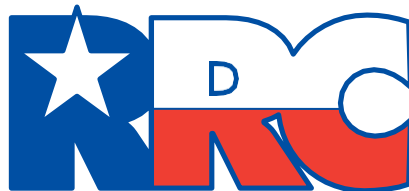


# **TEXAS CNG EXAMINATION STUDY GUIDE**

Category 4  
DOT Cylinder Tester  
Management Level



**Railroad Commission of Texas**

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# CNG EXAMINATION STUDY GUIDE

## Management-LEVEL

### DOT Cylinder Tester Management Level

#### Who should use this guide?

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You should use this guide if you plan to take the Railroad Commission’s management-level qualifying examination to perform CNG DOT Cylinder Tester activities.

A **Category 4** examination qualifies an individual to test CNG cylinders.

#### What books do I need?

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This examination tests your knowledge of the laws and standards that apply to DOT Cylinder Tester Management Level operations in Texas.

These laws and standards are found in:

*Regulations for Compressed Natural Gas and Liquefied 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?

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You may download the current edition of the Railroad Commission's *Regulations for Compressed Natural Gas And Liquefied Natural Gas* in PDF format free online at [www.rrc.texas.gov](http://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](http://www.nfpa.org); click on "Codes and Standards."

## Sections and Topics

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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

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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  $1.1 \times 1.25 \times$  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  $1.25 \times$  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**

## **Code of Federal Regulations 49 (2024)**

**Brazing** means a group of welding processes wherein coalescence is produced by heating to a suitable temperature above 800 °F and by using a nonferrous filler metal, having a melting point below that to the base metals. The filler metal is distributed between the closely fitted surfaces of the joint by capillary attraction.

**Burst pressure** means the highest internal pressure reached in a CNG fuel container during a burst test at a temperature of 21 °C.

**CNG fuel container** means a container designed to store CNG as motor fuel on-board a motor vehicle.



**Fill pressure** means the internal pressure of a CNG fuel container attained at the time of filling. Fill pressure varies according to the gas temperature in the container which is dependent on the charging parameters and the ambient conditions.

**Full wrapped** means applying the reinforcement of a filament or resin system over the entire liner, including the domes.

**Hoop wrapped** means winding of filament in a substantially circumferential pattern over the cylindrical portion of the liner so that the filament does not transmit any significant stresses in a direction parallel to the cylinder longitudinal axis.

**Hydrostatic pressure** means the internal pressure to which a CNG fuel container is taken during testing set forth in S5.4.1.

**Liner** means the inner gas tight container or gas cylinder to which the overwrap is applied.

**Service pressure** means the internal settled pressure of a CNG fuel container at a uniform gas temperature of 21 °C and full gas content. It is the pressure for which the container has been constructed under normal conditions.

### 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

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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

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### Company License

A Category 4 license for testing laboratories authorizes the testing of CNG cylinders. The original license fee is \$400; the renewal fee is \$200.

*Regulations for CNG, §13.61(b)(6)*

In addition to NFPA 55 §7.1.12, no person may engage in CNG activities until that person has obtained a license from the Commission authorizing that activity, except as follows:

(1) A state agency or institution, county, municipality, school district or other governmental subdivision is exempt from licensing requirements as provided in Texas Natural Resources Code, §116.031(d), if the entity is performing CNG activities on its own behalf, but is required to obtain a license to perform CNG activities for or on behalf of a second party.

(2) An ultimate consumer is not subject to the licensing requirements of this chapter in order to perform those CNG activities dealing only with the ultimate consumer; however, a license is required to register a transport or cylinder delivery unit. An ultimate consumer's license does not require a fee or a company representative.

(3) An original manufacturer of a new motor vehicle powered by CNG or a subcontractor of a manufacturer who produces a new CNG powered motor vehicle for the manufacturer is not subject to the licensing requirements of this chapter, but shall comply with all other rules in this chapter.

***Regulations for CNG, §13.61(e)***

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)***

Licenses or manufacturer registrations issued under this chapter expire one year after issuance at midnight on the last day of the month previous to the month in which they are issued.

