licensee from which any regulated CNG activity is performed.
Regulations for CNG, §13.3(35)

Pressure relief device--A device designed to provide a means of venting excess pressure to prevent rupture of a normally charged cylinder.
Regulations for CNG, §13.3(38)

Pullaway--The accidental separation of a hose from a cylinder, container, transfer equipment, or dispensing equipment, which could occur on a cylinder, container, transfer equipment, or dispensing equipment whether or not they are protected by a pullaway or breakaway device.
Regulations for CNG, §13.3(40)

Residential fueling facility--An assembly and its associated equipment and piping at a residence used for the compression and delivery of natural gas into vehicles.
Regulations for CNG, §13.3(42)

Trainee--An individual who has not yet taken and passed an employee-level rules examination.
Regulations for CNG, §13.3(47)

Transfer system--All piping, fittings, valves, pumps, compressors, meters, hoses, and equipment used in transferring CNG between containers.
Regulations for CNG, §13.3(48)

Transport--Any vehicle or combination of vehicles and CNG cylinders designed or adapted for use or used principally as a means of moving or delivering CNG from one place to another, including but not limited to any truck, trailer, semitrailer, cargo tank, or other vehicle used in the distribution of CNG.
Regulations for CNG, §13.3(49)

Ultimate consumer--The person controlling CNG immediately prior to its ignition.
Regulations for CNG, §13.3(50)

NFPA 52 (2013)

ASME Code. The American Society of Mechanical Engineers' *Boiler and Pressure Vessel Code*.
NFPA 52, §3.3.3

Container. A pressure vessel, cylinder, or cylinder(s) permanently manifolded together used to store CNG or LNG.
NFPA 52, §3.3.9

> ***Cargo Transport Container.*** A mobile unit designed to transport LNG or CNG.
> ***NFPA 52, §3.3.9.1***
>
> ***Composite Container.*** A container consisting of an inner metal or plastic gas-containing component, reinforced with a filament and resin outer layer.
> ***NFPA 52, §3.3.9.2***
>
> ***Fuel Supply Container.*** A container mounted on a vehicle to store LNG or CNG as the fuel supply to the vehicle.
> ***NFPA 52, §3.3.9.3***
>
> ***Fueling Facility Container.*** Primary storage for vehicular fueling.
> ***NFPA 52, §3.3.9.4***

Dispensing Station. A natural gas installation that dispenses CNG or LNG from storage containers or a distribution pipeline into vehicular fuel supply containers or into portable cylinders by means of a compressor, reformer, vaporizer, or pressure booster.
NFPA 52, §3.3.18

DOT. U.S. Department of Transportation.
NFPA 52, §3.3.19

Piping. A means of transporting natural gas. This term applies to refueling facilities.
NFPA 52, §3.3.42

Point of Transfer. The location where connections and disconnections are made.
NFPA 52, §3.3.43

Pressure.
Compression Discharge Pressure. The varying pressure at the point of discharge from the compressor.
NFPA 52, §3.3.44.1

Maximum Allowable Working Pressure (MAWP). The maximum pressure to which any component or portion of the pressure system can be subjected over the entire range of design temperatures. This value is 1.1 × 1.25 × the service pressure.
NFPA 52, §3.3.44.2

Operating Pressure. The varying pressure in a fuel supply container during normal container use.
NFPA 52, §3.3.44.3

Maximum Operating Pressure. The steady-state gauge pressure at which a part or system normally operates. This value is 1.25 × the pressure.
NFPA 52, §3.3.44.3.1

Set Pressure. The start-to-discharge pressure for which a relief valve is set and marked.
NFPA 52, §3.3.44.5

Settled Pressure. The pressure in a container after the temperature of the gas reaches equilibrium.
NFPA 52, §3.3.44.6

Storage Pressure. The varying pressure in the storage containers.
NFPA 52, §3.3.44.7

Pressure Regulator. A device, either adjustable or nonadjustable, for controlling and maintaining, within acceptable limits, a uniform outlet pressure.
NFPA 52, §3.3.45

Pressure Vessel. A container or other component designed in accordance with the ASME Boiler and Pressure Vessel Code or CSA B51, Boiler, Pressure Vessel and Pressure Piping Code.
NFPA 52, §3.3.47

Vaporizer. A device other than a container that receives LNG in liquid form and adds sufficient heat to convert the liquid to a gaseous state, or a device used to add heat to LNG for the purpose of saturating LNG.
NFPA 52, §3.3.59

Water Capacity. The amount of water at 60°F required to fill a container.
NFPA 52, §3.3.63

NFPA 55 (2013)

CFR. The Code of Federal Regulations of the United States Government. [1, 2012]
NFPA 55, §3.3.18

Compressor. A mechanical device used to increase the pressure and the resultant density of a gas through the act of compression.
NFPA 55, §3.3.22

Cylinder. A pressure vessel designed for absolute pressures higher than 40 psi and having a circular cross section. It does not include a portable tank, multiunit tank car tank, cargo tank, or tank car.
NFPA 55, §3.3.29

Emergency Shutoff Valve. A designated valve designed to shut off the flow of gases or liquids.
NFPA 55, §3.3.37

Automatic Emergency Shutoff Valve. A designated fail-safe automatic closing valve designed to shut off the flow of gases or liquids that is initiated by a control system where the control system is activated by either manual or automatic means.
NFPA 55, §3.3.37.1

Manual Emergency Shutoff Valve. A designated valve designed to shut off the flow of gases or liquids that is manually operated.
NFPA 55, §3.3.37.2

Qualified Individual. An individual knowledgeable in the hazards of compressed gases and cryogenic fluids through training and work experience.
NFPA 55, §3.3.82

Tank.
Portable Tank. Any packaging over 60 U.S. gal capacity designed primarily to be loaded into or on, or temporarily attached to, a transport vehicle or ship and equipped with skids, mountings, or accessories to facilitate handling of the tank by mechanical means.
NFPA 55, §3.3.94.1

Stationary Tank. A packaging designed primarily for stationary installations not intended for loading, unloading, or attachment to a transport vehicle as part of its normal operation in the process of use.
NFPA 55, §3.3.94.2

Sample Question 1

Pressure Vessel is defined as a container or other component designed in accordance with the _____ Code.

A. Railroad Commission
B. DOT
C. ASME
D. Federal

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 Natural Gas activities you will perform, as well as the rules and standards highlighted in this guide.

When you take the examination, read each question very carefully.

