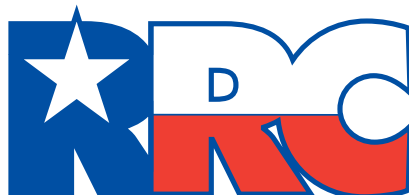


# **TEXAS LNG EXAMINATION STUDY GUIDE**

Motor/Mobile Fuel  
Dispenser Operator  
Employee Level



**RAILROAD COMMISSION OF TEXAS**

September 2012

## **NOTICE**

This publication is intended for use in its entirety as a guide for persons preparing to take Railroad Commission LNG qualifying examinations. Any other use or distribution of this publication or use or distribution of any portion of this publication for any purpose whatsoever is considered by the Railroad Commission of Texas to be misuse of this publication.

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' LNG Safety Rules (16 Texas Administrative Code, Chapter 14) and codes adopted by the Railroad Commission of Texas, and/or (2) other industry standards and/or practices.

Every effort was made to ensure that this publication was accurate and up-to-date as of the date of publication. The reader is cautioned, however, about reliance on this publication or any portion thereof at any time thereafter, particularly because changes in technology are likely to occur that might make portions of this publication inaccurate and out-of-date. The Railroad Commission of Texas assumes no liability, under any circumstances, for any actions taken or omissions made in reliance of the contents of this publication, from whatever source, or any other consequences of any such reliance.

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## Exam administration

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### Taking an examination in Austin

You may take any Railroad Commission qualifying examination in Austin without pre-registering (“walk-in”) on any business day, excluding holidays, from 8:00 a.m. to 12:00 noon at the Commission’s Alternative Fuels Training Center. The training center is located at 6506 Bolm Road, on the northwest corner of the intersection of Bolm Road and U.S. Highway 183.

Tuesdays and Thursdays are the preferred days for walk-in examinations.

(See map to Training Center on page 18.)

### Taking an examination outside of Austin

You may also take any Railroad Commission qualifying examination at more than two dozen other locations statewide. Exam dates, times and locations are listed three months in advance on the Commission’s web site. To view a complete schedule, go to [www.rrc.state.tx.us](http://www.rrc.state.tx.us). From the drop-down menu under “Education and Training,” choose “Training Classes & Qualifying Exams” and click on “Class/Exam Schedule.” The online schedule has links to maps showing each class and exam location.

You must register at least two business days in advance to take an examination outside of Austin. To register online, go to [www.rrc.state.tx.us](http://www.rrc.state.tx.us). From the drop-down menu under “Education and Training,” choose “Training Classes & Qualifying Exams” and click on “Register Now.” The web site allows you to register up to four people for an examination.

When you register online, you will receive a return e-mail confirming the registration and the dates and locations of the exams. Registering online also ensures that you will receive advance notification of any changes in the examination date, time or location.

### Payment for exams; LNG Form 2016; ID required

The fee is \$40.00 for each employee-level exam and \$70.00 for each management-level exam. Fees are non-refundable by state law, and cash cannot be accepted.

You may pay the required examination fee at any exam location by check or money order payable to the Railroad Commission of Texas. LNG Form 2016, “Application for Examination,” may also be completed at the examination site. Examinees must also present an official state-issued driver’s license or photo ID at the exam site.

You may also pay your examination fee by credit card in advance online. To pay by credit card, go to [www.rrc.state.tx.us](http://www.rrc.state.tx.us). From the drop-down menu under “Education and Training,” choose “Training Classes & Qualifying Exams” and click on “Pay Online.” Be sure to print out the confirmation page in Step 6. Make a copy of the confirmation page for your records and bring a copy with you to the examination site.

### Open-book examinations

All Railroad Commission employee-level qualifying examinations are open book. Examinees may use a copy of the Commission’s *Regulations for Compressed Natural Gas and Liquefied Natural Gas*. This study guide may not be used during any employee-level examination.

### **Examination time limit**

Railroad Commission employee-level qualifying examinations must be completed within two hours after the examination is given to you, including any breaks you elect to take. The examination proctor is the official timekeeper. You must submit both the examination itself and your answer sheet to the proctor within the two-hour limit.

### **Grades, reports and retakes**

The minimum passing grade is 75 percent on all Railroad Commission qualifying examinations.

Examinations administered at the Training Center in Austin are graded on-site, and examinees are immediately informed of the results. If you fail an examination that you took in Austin, you may retake that same examination only one additional time during a business day. Any subsequent examination must be taken on another business day, unless approved by the Commission.

Exams taken outside of Austin are graded as soon as possible, and the results of the examination are reported within 10 working days.