***Regulations for CNG, §13.61(i)***

A properly completed CNG Form 1001 listing all names under which CNG related activities requiring licensing are to be conducted and the applicant's properly qualified company representative, and the following forms or documents as applicable:

(A) CNG Form 1001A if the applicant will operate any outlets pursuant to subsection (1) of this section;

(B) CNG Form 1007, 1007A, or 1007T and any information requested in §13.69 of this title if the applicant intends to register any CNG cargo tanks or container delivery units;

(C) CNG Form 1019 if the applicant will be transferring the operation of one or more existing retail service stations.

(D) any form required to comply with §13.62 of this title (relating to Insurance Requirements);

(E) a copy of current certificate of account status if required by §13.75 of this title (relating to Franchise Tax Certification and Assumed Name Certificate); and/or

(F) copies of the assumed name certificates if required by §13.75 of this title.

***Regulations for CNG, §13.61(k)(1)***

For license and manufacturer registration renewals:

- (1) AFS shall notify the licensee or registered manufacturer in writing at the address on file with AFS of the impending license or manufacturer registration expiration at least 30 calendar days before the date the license or registration is scheduled to expire.
- (2) The renewal notice shall include copies of applicable CNG Forms 1001, 1001A, and 1007, 1007A, or CNG Form 1001M showing the information currently on file.
- (3) The licensee or registered manufacturer shall review and return all renewal documentation to AFS with any necessary changes clearly marked on the forms. The licensee or registered manufacturer shall submit any applicable fees with the renewal documentation.
- (4) Failure to meet the renewal deadline set forth in this section shall result in expiration of the license or manufacturer registration.
- (5) If a person's license or manufacturer registration expires, that person shall immediately cease performance of any CNG activities authorized by the license or registration.
- (6) If a person's license or manufacturer registration has been expired for 90 calendar days or fewer, the person shall submit a renewal fee that is equal to 1 1/2 times the renewal fee in subsection (a) of this section.
- (7) If a person's license or manufacturer registration has been expired for more than 90 calendar days but less than one year, the person shall submit a renewal fee that is equal to two times the renewal fee.
- (8) If a person's license or manufacturer registration has been expired for one year or longer, that person shall not renew, but shall comply with the requirements for issuance of an original license or manufacturer registration under subsections (k) or (m) of this section. Railroad Commission of Texas 38 - Regulations for Compressed Natural Gas and Liquefied Natural Gas
- (9) After verification that the license or registered manufacturer has met all requirements for licensing or manufacturer registration, AFS shall renew the license or registration and send the applicable authorization to the licensee or manufacturer.

***Regulations for CNG, §13.61(p)***

A person who is otherwise eligible to renew a license or registration may renew an unexpired license or registration by paying the required renewal fee to the commission before the expiration date of the license or registration. A person whose license or registration has expired may not engage in activities that require a license or registration until the license or registration has been renewed.

***Texas Natural Resources Code, §116.033(b)***

## **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)***

Rules examination. 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)***

The Commission may deny, suspend, or revoke a license, registration, or certificate for any person who fails to comply with this chapter.

(1) If AFS determines that an applicant for license, manufacturer registration, certificate, or renewal has not met the requirements of this chapter, AFS shall notify the applicant in writing of the reasons for the proposed denial. In the case of an applicant for license, manufacturer registration, or certificate, the notice shall advise the applicant that the application may be resubmitted within 30 calendar days of receipt of the denial with all cited deficiencies corrected, or, if the applicant disagrees with AFS' determination, the applicant may request a hearing in writing on the matter within 30 calendar days of receipt of the notice of denial.

(2) If the applicant resubmits the application within 30 days of receipt of the denial with all deficiencies corrected, AFS shall issue the license, manufacturer registration, certificate, or renewal as applicable.

***Regulations for CNG, §13.71(a)***

## Required Filings

Physical inspection of stationary installations.

(1) Aggregate storage capacity of 84,500 standard cubic feet or more. The applicant shall notify AFS in writing when the installation is ready for inspection.

(A) If any non-compliance items are cited at the time of AFS' initial inspection, the installation shall not be placed into CNG service until the non-compliance items are corrected, as determined at the time of inspection, depending on the nature of the non-compliance items cited.

(B) If AFS does not physically inspect the facility within 30 calendar days of receipt of notice that the facility is ready for inspection, the facility may operate conditionally until the initial inspection is completed.