ADMINISTRATIVE RULES - GENERAL REQUIREMENTS

Licensees, registered manufacturers, company representatives, and operations supervisors at each outlet shall have copies of all current licenses and/or manufacturer registrations and certification cards for employees at that location available for inspection during regular business hours. In addition, licensees and registered manufacturers shall maintain a current version of the rules in this chapter and any adopted codes covering CNG activities performed by the licensee or manufacturer, and shall provide at least one copy of all publications to each company representative and operations supervisor. The copies shall be available to employees during business hours.
Regulations for CNG, §13.61(h)

Application for a New Certificate

In addition to NFPA 52 §§1.4.3 and 4.2, and NFPA 55 §4.7, no person shall perform work, directly supervise CNG activities, or be employed in any capacity requiring contact with CNG unless that individual is employed by a licensee and:
(A) is a certificate holder who is in compliance with renewal requirements in subsection (h) of this section;
(B) is a trainee who complies with subsection (f) of this section; or
(C) holds a current examination exemption pursuant to subsection (g) of this section.
Regulations for CNG, §13.70(a)(1)

An individual who passes the applicable rules examination with a score of at least 75% will become a certificate holder. AFS will send a certificate to the licensee listed on the CNG Form 1016.
If a licensee is not listed on the form, AFS will send the certificate to the individual's personal address.
(A) Successful completion of any required examination shall be credited to and accrue to the individual.
(B) An individual who has been issued a certificate shall make it readily available and shall present the certificate to any Commission employee or agent who requests proof of certification.
Regulations for CNG, §13.70(b)(1)

An individual who files CNG Form 1016 and pays the applicable nonrefundable examination fee may take the rules examination.
(A) Dates and locations of available Commission CNG examinations may be obtained on the Commission's web site. Examinations may be administered:
(i) at the Commission's AFS Training Center in Austin:
(ii) at other designated times and locations around the state; and
(iii) through an online testing or proctoring service.
(B) Individuals or companies may request in writing that examinations be given in their area. AFS shall schedule examinations at its discretion.
(C) Exam fees.
(i) The nonrefundable management-level rules examination fee is $70.
(ii) The nonrefundable employee-level rules examination fee is $40.
(iii) The nonrefundable examination fees shall be paid each time an individual takes an examination.
(iv) A military service member, military veteran, or military spouse shall be exempt from the examination fee pursuant to the requirements in §13.76 of this title (relating to Military Fee Exemption). An individual who receives a military fee exemption is not exempt from renewal fees specified in subsection (h) of this section.
(v) Beginning February 7, 2023, individuals who register for an examination to be administered by a testing or proctoring service shall pay any fee required by the testing or proctoring service in addition to paying the examination fee to the Commission.
(D) Time limits.
(i) An applicant shall complete the examination within two hours.
(ii) The examination proctor shall be the official timekeeper.
(iii) An examinee shall submit the examination and the answer sheet to the examination proctor before or at the end of the established time limit for an examination.
(iv) The examination proctor shall mark any answer sheet that was not completed within the time limit.
Regulations for CNG, §13.70(b)(3)

Failure of any examination shall immediately disqualify the individual from performing any CNG related activities covered by the examination which is failed, except for activities covered by a separate examination which the individual has passed.
(1) Any individual who fails an examination administered by the Commission at the Austin location may retake the same examination one additional time during a business day.
(2) Any subsequent examinations shall be taken on another business day, unless approved by the AFS director.
(3) An individual who fails an examination may request an analysis of the individual's performance on the examination.
Regulations for CNG, §13.70(e)

Trainees.
(1) 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, as specified in subsection (b) of this section or registered as specified in subsection (g) of this section, subject to the following conditions:
(A) In addition to NFPA 52 §4.2, 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.
(B) A trainee who has been in training for a total period of 45 calendar days, in any combination and with any number of employers, shall cease to perform any CNG activities for which the trainee is not certified until the trainee successfully completes the rules examination.
(2) A trainee who fails the rules examination shall immediately cease to perform any CNG related activities covered by the examination failed.
Regulations for CNG, §13.70(f)

Requirements for certificate holder renewal.
(1) In order to maintain active status, certificate holders shall renew their certificate or exemption annually as specified in this subsection.
(2) AFS shall notify licensees of any of their employees' pending renewal deadlines and shall notify the individual if not employed by a licensee, in writing, at the address on file with AFS no later than March 15 of a year for the May 31 renewal date of that year.
(3) Certificate holders shall pay the nonrefundable $25 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.
(A) Failure to pay the nonrefundable annual renewal fee by the deadline shall result in a lapsed certificate.
(i) To renew a lapsed certificate, the individual shall pay the nonrefundable $25 annual renewal fee plus a nonrefundable $20 late-filing fee. Failure to do so shall result in the expiration of the certificate.
(ii) If an individual's certificate lapses or expires, that individual shall immediately cease performance of any CNG activities authorized by the certificate.
(iii) 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 of subsection (a) of this section.
(B) Upon receipt of the annual renewal fee and late filing fee, AFS shall verify that all applicable requirements have been met. After verification, AFS shall renew the certificate and send a copy of the certificate, and the individual may continue or resume CNG activities authorized by that certificate.
Regulations for CNG, §13.70(h)

General installers and repairmen exemption.

(1) Any individual who is currently licensed as a master or journeyman plumber by the Texas State Board of Plumbing Examiners or who is currently licensed with a Class A or B Air Conditioning and Refrigeration Contractors License issued by the Texas Department of Licensing and Regulation may register with AFS and be granted an exemption to the service and installation technician employee-level examination requirements provided the applicant:
(A) holds an active license in compliance with Texas Occupations Code, §1302.260, relating to Issuance and Term of License, and §1301.351, relating to License, Endorsement, or Registration Required;
(B) submits a completed CNG Form 1016B;
(C) submits the required $30 original filing fee, except as described in paragraph (8) of this subsection;
(D) submits a legible copy of a current Air Conditioning and Refrigeration Contractors License or Master/Journeyman Plumbers certificate; and
(E) submits a legible copy of a current picture state-issued identification card or driver's license.
(2) This exemption does not become effective until the examination exemption card is issued by AFS.
(3) The examination exemption accrues to the individual and is nontransferable. An exemption does not allow other individuals to perform CNG related activities under the supervision of the registered individual. Each individual performing CNG related activities must be registered or certified by examination in accordance with subsection (a) of this section.
(4) Any individual granted such exemption shall maintain registered status at all times. Upon failure to maintain registered status, the individual shall immediately cease all affected CNG activities until proper status has been regained.
(5) In order to maintain an exemption, each individual issued an examination exemption card must maintain a valid master or journeyman plumbers license or Class A or B Air Conditioning and Refrigeration Contractors license. Each individual shall also pay a $20 annual renewal fee to AFS on or before May 31 of each year. Failure to pay the annual renewal fee by May 31 shall result in a lapsed exemption. If an individual's exemption lapses, that individual shall cease all CNG activities until the exemption has been renewed. To renew a lapsed exemption, the individual shall pay the $20 annual renewal fee plus a $20 late filing fee. Failure to do so shall result in the expiration of the examination exemption. If the individual's examination exemption has been expired for more than two years, the individual shall complete all requirements necessary to apply for a new exemption.
(6) Individuals issued an exemption must maintain a valid master or journeyman plumbers license or ACR Contractors license to renew their Commission registration.
(7) Any individual who is issued an exemption under this subsection agrees to comply with the current edition of the rules in this chapter. In the event the exempt individual surrenders, fails to renew, or has the license revoked either by the Texas State Board of Plumbing Examiners or Texas Department of Licensing and Regulation, that individual shall immediately cease performing any CNG activity granted by this section.
(8) A military service member, military veteran, or military spouse shall be exempt from the original registration fee pursuant to the requirements in §13.76 of this title. An individual who receives a military fee exemption is not exempt from renewal fees specified in subsection (h) of this section.
Regulations for CNG, §13.70(g)