If you pass an examination, the Railroad Commission will issue you a blue certification card within 10 working days. You will be notified by letter if you fail an examination.

### **Contacts**

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# TEXAS LNG EXAMINATION STUDY GUIDE MOTOR/MOBILE FUEL DISPENSER OPERATOR

## Who should use this guide?

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You should use this guide if you plan to take the Railroad Commission's employee-level qualifying examination authorizing the storage, sale and dispensing of LNG into motor fuel containers and mobile fuel containers.

## What books do I need?

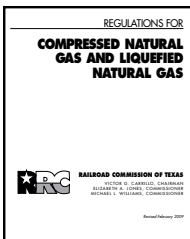
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This examination tests your knowledge of the laws and standards that apply to the storage, sale and dispensing of LNG into motor fuel containers and mobile fuel containers.

These laws and standards are found in the Railroad Commission's *Regulations for Compressed Natural Gas and Liquefied Natural Gas* (16 Texas Administrative Code, Chapter 14), known informally as the Commission's LNG Safety Rules.

## Where do I get the book?

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You may download the current edition of the Railroad Commission's *Regulations for Compressed Natural Gas and Liquefied Natural Gas* free online. Go to the Commission's home page at [www.rrc.state.tx.us](http://www.rrc.state.tx.us). From the drop-down menu under "Education and Training," choose "Training Classes & Qualifying Exams" and click on "CNG/LNG Safety Rules (PDF)." You may also buy a printed copy of the book for \$10.00, tax included, by calling the Railroad Commission's publications office at (512) 463-7309.

## Sections and topics

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Before you take this examination you should know the definitions on pp. 6–8 of this study guide and the contents of the sections of the codes and standards listed below. The actual examination may not include questions on each of the listed sections and topics, and the exam questions are not organized by topic as they are in this study guide.

### *Regulations for Compressed Natural Gas and Liquefied Natural Gas*

§14.2101	Uniform Protection Requirements
§14.2107	Stationary LNG Storage Containers
§14.2110	LNG Container Installation Distance Requirements
§14.2116	Transfer of LNG

§14.2304	General Facility Design
§14.2310	Emergency Refueling
§14.2313	Fuel Dispensing Systems
§14.2319	Automatic Fuel Dispenser Safety Requirements
§14.2322	Protection of Automatic and Other Dispensers
§14.2607	Vehicle Fuel Containers
§14.2610	Installation of Vehicle Fuel Containers
§14.2616	Installation of Venting Systems and Monitoring Sensors
§14.2634	Vehicle Fueling Connection
§14.2637	Signs and Labeling

## **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 LNG activities you will perform.

### ***Regulations for Compressed Natural Gas and Liquefied Natural Gas***

The **aggregate water capacity** is the sum of all individual container capacities as measured by weight or volume of water when the containers in a battery at an installation are full.

***LNG Safety Rules, §14.2007(2)***

**ASME** means the American Society of Mechanical Engineers.

***LNG Safety Rules, §14.2007(6)***

An **automatic fuel dispenser** is a fuel dispenser which requires transaction authorization.

***LNG Safety Rules, §14.2007(8)***

**Combustible material** is a solid material which, in the form in which it is used and under the conditions anticipated, can be ignited and will burn, support combustion, or release flammable vapors when subjected to fire or heat.

***LNG Safety Rules, §14.2007(11)***

A **commercial installation** is an LNG equipment installation located on premises other than a single-family dwelling used primarily as a residence.

***LNG Safety Rules, §14.2007(12)***

A **container** is any LNG vessel manufactured to the applicable sections of the API Code, ASME Code, or DOT requirements in effect at the time of manufacture.

***LNG Safety Rules, §14.2007(15)***

**Container appurtenances** are components installed in container openings, including but not limited to pressure relief devices, shutoff valves, backflow check valves, excess flow check valves, internal valves, liquid level gauges, pressure gauges, and plugs.

*LNG Safety Rules, § 14.2007(16)*

A **conversion** is the changes made to a vehicle to allow it to use LNG as a motor fuel.

*LNG Safety Rules, § 14.2007(17)*

**Design pressure** is the pressure for which a system or a portion of that system is designed.

*LNG Safety Rules, § 14.2007(18)*

A **dispensing system** is that combination of valves, meters, hoses, piping, electrical connections, and fuel connections used to distribute LNG to mobile or motor fuel containers.

*LNG Safety Rules, § 14.2007(20)*

**DOT** means the United States Department of Transportation.

*LNG Safety Rules, § 14.2007(21)*

A **fixed-length dip tube** is a pipe with a fixed open end positioned inside a container at a designated elevation to measure a liquid level.