(2) Aggregate storage capacity of less than 84,500 standard cubic feet. After receipt of CNG Form 1501, AFS shall conduct an inspection as soon as possible to verify the installation described complies with the rules in this chapter. The facility may be operated prior to inspection if the facility fully complies with the rules in this chapter. If the initial inspection at a commercial installation results in the citation of non-compliance items, AFS may require that the subject container, including any piping, appliances, appurtenances, or equipment connected to it be immediately removed from CNG service until the applicant corrects the non-compliance items.

(3) Material variances. If AFS determines the completed installation varies materially from the application originally accepted, correction of the variance and notification to AFS or resubmittal of the application is required. AFS' review of such resubmitted application shall comply with subsection (b)(3) of this section.

(4) In the event an applicant has requested an inspection and AFS' inspection identifies non-compliance items requiring modifications by the applicant, AFS may assess an inspection fee to cover the costs associated with any additional inspection, including mileage and per diem rates set by the legislature.

***Regulations for CNG, §13.25(d)***

## 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**

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### **Cylinders, Containers.**

**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*

Containers shall be fabricated of steel, aluminum, or composite materials.  
*NFPA 52, §5.4.1*

The container shall be designed for CNG service.  
*NFPA 52, §5.4.2*

The container shall be permanently marked “CNG” by the manufacturer.  
*NFPA 52, §5.4.2.1*

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*

The repair or alteration of an ASME pressure vessel shall comply with the requirements of the NB-23, *National Board Inspection Code*.  
*NFPA 52, §5.4.7*

#### **Container and material requirements.**

**Type 1—Non-composite metallic container** means a metal container.

**Type 2—Composite metallic hoop wrapped container** means a metal liner reinforced with resin impregnated continuous filament that is “hoop wrapped”.

**Type 3—Composite metallic full wrapped container** means a metal liner reinforced with resin impregnated continuous filament that is “full wrapped”.

**Type 4—Composite non-metallic full wrapped container** means resin impregnated continuous filament with a non-metallic liner “full wrapped.”

*Code of Federal Regulations 49, §571.304 S5*

#### **General requirements.**

Each passenger car, multipurpose passenger vehicle, truck, and bus that uses CNG as a motor fuel shall be equipped with a CNG fuel container that meets the requirements of S7 through S7.4.

Each CNG fuel container manufactured on or after March 27, 1995 shall meet the requirements of S7 through S7.4.

*Code of Federal Regulations 49, §571.304 S6*



## Pressure Relief Devices

When required by 7.1.6.5.2, pressure relief devices shall be provided to protect containers and systems containing compressed gases from rupture in the event of overpressure from thermal exposure.

**NFPA 55, §7.1.6.5.1**

Pressure relief devices to protect containers shall be designed and provided in accordance with CGA S-1.1, *Pressure Relief Device Standards – Part 1 – Cylinders for Compressed Gases*, for cylinders; CGA S-1.2, *Pressure Relief Device Standards – Part 2 – Cargo and Portable Tanks for Compressed Gases*, for portable tanks; and CGA S-1.3, *Pressure Relief Device Standards – Part 3 – Stationary Storage Containers for Compressed Gases*, for stationary tanks or in accordance with applicable equivalent requirements in the country of use.

**NFPA 55, §7.1.6.5.2**

Pressure relief devices shall be sized in accordance with the specifications to which the container was fabricated.

**NFPA 55, §7.1.6.5.3**

The pressure relief device shall have the capacity to prevent the maximum design pressure of the container or system from being exceeded.

**NFPA 55, §7.1.6.5.4**

## 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**

## 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)*

### 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.*

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## Installation of Valves

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*

## Testing Requirements

*Test requirements.*

**Pressure cycling test at ambient temperature.** Each CNG fuel container shall not leak when tested in accordance with S8.1.

*Code of Federal Regulations 49, §571.304 S7.1*

*Hydrostatic burst test.*

Each Type 1 CNG fuel container shall not leak when subjected to burst pressure and tested in accordance with S8.2. Burst pressure shall not be less than 2.25 times the service pressure for non-welded containers and shall not be less than 3.5 times the service pressure for welded containers.