Report of CNG Incident/Accident

(a) At the earliest practical moment or within two hours following discovery, a licensee owning, operating, or servicing equipment or an installation shall notify AFS by telephone of any incident or accident involving CNG which:
(1) caused a death or personal injury requiring hospitalization;
(2) required taking an operating facility out of service;
(3) resulted in unintentional gas ignition requiring emergency response;
(4) meets the requirements of subsection (c) of this section;
(5) caused an estimated damage to the property of the operator, others or both totaling $50,000 or more, including gas loss;
(6) involves a single release of CNG during or following CNG transfer or during container transportation. Any loss of CNG which is less than 1.0% of the gross amount delivered, stored, or withdrawn need not be reported. However, any loss occurring as a result of a pullaway shall be reported;
(7) could reasonably be judged as significant because of rerouting of traffic, evacuation of buildings, or media interest, even though it does not meet paragraphs (1) - (6) of this subsection; or
(8) is required to be reported to any other state or federal agency (such as the Texas Department of Public Safety or the United States Department of Transportation).
(b)The telephonic notice required by this section shall be made to the Railroad Commission's 24-hour emergency line at (512) 463-6788 or (844) 773-0305 and shall include the following:
(1) date and time of the incident;
(2) name of reporting operator;
(3) phone number of operator;
(4) location of leak or incident;
(5) personal injuries and/or fatalities;
(6) whether fire, explosion, or gas leak has occurred;
(7) status of gas leak or other immediate hazards;
(8) other significant facts relevant to the incident; and
(9) whether immediate assistance from AFS is requested.
(c) Any transport unit required to be registered with AFS in accordance with §13.69 of this title (relating to Registration and Transfer of CNG Cargo Tanks and Delivery Units) which is involved in an accident where there is damage to the tank, piping or appurtenances, or any release of CNG resulting from an accident shall be reported to AFS in accordance with this section regardless of the accident location. Any CNG powered motor vehicle used for school transportation or mass transit including any state owned vehicle which is involved in an accident resulting in a substantial release of CNG or damage to the CNG conversion equipment shall be reported to AFS in accordance with this section regardless of accident location.
(d) Following the initial telephone report, the licensee who made the telephonic report shall submit CNG Form 1020 to AFS. The form shall be postmarked within 14 calendar days of the date of initial notification to AFS, or within five business days of receipt of the fire department report, whichever occurs first, unless AFS grants authorization for a longer period of time when additional investigation or information is necessary.
(e) Within five business days of receipt, AFS shall review CNG Form 1020 and notify in writing the person submitting CNG Form 1020 if the report is incomplete and specify in detail what information is lacking or needed. Incomplete reports may delay the resumption of CNG activities at the involved location.
Regulations for CNG, §13.36

General Rules for Stationary CNG Installations

Cylinders, Containers, and Tanks

Design and Construction. Cylinders, containers, and tanks shall be designed, fabricated, tested, and marked (stamped) in accordance with regulations of DOT, Transport Canada (TC) *Transportation of Dangerous Goods Regulations*, or the ASME *Boiler and Pressure Vessel Code*, "Rules for the Construction of Unfired Pressure Vessels," Section VIII.
NFPA 55, §7.1.6.1

Cylinders shall be manufactured, inspected, marked, tested, retested, equipped, and used in accordance with the following:
(1) U.S. Department of Transportation (DOT) or Transport Canada (TC) regulations, exemptions, or special permits
(2) ANSI NGV2, *Compressed Natural Gas Vehicle Fuel Containers*, specifically for CNG service
(3) CSA B51, *Boiler, Pressure Vessel and Pressure Piping Code*
(4) U.S. Federal Motor Vehicle Safety Standard, 49 CFR 571.304, *Compressed Natural Gas Fuel Container Integrity*.
NFPA 52, §5.4.4

Pressure Relief Devices

Each cylinder complying with 5.4.4 shall be fitted with one or more pressure relief devices (PRDs) with the number, location, and part number as specified by the cylinder manufacturer and OEM for CNG service for a new vehicle, in accordance with the following:
(1) For a retrofitted vehicle, each cylinder complying with 5.4.4 shall be of the number, location, and part number as specified by the cylinder manufacturer.
(2) A PRD shall be in accordance with one of the following standards:
(a) CGA S-1.1, *Pressure Relief Device Standards* — Part 1 — *Cylinders for Compressed Gases*
(b) ANSI/IAS PRD 1, *Pressure Relief Devices for Natural Gas Vehicle* (NGV) *Fuel Containers*
(c) ANSI/IAS PRD 1a, *Addenda to* ANSI/IAS PRD 1, *Pressure Relief Devices for Natural Gas Vehicle (NGV) Fuel Containers*
(d) ANSI/CSA PRD 1b, *Addenda to* ANSI/IAS PRD 1, *Pressure Relief Devices for Natural Gas Vehicle (NGV) Fuel Containers*
(3) The PRD shall be in direct communication with the fuel and vented to the atmosphere by a method that withstands the maximum pressure that results.
NFPA 52, §5.5.1

PRDs shall be located so that the temperature to which they are subjected is representative of the temperature to which the fuel supply container is subjected.
NFPA 52, §5.5.1.2

Pressure relief valves for CNG service shall not be fitted with lifting devices.
NFPA 52, §5.5.2.2

The adjustment, if external, shall be provided with a means for sealing the adjustment to prevent tampering.
NFPA 52, §5.5.2.2.1