*LNG Safety Rules, § 14.2007(26)*

An **ignition source** is any item, substance, or event having adequate temperature and energy release of the type and magnitude sufficient to ignite any flammable mixture of gases or vapors that could occur at a site.

*LNG Safety Rules, § 14.2007(28)*

An **LNG system** is a system of safety devices, containers, and other LNG equipment installed at a facility or on a vehicle and designed for use in the sale, storage, transportation for delivery, or distribution of LNG.

*LNG Safety Rules, § 14.2007(38)*

An **LNG transport** is any vehicle or combination of vehicles and LNG containers designed or adapted for use or used principally as a means of moving or delivering LNG from one place to another, including but not limited to any truck, trailer, semi-trailer, cargo tank, or other vehicle used in the distribution of LNG.

*LNG Safety Rules, § 14.2007(39)*

A **mass transit vehicle** is any vehicle which is owned or operated by a political subdivision of a state, city, or county, and which is used primarily in the conveyance of the general public.

*LNG Safety Rules, § 14.2007(40)*

The **maximum allowable working pressure** is the maximum gauge pressure permissible at the top of completed equipment, containers, or vessels in their operating position for a design temperature.

*LNG Safety Rules, § 14.2007(41)*

A **mobile fuel container** is an LNG container mounted on a vehicle and used to store LNG as the fuel supply for uses other than motor fuel.

*LNG Safety Rules, § 14.2007(42)*

A **motor fuel system** is an LNG system to supply LNG as a fuel for an engine used to propel the vehicle.  
*LNG Safety Rules, § 14.2007(45)*

The **point of transfer** is the point at which a connection is made to transfer LNG from one container to another.  
*LNG Safety Rules, § 14.2007(53)*

A **pressure relief valve** is a valve which is designed both to open automatically to prevent a continued rise of internal fluid pressure in excess of a specified value (set pressure) and to close when the internal fluid pressure is reduced below the set pressure.  
*LNG Safety Rules, § 14.2007(54)*

A **pressure vessel** is a container or other component designed in accordance with the ASME Code.  
*LNG Safety Rules, § 14.2007(55)*

**PSIG** means pounds per square inch gauge.  
*LNG Safety Rules, § 14.2007(57)*

A **public transportation vehicle** is a vehicle for hire or service to the general public including but not limited to taxis, buses, and airport courtesy cars.  
*LNG Safety Rules, § 14.2007(58)*

A **special transit vehicle** is a vehicle primarily used by a school or mass transit authority for special transit purposes such as transport of mobility impaired individuals.  
*LNG Safety Rules, § 14.2007(63)*

A **trainee** is an individual employed by a licensee for a period not to exceed 45 days without that individual having successfully completed the required examinations for the LNG activities to be performed.  
*LNG Safety Rules, § 14.2007(67)*

The **transfer area** is that portion of an LNG refueling station where LNG is introduced into or dispensed from a stationary installation.  
*LNG Safety Rules, § 14.2007(68)*

A **transfer system** is all piping and equipment used in transferring LNG between containers.  
*LNG Safety Rules, § 14.2007(69)*

A **transport** is any bobtail or semi-trailer equipped with one or more containers.  
*LNG Safety Rules, § 14.2007(71)*

A **transport system** is any and all piping, fittings, valves, and equipment on a transport, excluding the container.  
*LNG Safety Rules, § 14.2007(72)*

An **ultimate consumer** is the person controlling LNG immediately prior to its ignition.  
*LNG Safety Rules, § 14.2007(73)*

**Water capacity** is the amount of water in gallons required to fill a container.  
*LNG Safety Rules, § 14.2007(75)*



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

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

# GENERAL RULES FOR ALL STATIONARY LNG INSTALLATIONS

## Uniform Protection Requirements

(c) Stationary LNG installations must be protected from tampering and damage by either fencing or guardrails, or a combination of both.

The protection at a stationary LNG installation must extend at least 24 inches beyond any part of the LNG transfer system, dispenser system, or storage container.

(e) Fencing at LNG stationary installations must comply with the following:

(1) Fencing material at LNG stationary installations must be solid construction of noncombustible material or chain link with wire at least 12 ½ American wire gauge in size.

(2) Fencing at LNG stationary installations must 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 corner posts at LNG stationary installations must be composed of noncombustible material if located within the minimum distances specified for ignition sources or combustible materials

(4) A minimum clearance of 24 inches must be maintained between the fencing and any part of an LNG transfer system, dispensing system, or storage container that is part of a stationary installation.