*Code of Federal Regulations 49, §571.304 S7.2.1*

Each Type 2, Type 3, or Type 4 CNG fuel container shall not leak when subjected to burst pressure and tested in accordance with S8.2. Burst pressure shall be not less than 2.25 times the service pressure.  
*Code of Federal Regulations 49, §571.304 S7.2.2*

***Bonfire test.*** Each CNG fuel container shall be equipped with a pressure relief device. Each CNG fuel container shall completely vent its contents through a pressure relief device or shall not burst while retaining its entire contents when tested in accordance with S8.3.  
*Code of Federal Regulations 49, §571.304 S7.3*

***Labeling.*** Each CNG fuel container shall be permanently labeled with the information specified in paragraphs (a) through (h) of this section. Any label affixed to the container in compliance with this section shall remain in place and be legible for the manufacturer's recommended service life of the container. The information shall be in English and in letters and numbers that are at least 6.35 mm (1/4 inch) high.

(a) The statement: "If there is a question about the proper use, installation, or maintenance of this container, contact \_\_\_\_\_," inserting the CNG fuel container manufacturer's name, address, and telephone number.

(b) The statement: "Manufactured in \_\_\_\_\_," inserting the month and year of manufacture of the CNG fuel container.

(c) The statement: "Service pressure \_\_\_\_\_ kPa, (\_\_\_\_\_ psig)."

(d) The symbol DOT, constituting a certification by the CNG container manufacturer that the container complies with all requirements of this standard.

(e) The container designation (e.g., Type 1, 2, 3, 4).

(f) The statement: "CNG Only."

(g) The statement: "This container should be visually inspected for damage and deterioration after a motor vehicle accident or fire, and either (a) at least every 12 months when installed on a vehicle with a GVWR greater than 4,536 kg, or (b) at least every 36 months or 36,000 miles, whichever comes first, when installed on a vehicle with a GVWR less than or equal to 4,536 kg."

(h) The statement: "Do Not Use After \_\_\_\_\_" inserting the month and year that mark the end of the manufacturer's recommended service life for the container.

*Code of Federal Regulations 49, §571.304 S7.4*

## **Test Conditions: Fuel Container Integrity**

### ***Pressure cycling test.***

The requirements of S7.1 shall be met under the conditions of S8.1.1 through S8.1.4.

*Code of Federal Regulations 49, §571.304 S8.1*

Hydrostatically pressurize the CNG container to the service pressure, then to not more than 10 percent of the service pressure, for 13,000 cycles.

*Code of Federal Regulations 49, §571.304 S8.1.1*

After being pressurized as specified in S8.1.1, hydrostatically pressurize the CNG container to 125 percent of the service pressure, then to not more than 10 percent of the service pressure, for 5,000 cycles.

*Code of Federal Regulations 49, §571.304 S8.1.2*

The cycling rate for S8.1.1 and S8.1.2 shall be any value up to and including 10 cycles per minute.

*Code of Federal Regulations 49, §571.304 S8.1.3*

The cycling is conducted at ambient temperature.

*Code of Federal Regulations 49, §571.304 S8.1.4*

Hydrostatically pressurize the CNG fuel container, as follows: The pressure is increased up to the minimum prescribed burst pressure determined in S7.2.1 or S7.2.2, and held constant at the minimum burst pressure for 10 seconds.

***Code of Federal Regulations 49, §571.304 S8.2.1***

The pressurization rate throughout the test shall be any value up to and including 1,379 kPa (200 psi) per second.

***Code of Federal Regulations 49, §571.304 S8.2.2***

***Bonfire test.***

Fill the CNG fuel container with compressed natural gas and test it at:

- (a) 100 percent of service pressure; and
- (b) 25 percent of service pressure.

***Code of Federal Regulations 49, §571.304 S8.3.1***

***Container positioning.***

(a) Position the CNG fuel container in accordance with paragraphs (b) and (c) of S8.3.2.

(b) Position the CNG fuel container so that its longitudinal axis is horizontal and its bottom is 100 mm (4 inches) above the fire source.

(c)(1) Position a CNG fuel container that is 1.65 meters (65 inches) in length or less and is fitted with one pressure relief device so that the center of the container is over the center of the fire source.

(2) Position a CNG fuel container that is greater than 1.65 meters (65 inches) in length and is fitted with one pressure relief device at one end of the container so that the center of the fire source is 0.825 meters (32.5 inches) from the other end of the container, measured horizontally along a line parallel to the longitudinal axis of the container.

(3) Position a CNG fuel container that is fitted with pressure relief devices at more than one location along its length so that the portion of container over the center of the fire source is the portion midway between the two pressure relief devices that are separated by the greatest distance, measured horizontally along a line parallel to the longitudinal axis of the container.