Piping

Pipe, tubing, fittings, gaskets, and packing material shall be compatible with the fuel under the maximum service conditions.
NFPA 52, §5.8.1

The following components shall not be used for CNG service:
(1) Fittings, street els, and other piping components of cast irons other than those complying with ASTM A 47, *Standard Specification for Ferritic Malleable Iron Castings (Grade 35018)*; ASTM A 395, *Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures*; and ASTM A 536, *Standard Specification for Ductile Iron Castings (Grade 60-40-18)*
(2) Plastic pipe, tubing, and fittings for high-pressure service
(3) Galvanized pipe and fittings
(4) Aluminum pipe, tubing, and fittings
(5) Pipe nipples for the initial connection to a container
(6) Copper alloy with copper content exceeding 70 percent.
NFPA 52, §5.8.4

Valves

Valves, valve packing, and gaskets shall be designed or selected for the fuel over the full range of pressures and temperatures to which they are subjected under operating conditions.
NFPA 52, §5.9.1

Shutoff valves shall have a rated service pressure not less than the rated service pressure of the entire system and shall be capable of withstanding a hydrostatic test of at least four times the rated service pressure without rupture.
NFPA 52, §5.9.1.1

Valves of cast irons other than those complying with ASTM A 47, Standard Specification for Ferritic Malleable Iron Castings (Grade 35018); ASTM A 395, *Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures*; and ASTM A 536, *Standard Specification for Ductile Iron Castings (Grade 60-40-18)*, shall not be used as primary stop valves.
NFPA 52, §5.9.2

Valves of a design that allows the valve stem to be removed without removal of the complete valve bonnet or without disassembly of the valve body shall not be used.
NFPA 52, §5.9.3

The manufacturer shall stamp or otherwise permanently mark the valve body to indicate the service ratings.
NFPA 52, §5.9.4

Hose and Hose Connections

Hose and metallic hose shall be constructed of or lined with materials that are resistant to corrosion and exposure to natural gas.
NFPA 52, §5.10.1

Hose, metallic hose, flexible metal hose, tubing, and their connections shall be designed or selected for the most severe pressures and temperatures under normal operating conditions with a burst pressure of at least four times the service pressure.
NFPA 52, §5.10.2

Prior to use, hose assemblies shall be tested by the OEM or its designated representative at a pressure at least twice the service pressure.
NFPA 52, §5.10.3

Hose and metallic hose shall be distinctly marked by the OEM or component manufacturer, either by the manufacturer's permanently attached tag or by distinct markings indicating the manufacturer's name or trademark, applicable service identifier, and design pressure.
NFPA 52, §5.10.4

Removal from CNG Service

In addition to NFPA 55 §§7.1.14 and 7.1.15 and for any installations subject to NFPA 52 requirements, if AFS determines that any CNG cylinder or installation constitutes an immediate danger to the public health, safety, and welfare, AFS shall require the immediate removal of all CNG and/or the immediate disconnection by a properly licensed company to the extent necessary to eliminate the danger. This may include equipment or any part of the system including the service container. A warning tag shall be attached by AFS until the unsafe condition is remedied. Once the unsafe condition is remedied, the tag may be removed by an AFS inspector or by the licensee if authorized by AFS.
Regulations for CNG, §13.38(a)

Manufacturer's Nameplates and Markings on ASME Containers

Pressure vessels shall be manufactured, inspected, marked, and tested in accordance with ASME *Boiler and Pressure Vessel Code*, Section VIII or Section X.
NFPA 52, §5.4.5.1

In addition to NFPA 52 §5.4.5.1 and NFPA 55 §7.1.6.1:
(1) Compressed natural gas (CNG) shall not be introduced into any ASME container unless the container is equipped with an original nameplate or at least one of the following nameplates permanently attached to the container or has the required information stamped directly on the vessel.
(A) A duplicate nameplate is an additional ASME container nameplate issued by the original manufacturer with duplicate information as the original nameplate and clearly marked as a duplicate nameplate but installed in a remote location.
(B) A modification (or alteration) nameplate is a nameplate issued and affixed by an ASME Code facility including only partial information applicable to a modification or alteration performed on that container.
(C) A replacement nameplate is a nameplate including the identical information as the original nameplate and identified as a replacement nameplate, but issued and affixed by the original manufacturer or its successor company or companies when the original nameplate is lost or illegible.
Regulations for CNG, §13.40(a)(1)

Sample Question 2

Shutoff valves shall have a rated service pressure _____ than the rated service pressure of the entire system and shall be capable of withstanding a hydrostatic test of at least _____ times the rated service pressure without rupture.

A. Three times greater / four
B. Two times greater / five
C. Not less / four
D. Three times greater / five

Answer on last page.

CNG Compression, Storage, and Dispensing

General

Equipment related to a compression, storage, or dispensing installation shall be protected to prevent damage from vehicles and minimize the possibilities of physical damage and vandalism.
NFPA 52, §7.3.2

Compression equipment shall be designed for use with CNG and for the pressures and temperatures to which it is subjected under operating conditions.
NFPA 52, §7.3.7

Compression equipment shall have pressure relief devices that limit each stage pressure to the maximum allowable service pressure for the compression cylinder and piping associated with that stage of compression.
NFPA 52, §7.3.8

Where CNG compression equipment is operated unattended, it shall be equipped with a high discharge and a low suction pressure automatic shutdown control.
NFPA 52, §7.3.9

In addition to NFPA 52 §7.3.2, and NFPA 55 §§4.11 and 7.1.9, equipment related to a compression, storage, or dispensing installation, shall be protected from tampering and damage in accordance with subsections (b) and (c) of this section. These protections shall be maintained in good condition at all times.
Regulations for CNG, §13.93(a)

Fencing at CNG stationary installations shall comply with the following.
(1) Fencing material shall be chain link type with wire at least 12-1/2 American wire gauge in size.
(2) Fencing shall be at least six feet in height at all points. Fencing may be five feet in height when topped with at least three strands of barbed wire, with the strands four inches apart.
(3) Uprights, braces, and cornerposts of the fence shall be composed of noncombustible material.
(4) Uprights, braces, and cornerposts of the fence shall be anchored in concrete a minimum of 12 inches below the ground.
(5) All fenced enclosures shall have at least one gate suitable for ingress and egress. All gates shall be locked whenever the area enclosed is unattended.
(6) A minimum clearance of two feet shall be maintained between the fencing and the compression equipment, cylinder cascade(s), or container(s), and the entire dispensing system(s).
(7) Fencing which is located more than 25 feet from any point of a CNG dispensing system(s), container(s), or compression equipment is designated as perimeter fencing. If a CNG dispensing system(s), cylinder cascade(s), or compression equipment is located inside perimeter fencing and is subject to vehicular traffic, it shall be protected against damage according to the specifications set forth in subsection (c) of this section.
(8) The storage and compression area must be completely enclosed by fencing.
(9) Where fencing is not used to protect the installation, then valve locks, a means of locking the electric control for the compressors, or other suitable means shall be provided to prevent unauthorized withdrawal of CNG.
Regulations for CNG, §13.93(b)

Guardrails at CNG stationary installations shall comply with the following:
(1) Vertical supports for guardrails shall be at least three-inch Schedule 40 steel pipe, or other material with equal or greater strength. The vertical supports shall be capped on the top or otherwise protected to prevent the entrance of water or debris into the guardpost, anchored in concrete at least 18 inches below the ground, and rise at least 30 inches above the ground. Supports shall be spaced four feet apart or less.
(2) The top of the horizontal guardrailing shall be secured to the vertical supports at least 30 inches above the ground. The horizontal guardrailing shall be at least three-inch Schedule 40 steel pipe, or other material with equal or greater strength. The horizontal guardrailing shall be capped on the ends or otherwise protected to prevent the entrance of water or debris into the guardpost, and welded or bolted to the vertical supports with bolts of sufficient size and strength to prevent damage to the protected equipment under normal conditions, including the nature of the traffic to which the protected equipment is subjected.
(3) Openings in horizontal guardrailing shall not exceed 36 inches. Only one opening is allowed on each side of the guardrailing. A means of temporarily removing the horizontal guardrailing and/or vertical supports to facilitate the handling of heavy equipment may be incorporated into the horizontal guardrailing and vertical supports. In no case shall the protection provided by the horizontal guardrailing and vertical supports be decreased.
(4) A minimum clearance of 24 inches shall be maintained between the railing and any part of the CNG compression equipment, cylinder cascade(s), container(s), or dispensing equipment.
(5) The operating end of the container(s) and any part of the CNG compression equipment, piping, or cylinder cascade(s) which is exposed to collision damage or vehicular traffic shall be protected from this type of damage.
Regulations for CNG, §13.93(c)

Dispenser protection. Each dispenser shall be secured to a concrete island a minimum of six inches above the normal grade and two inches above the grade of any other fuel dispenser(s). Each dispenser shall be protected against collision damage. Support columns or other such protection installed at the approach end(s) of the concrete island shall prevent collision with the dispenser. If such protection cannot be provided, then the requirements of subsection (c) of this section shall apply.
Regulations for CNG, §13.93(d)

Location of Installations

CNG storage containers charged with CNG not connected for use shall be located outdoors.
NFPA 52, §7.4.2.1

A facility in which CNG compression, storage, and dispensing equipment are sheltered by weather protection constructed in accordance with the requirements of the building code and by a roof designed for ventilation and dispersal of escaped gas shall be considered to be located outdoors.
NFPA 52, §7.4.2.2

Compression, storage, and dispensing equipment located outdoors shall not be beneath electric power lines or where exposed by their failure.
NFPA 52, §7.4.2.3.1

Compression, storage, and dispensing equipment located outdoors shall be a minimum of 10 ft from the nearest important building or line of adjoining property that is able to be built upon or from any source of ignition.
NFPA 52, §7.4.2.3.2

A clear space of at least 3 ft shall be provided for access to all valves and fittings of multiple groups of containers.
NFPA 52, §7.4.2.5

Combustible material shall not be permitted within 10 ft of any stationary container.
NFPA 52, §7.4.2.6

The minimum separation between containers and aboveground tanks containing flammable or combustible liquids shall be 20 ft.
NFPA 52, §7.4.2.7

During outdoor fueling operations, the point of transfer shall be located at least 10 ft from any important building, mobile home, public sidewalk, highway, street, or road and at least 3 ft from storage containers.
NFPA 52, §7.4.2.8

Installation of Cylinders and Cylinder Appurtenances

Storage containers shall be installed above ground on stable, noncombustible foundations or in vaults with ventilation and drainage.
NFPA 52, §7.5.1

In areas subject to flooding, each container shall be anchored to prevent floating.
NFPA 52, §7.5.1.2

Containers shall be protected by painting or other equivalent means where necessary to inhibit corrosion.
NFPA 52, §7.5.2

Composite containers shall not be painted without prior permission from the container manufacturer.
NFPA 52, §7.5.2.1

Horizontally installed containers shall not be in direct contact with each other.
NFPA 52, §7.5.2.2

Composite containers shall be protected from UV radiation as required by the manufacturer.
NFPA 52, §7.5.2.3

Means shall be provided to prevent the flow or accumulation of flammable or combustible liquids under containers, such as by grading, pads, or diversion curbs.
NFPA 52, §7.5.3

Installation of Pressure Relief Devices

Pressure relief valves shall be arranged so that they discharge to a location where escaping gas does not impinge on buildings, other equipment, or areas that are occupiable by the public.
NFPA 52, §7.6.1

Pressure relief valves on pressure vessels shall be installed so that any discharge is in a vertical position.
NFPA 52, §7.6.2

Pressure relief valves shall be fitted with rain caps.
NFPA 52, §7.6.2.1

A pressure relief valve other than a rupture disc shall be installed in the fueling transfer system to prevent pressures in excess of 125 percent of the vehicle service pressure from being supplied to the vehicle.
NFPA 52, §7.6.3

Installation of Pressure Regulator

Regulators shall be designed, installed, or protected so that their operation is not affected by freezing rain, sleet, snow, ice, mud, insects, or debris.
NFPA 52, §7.7.1

Regulator protection of 7.7.1 shall be permitted to be integral with the regulator.
NFPA 52, §7.7.2

Installation of Pressure Gauges

Gauges or other readout devices shall be installed to indicate compression discharge pressure, storage pressure, and dispenser discharge pressure.
NFPA 52, §7.8

Installation of Piping and Hoses

Piping and hose shall be run directly with provisions for expansion, contraction, jarring, vibration, and settling.
NFPA 52, §7.9.1

Exterior piping shall be either buried or installed above ground and shall be supported and protected against mechanical damage.
NFPA 52, §7.9.1.1

Underground piping shall be buried not less than 18 in. below the surface of the ground unless otherwise protected from damage by movement of the ground.
NFPA 52, §7.9.1.2

Underground and aboveground piping shall be protected from corrosion in compliance with recognized practices.
NFPA 52, §7.9.1.3