(4) Test a CNG fuel container that is greater than 1.65 meters (65 inches) in length, is protected by thermal insulation, and does not have pressure relief devices, twice at 100 percent of service pressure. In one test, position the center of the container over the center of the fire source. In another test, position one end of the container so that the fire source is centered 0.825 meters (32.5 inches) from one end of the container, measured horizontally along a line parallel to the longitudinal axis of the container.

***Code of Federal Regulations 49, §571.304 S8.3.2***

***Number and placement of thermocouples.***

To monitor flame temperature, place three thermocouples so that they are suspended 25 mm (one inch) below the bottom of the CNG fuel container. Position thermocouples so that they are equally spaced over the length of the fire source or length of the container, whichever is shorter.

***Code of Federal Regulations 49, §571.304 S8.3.3***

***Shielding.***

(a) Use shielding to prevent the flame from directly contacting the CNG fuel container valves, fittings, or pressure relief devices.

(b) To provide the shielding, use steel with 0.6 mm (.025 in) minimum nominal thickness.

(c) Position the shielding so that it does not directly contact the CNG fuel container valves, fittings, or pressure relief devices.

***Code of Federal Regulations 49, §571.304 S8.3.4***

***Fire source.***

Use a uniform fire source that is 1.65 meters long (65 inches). Beginning five minutes after the fire is ignited, maintain an average flame temperature of not less than 430 degrees Celsius (800 degrees Fahrenheit) as determined by the average of the two thermocouples recording the highest temperatures over a 60 second interval: If the pressure relief device releases before the end of the fifth minute after ignition, then the minimum temperature requirement does not apply.

***Code of Federal Regulations 49, §571.304 S8.3.5***

***Recording data.***

Record time, temperature, and pressure readings at 30 second intervals, beginning when the fire is ignited and continuing until the pressure release device releases.

***Code of Federal Regulations 49, §571.304 S8.3.6***

***Duration of exposure to fire source.***

The CNG fuel container is exposed to the fire source for 20 minutes after ignition or until the pressure release device releases, whichever period is shorter.

***Code of Federal Regulations 49, §571.304 S8.3.7***

***Number of tests per container.***

A single CNG fuel container is not subjected to more than one bonfire test.

***Code of Federal Regulations 49, §571.304 S8.3.8***

***Wind velocity.***

The average ambient wind velocity at the CNG fuel container during the period specified in S8.3.6 of this standard is not to exceed 2.24 meters/second (5 mph).

***Code of Federal Regulations 49, §571.304 S8.3.9***

The average wind velocity at the container is any velocity up to and including 2.24 meters/second (5 mph).

***Code of Federal Regulations 49, §571.304 S8.3.10***

**Defective Cylinders**

Defective cylinders, containers, and tanks shall be returned to the supplier.

***NFPA 55, §7.1.6.2.1***

Suppliers shall repair the cylinders, containers, and tanks, remove them from service, or dispose of them in an approved manner.

***NFPA 55, §7.1.6.2.2***

Suppliers shall ensure that defective cylinders, containers, and tanks that have been repaired are evaluated by qualified individuals to verify that the needed repairs and any required testing has been performed and that those repaired or tested are in a serviceable condition before returning them to service.

***NFPA 55, §7.1.6.2.3***

## **Service and Repair**

Service, repair, modification, or removal of valves, pressure relief devices, or other compressed gas cylinder, container, and tank appurtenances shall be performed by trained personnel and with the permission of the container owner.

*NFPA 55, §7.1.12*

Compressed gas cylinders, containers, and tanks exposed to fire shall not be used or shipped while full or partially full until they are requalified in accordance with the pressure vessel code under which they were manufactured.

*NFPA 55, §7.1.14*

Leaking, damaged, or corroded compressed gas cylinders, containers, and tanks shall be removed from service.

*NFPA 55, §7.1.15.1*

## **Natural Resources Code**

### **Chapter 116 – Compressed Natural Gas**

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#### **Entry on Property; Inspection and Investigation**

(a) An employee, agent, or inspector of the commission may enter the premises of a licensee under this chapter or any building or other premises open to the public or inspect any CNG or LNG system or motor vehicle equipped with CNG or LNG equipment at any reasonable time for the purpose of determining and verifying compliance with this chapter and rules of the commission adopted under this chapter.