Threaded pipe and fittings shall not be used underground.
NFPA 52, §7.9.1.4

Underground piping shall be of welded construction without valves, unwelded mechanical joints, or connections installed underground.
NFPA 55, §7.1.18.1

Testing

Piping, tubing and hose, and hose assemblies shall be leak tested after assembly to prove them free from leaks at a pressure equal to at least the normal service pressure of that portion of the system.
NFPA 52, §7.10.1

Pressure relief valves shall be tested at least every 3 years.
NFPA 52, §7.10.2

Installation of Emergency Shutdown Equipment

A manually operated container valve shall be provided for each DOT or TC storage cylinder.
NFPA 52, §7.11.1.1

Individual ASME pressure vessels of any size, not part of a manifold system, shall have a manual shutoff valve.
NFPA 52, §7.11.1.3

The fill line on a storage container shall be equipped with a backflow check valve to prevent discharge of natural gas from the container in case of the rupture of the line, hose, fittings, or other equipment upstream of the storage containers.
NFPA 52, §7.11.2

Where excess-flow check valves are used, the closing flow shall be greater than the maximum system design flow rate and less than the flow rating of the piping system that results from a complete line failure between the excess-flow valve and the equipment downstream of the excess-flow check valve.
NFPA 52, §7.11.3

An emergency manual shutdown device shall be provided within 10 ft of the dispensing area and also greater than 25 ft from the dispensing area.
NFPA 52, §7.11.5

This device, when activated, shall shut off the power supply and gas supply to the compressor and the dispenser.
NFPA 52, §7.11.5.1

Emergency shutdown devices shall be distinctly marked for easy recognition with a permanently affixed legible sign.
NFPA 52, §7.11.5.2

Breakaway protection shall be provided in a manner that, in the event of a pullaway, natural gas ceases to flow at any separation.
NFPA 52, §7.11.6

A breakaway device shall be installed at every dispensing point.
NFPA 52, §7.11.6.1

A breakaway device shall be arranged to separate using a force not greater than 150 lb. when applied in any direction that the vehicle would move.
NFPA 52, §7.11.6.2

Installation of Electrical Equipment

Fixed electrical equipment and wiring within areas specified in Table 7.4.2.9 shall comply with Table 7.4.2.9 and be installed in accordance with NFPA 70, *National Electrical Code*.
NFPA 52, §7.12.1

Stray or Impressed Currents and Bonding

Where stray or impressed currents, such as those from cathodic protection, are used or present on dispensing systems, protective measures shall be taken to prevent ignition.
NFPA 52, §7.13.1

Static protection shall not be required where CNG is transferred by conductive or nonconductive hose, flexible metallic tubing, or pipe connections where both halves of the metallic couplings are in continuous contact.
NFPA 52, §7.13.2

Operation

A cylinder shall not be charged in excess of the design pressure at the normal temperature for that cylinder.
NFPA 52, §7.14.1

DOT, TC, and ANSI/IAS NGV2 cylinders shall be charged in accordance with DOT, TC, and ANSI/IAS NGV2 regulations.
NFPA 52, §7.14.1.1

DOT, TC, and ANSI/IAS NGV2 cylinders shall not be subjected to pressure in excess of 125 percent of the marked service pressure even if, on cooling, the pressure settles to the marked service pressure.
NFPA 52, §7.14.1.2

CNG dispensing systems shall be equipped to stop fuel flow automatically when a fuel supply container reaches the temperature-corrected fill pressure.
NFPA 52, §7.14.3

Fire Protection

A portable fire extinguisher having a rating of not less than 20-B:C shall be provided at the dispensing area.
NFPA 52, §7.15

Maintenance

Containers and their appurtenances, piping systems, compression equipment, controls, and detection devices shall be maintained in safe operating condition and according to manufacturers' instructions.
NFPA 52, §7.16.1

Integrity. Piping, tubing, pressure regulators, valves, and other apparatus shall be kept gastight to prevent leakage.
NFPA 55, §7.3.1.3.1

Maintenance of flammable gas system piping and components shall be performed annually by a qualified representative of the equipment owner.
NFPA 55, §7.6.6.1

This maintenance shall include inspection for physical damage, leak tightness, ground system integrity, vent system operation, equipment identification, warning signs, operator information and training records, scheduled maintenance and retest records, alarm operation, and other safety-related features.
NFPA 55, §7.6.6.2

Dispenser Accuracy

The dispenser shall be designed to detect any malfunction that fills the vehicle fuel container in excess of the limits specified, or causes the relief valve required in 7.6.3 to open.
NFPA 52, §7.14.4

After any such malfunction, the dispenser shall be repaired and calibrated in accordance with Section 7.16 before continued operation.
NFPA 52, §7.14.4.1

Sample Question 3

An emergency manual shutdown device shall be provided within _____ of the dispensing area and also greater than 25 ft from the dispensing area.

A. 10 ft
B. 6 ft
C. 3 ft
D. 1 ft

Answer on last page.

Engine Fuel Systems

Applicability

(a) This subchapter applies to the design, installation, inspection, and testing of compressed natural gas (CNG) fuel supply systems for vehicular internal combustion engines.
(b) Installation of each component of the system shall be made in conformance to the written instructions provided by the manufacturer.
Regulations for CNG, §13.131

Installation of Fuel Supply Cylinders

Fuel supply containers on vehicles shall be permitted to be located within, below, or above the driver or passenger compartment, provided all connections to the container(s) are external to, or sealed and vented from, these compartments.
NFPA 52, §6.3.2

Fuel supply containers shall be protected with a means to prevent damage that occurs due to road hazards, loading, unloading, direct sunlight, exhaust heat, and vehicle use, including accidental cargo leakage.
NFPA 52, §6.3.2.1

Shields, if present, shall be installed in a manner that prevents damage to the shield or coating in the following occurrences:
(1) Direct contact between the shield and the fuel supply container
(2) Trapping of solid materials or liquids between the shield and fuel supply container.
NFPA 52, §6.3.2.2

The fuel supply container shall be positioned to prevent contact with vehicle components such as, but not limited to, frame members, body panels, or brake lines that leads to container fretting or abrasion over time.
NFPA 52, §6.3.2.3

Vehicle fuel supply containers shall be mounted in a location to minimize damage from collision.
NFPA 52, §6.3.3

Containers shall be protected by covers from accidental contact with overhead electrical wiring.
NFPA 52, §6.3.3.1

The fuel system, including containers, shall be installed with as much road clearance as practical.
NFPA 52, §6.3.3.2

This minimum clearance shall be measured from the road to the container, its housing, or its fittings, whichever is lowest, and shall not, with the vehicle loaded to its gross weight rating, allow any component to touch the road surface in the event of a flat tire or the removal of any tire.
NFPA 52, §6.3.3.3

No portion of a fuel supply container or container appurtenance mounted on the undercarriage of the vehicle shall be located ahead of the front axle or behind the point of attachment of the rear bumper to the vehicle.
NFPA 52, §6.3.3.4

Container valves shall be protected from physical damage using the vehicle structure, valve protectors, or a metal shield.
NFPA 52, §6.3.3.4.1

No part of the fuel supply container or its appurtenances shall protrude beyond the sides or top of any vehicle to prevent the container from being struck or punctured.
NFPA 52, §6.3.3.5

Installation of Valves

All pressure relief devices and connections between pressure-carrying components installed within driver, passenger, or a closed compartment (see 6.4.7) shall be vented to the outside of the vehicle.
NFPA 52, §6.4.1

Every cylinder shall be equipped with either of the following:
(1) A manual valve
(2) A normally closed, remotely actuated shutoff valve connected directly to the cylinder and equipped to bleed the cylinder manually.
NFPA 52, §6.6.1

Vehicles with more than one fuel supply container, where each container is equipped with a normally closed remotely actuated shutoff valve, shall have an automatic system to detect the failure of any one of the valves.
NFPA 52, §6.6.1.1

In addition to the valve required by 6.6.1, a manual shutoff valve or a normally closed, automatically actuated shutoff valve shall be installed that allows isolation of the container(s) from the remainder of the fuel system.
NFPA 52, §6.6.2

The fueling system shall be equipped with a backflow check valve that prevents the return flow of gas from the container(s) to the filling connection.
NFPA 52, §6.6.5

Installation of Piping

Components in the engine compartment shall be designed or selected for a minimum temperature range of −40°F to 250°F.
NFPA 52, §6.2.2.1

All other components shall be designed or selected for service per the OEM's engineering requirements.
NFPA 52, §6.2.2.2

Manifolds connecting fuel containers shall be fabricated to minimize vibration.
NFPA 52, §6.5.1

Manifolds shall be installed in a protected location or shielded to prevent damage from unsecured objects.
NFPA 52, §6.5.1.1

A pipe thread jointing material impervious to the action of the natural gas used in the system shall be applied to all male pipe threads prior to assembly.
NFPA 52, §6.5.3

Piping and fittings shall be clear and free from cutting or threading burrs and scales.
NFPA 52, §6.5.4

Where necessary to prevent abrasion, fuel lines passing through a panel shall be protected by grommets or other protective devices.
NFPA 52, §6.5.5

Fuel lines shall have clearance from the engine exhaust system to protect the fuel lines from excessive heat by durable and effective means.
NFPA 52, §6.5.6

A bend in piping or tubing shall be prohibited where such a bend weakens the piping or tubing.
NFPA 52, §6.5.8

Joints or connections on piping systems shall be located in an accessible location.
NFPA 52, §6.5.9

Installation of Pressure Regulators

An automatic pressure-reducing regulator(s) shall be installed to reduce the fuel container pressure to a level consistent with the service pressure required by the gas–air mixer, throttle body, or fuel injectors.
NFPA 52, §6.8.1

Means shall be provided to prevent regulator malfunctions due to refrigeration effects.
NFPA 52, §6.8.2

Labeling

A vehicle equipped with a CNG fuel system shall bear the following durable labels:
(1) A label readily visible and located in the engine compartment shall include the following:
(a) Identification as a CNG-fueled vehicle
(b) System service pressure
(c) Installer's name or company
(d) Fuel container life expires (insert date for limited-life fuel containers. This label item not required for containers with unlimited life.)
(e) Total container water volume in gallons (liters)
(f) Date by which fuel containers are to be inspected (insert date) and every (insert number) months thereafter
(2) A label located at the fueling connection receptacle shall include the following:
(a) Identification as a CNG-fueled vehicle
(b) System service pressure
(c) Fuel container life expires (insert date for limited-life fuel containers. This label item not required for containers with unlimited life.)
(d) Fuel containers are to be inspected by (insert date) and each (insert number) months thereafter.
NFPA 52, §6.11.1

The fuel container inspection dates shall be changed after each required container inspection to denote the next required inspection date and shall be permitted on a separate additional label.
NFPA 52, §6.11.1.1

The marking in the label required by 6.11.3.1 shall consist of a border and the letters "CNG" [1 in. minimum height centered in the diamond] of silver or white reflective luminous material on a blue background.
NFPA 52, §6.11.3.3

System Testing

The completed fuel system assembly shall be leak tested using natural gas or inert gas.
NFPA 52, §6.12.1

Before use, every connection shall be verified leak free with a noncorrosive leak detector solution or a leak detector instrument after the equipment is connected and pressurized to its service pressure.
NFPA 52, §6.12.2

If the completed assembly is leak tested with natural gas, the testing shall be done under ventilated conditions.
NFPA 52, §6.12.3

Where a vehicle is involved in an accident or fire causing damage to the CNG container, or if the container is subjected to a pressure greater than 125 percent of service pressure, the CNG container shall be replaced or removed, inspected, and retested in accordance with the document under which it was originally manufactured before being returned to service.
NFPA 52, §6.12.4

Where a vehicle is involved in an accident or fire causing damage to any part of the CNG fuel system, the system shall be repaired and retested before being returned to service.
NFPA 52, §6.12.5

Damaged fuel lines shall be replaced and not repaired.
NFPA 52, §6.13.1

Venting of CNG to the Atmosphere

The venting or depressurization of a CNG container shall be performed only by trained personnel using written procedures.
NFPA 52, §6.14.1

The gas to be removed from the container shall be discharged into a closed transfer system or vented by an approved method of atmospheric venting.
NFPA 52, §6.14.1.1

A valve shall be used to control the discharge of gas from high-pressure systems to a venting system.
NFPA 52, §6.14.1.2

Sample Question 4

Vehicle fuel supply containers shall be mounted in a location to maximize damage from collision.

A. True
B. False

Answer on last page.