(b) Any authorized representative of the LPG division may enter any building or premises where an accident has occurred in which CNG or LNG was a probable cause for purposes of investigating the cause, origin, and circumstances of such accident. The LPG division may request that any state or local authority having jurisdiction take appropriate action as may be necessary for preservation of property and premises.

*Texas Natural Resources Code, §116.015*

#### **Insurance Requirements**

All licensees must acquire and maintain appropriate workers' compensation or coverage for its employees under policies of work-related accident, disability, and health insurance, including coverage for death benefits, from an insurance carrier authorized to provide coverage in this state and other insurance coverage required by the commission in the amounts required by the commission.

*Texas Natural Resources Code, §116.036(a)*

#### **Disciplinary Action**

If the commission or division determines that the probable violation or noncompliance constitutes an immediate danger to the public health, safety, and welfare, it shall require the immediate cessation of the probable violation or noncompliance and proceed with a hearing.

*Texas Natural Resources Code, §116.037(e)*

## Registration

Each motor vehicle that is equipped with a CNG or LNG cargo tank and each motor vehicle used principally to transport CNG or LNG in portable cylinders or containers must be registered with the commission as provided by commission rules.

*Texas Natural Resources Code, §116.072(a)*

## 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*

## Injunctive Relief

On request of the commission, the attorney general shall bring suit in the name of the state to enjoin a person from violating this chapter or a rule adopted under this chapter.

*Texas Natural Resources Code, §116.141(a)*

## 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.

(c) In determining the amount of the penalty, the commission shall consider the person's history of previous violations of this chapter, the seriousness of the violation, any hazard to the health or safety of the public, and the demonstrated good faith of the person charged.

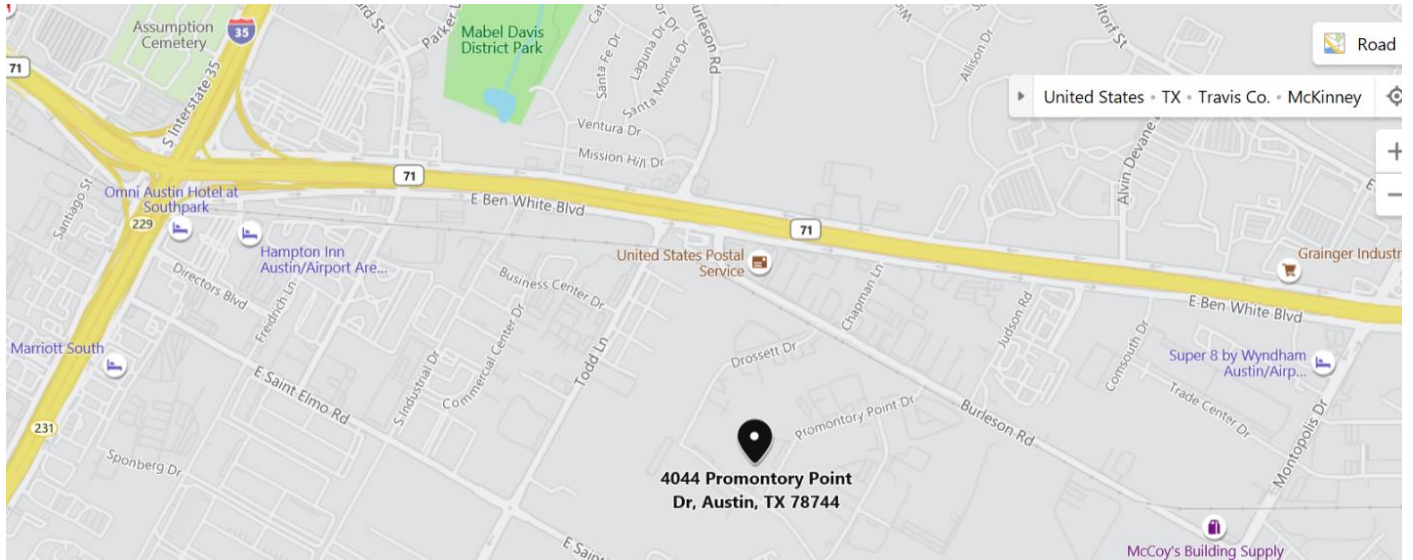
*Texas Natural Resources Code, §116.143*

## 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