Residential Fueling Facilities

Scope

The capacity of an RFF-CNG shall not exceed 5 scf/min of natural gas.
NFPA 52, §8.1.2

Storage of CNG shall be prohibited.
NFPA 52, §8.1.3

CNG shall be permitted to be stored in the vehicle fuel supply container.
NFPA 52, §8.1.3.1

General

All equipment related to an RFF-CNG installation shall be protected to minimize the possibility of physical damage and vandalism.
NFPA 52, §8.3.1

Installation

All RFF-CNG equipment shall be installed in accordance with the equipment manufacturer's instructions.
NFPA 52, §8.4.1.1

The RFF-CNG shall have a nameplate marked with minimum and maximum gas inlet pressures and flow rates, gas outlet maximum pressure, and electrical requirements.
NFPA 52, §8.4.1.2

Installation of Pressure Relief Valves

Installation of PRVs. PRVs shall have PRD vents or vent lines to convey escaping gas to the outdoors and then upward to prevent impinging on buildings, other equipment, or areas open to the public (e.g., sidewalks).
NFPA 52, §8.5

Installation of Pressure Gauges

For measurement and test purposes, pressure gauges shall be permitted to be installed but shall not be required.
NFPA 52, §8.6

Pressure Regulation

An RFF-CNG shall be equipped to stop fuel flow automatically when the container(s) reaches the temperature-corrected fill pressure.
NFPA 52, §8.7

Piping and Hoses

All piping and hose from the outlet of the compressor shall be supplied as part of the RFF-CNG.
NFPA 52, §8.8.1

All gas piping to the RFF-CNG shall be installed in accordance with NFPA 54, *National Fuel Gas Code*.
NFPA 52, §8.8.2

The use of hose in an installation shall be restricted to the following:
(1) A fueling hose limited to a maximum length of 25 ft and supported above the floor/ground level or otherwise protected from mechanical damage from abrasion and being driven over by a vehicle
(2) A maximum of 3 ft in length where used to prevent abrasion damage resulting from vibration on the inlet or outlet, or both.
NFPA 52, §8.8.3

Installation of Emergency Shutdown Equipment

An RFF-CNG shall be equipped with emergency manual shutdown of the gas supply and electric power.
NFPA 52, §8.10.1

The emergency electrical switch shall be at least 5 ft from the RFF-CNG and in view of the RFF-CNG.
NFPA 52, §8.10.1.1

Breakaway protection shall be provided in a manner so that, in the event of a pullaway, natural gas ceases to flow.
NFPA 52, §8.10.2

Sample Question 5

Residential fueling hose is not to exceed _____ and shall be supported above the floor/ground level or otherwise protected from mechanical damage from abrasion and being driven over by a vehicle.

A. 10 ft
B. 15 ft
C. 25 ft
D. 35 ft

Answer on last page.

Natural Resources Code
Chapter 116 – Compressed Natural Gas

Warning Tags

(a) An employee, agent, or inspector of the commission may declare unsafe or dangerous for service any motor vehicle required to be registered under this chapter or any CNG or LNG equipment or system that is defective or that does not otherwise conform to the safety requirements of this chapter and the rules adopted under this chapter and shall attach a warning tag to the motor vehicle, equipment, or system in a conspicuous location.
(b) A person may not sell, furnish, deliver, or supply compressed natural gas and liquefied natural gas for use or consumption by or through a motor vehicle or system in a public place or operate a motor vehicle having CNG or LNG equipment to which a warning tag is attached.
(c) A warning tag may be removed on approval of the commission or by a person designated by the commission to remove the tag. A warning tag may not be removed by any person who is not authorized to remove the tag by the commission.
Texas Natural Resources Code, §116.103

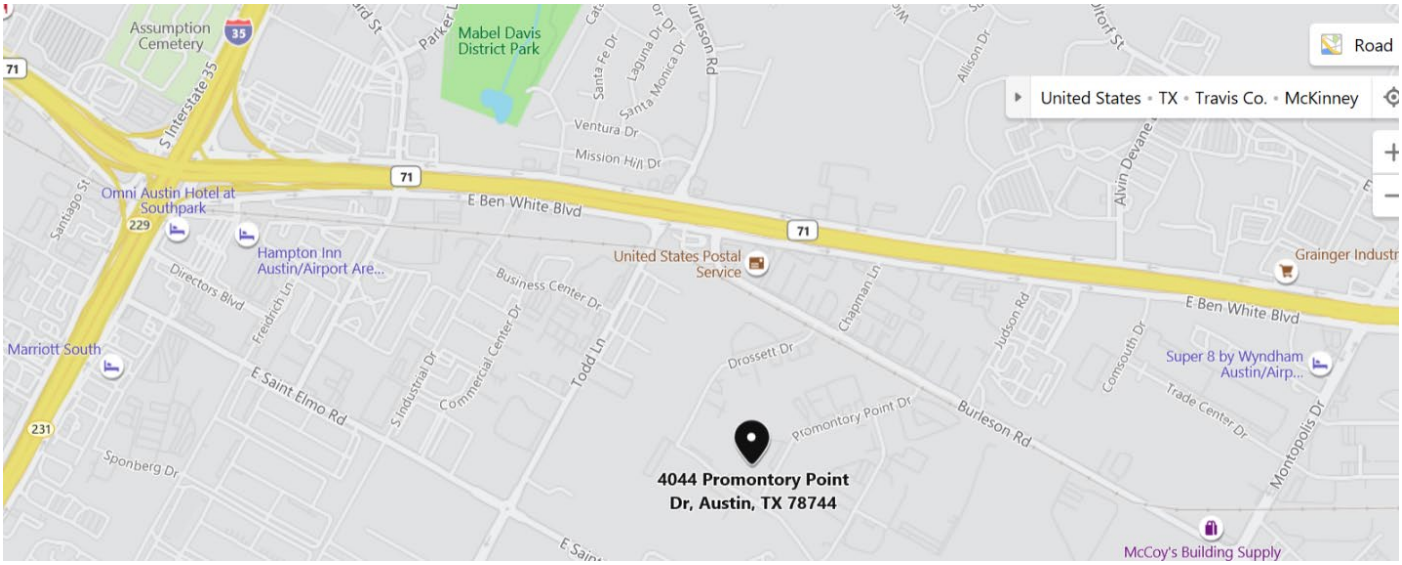
Administrative Penalty

(a) If a person violates this chapter, a rule of the commission adopted under this chapter, or a term, condition, or provision of a license or registration issued by the commission under this chapter and the violation results in pollution of the air or water of this state or poses a threat to the public safety, the person may be assessed a civil penalty by the commission.
(b) The penalty may not exceed $10,000 a day for each violation. Each day a violation continues may be considered a separate violation for purposes of penalty assessments.
Texas Natural Resources Code, §116.143

Penalty Assessment Procedure

A civil penalty under Section 116.145 of this code may be assessed only after the person charged with the violation has been given an opportunity for a public hearing.
Texas Natural Resources Code, §116.144(a)

Alternative Fuels Training Center
4044 Promontory Point
Austin, Texas 78744



Sample Question Answers

1. C
2. C
3. A
4. B
5. C