(g) Stationary LNG installations must comply with the sign and lettering requirements as the following:

(1) Unless colors are specified, lettering must be a color in sharp contrast to the background color of the sign and must be easily readable.

(2) Signs must be visible from each point of transfer;

(3) Signs on emergency shutdown devices must be permanently affixed;

(4) Signs bearing the words, "NATURAL GAS," must be located on all operating sides of dispensers; and

(5) Signs indicating the licensee's name must be located at either the vehicle dispenser or refueling area, or at the loading or unloading area.

(h) At least two monitoring sensors must be installed at all LNG stationary installations to detect hazardous levels of LNG.

Monitoring sensors at stationary LNG installations must activate at not more than 25 percent of the lower flammability limit of LNG.

All monitoring sensors at LNG stationary installations must be installed and maintained in accordance with the manufacturer's instructions.

***LNG Safety Rules, §14.2101***

### **Stationary LNG Storage Containers**

(b) ASME, DOT and API containers must be identified by attachment of a stainless steel nameplate in a location that will remain visible after the container is installed and by a method that will minimize corrosion of the nameplate, its means of attachment, and the container.

(d) Shop-fabricated and shop-tested LNG containers must be leak-tested to 90 percent of the pressure relief valve setting after being installed and filled with LNG.

***LNG Safety Rules, §14.2107***

### **Container Installation Distance Requirements**

(a) LNG containers must be installed in accordance with the following minimum distance requirements:

(1) Containers with aggregate water capacities up to 15,540 gallons must be located at least 25 feet from any building, property line, stationary ignition sources, or other aboveground flammable liquids;

(2) Containers with aggregate water capacities from 15,541 to 93,240 gallons must be located at least 50 feet from any building, property line, stationary ignition sources, or other aboveground flammable liquids;

(3) Containers with aggregate water capacities of 93,241 gallons or more must be located at least 100 feet from any building, property line, stationary ignition sources, or other aboveground flammable liquids.

(4) Underground LNG containers must be located at least 15 feet apart, regardless of size.

(5) LNG dispensers or points of transfer must be located at least 25 feet from the nearest building not associated with the LNG facility and from any line of adjoining property that can be built upon.

(c) Stationary LNG containers and piping must not be placed in the area directly beneath or above an electric transmission, distribution, or customer service line and the area six feet to either side of that line.

***LNG Safety Rules, §14.2110***

**Transfer of LNG**

(a) Venting of LNG is prohibited as part of routine activities, except for the following:

- (1) as provided for in §14.2119 of this title (relating to Transport Vehicle Loading and Unloading Facilities and Procedures); and
- (2) through a trycock installed on a stationary storage tank during filling of the tank.

(b) LNG being transferred into stationary storage containers must be compatible in composition or temperature and density with the LNG already in the container.

When making transfers into fueling facility containers, the LNG must be transferred at a pressure that will not exceed the set pressure of the pressure relief device.

(c) When the composition or temperature and density are not compatible, measures must be taken to prevent an excessive rate of vapor evolution.

(d) At least one licensed or certified individual must be in attendance while unloading is in progress.

(e) Ignition sources must not be permitted within 25 feet of the transfer area or within the distances specified while transfer of LNG is in progress.

(f) When making transfers into fueling facility containers, measuring instruments must be provided to determine that containers are not overfilled.

When making transfers into fueling facility containers, LNG must be transferred at a pressure that will not exceed the set pressure of the pressure relief device.

(d) At least one licensed or certified individual must be present while unloading an LNG transport.

***LNG Safety Rules, §14.2116*****SAMPLE QUESTION**

Monitoring sensors at stationary LNG installations must activate at not more than \_\_\_\_\_ percent of the \_\_\_\_\_ flammability limit of LNG.

- A. 25 / lower
- B. 35 / lower
- C. 25 / upper
- D. 35 / upper

***Answer: A***

## **GENERAL RULES FOR LNG FUELING FACILITIES**

### **General Facility Design**

(d) LNG must not be vented to the atmosphere under normal operations unless the vent leads to a safe point of discharge at an LNG fueling facility.

Vent pipes or stacks must have the open end suitably protected to prevent entrance of rain, snow, and other foreign material at an LNG fueling facility.

Vent stacks must have provision for drainage at an LNG fueling facility.

(e) Instructions identifying the location and operation of emergency controls must be conspicuously posted in the facility area.

(f) LNG fueling facility containers, liquid impoundment areas, and points of transfer must be located according to the distances specified as relating to LNG Container Installation Distance Requirements.

(g) LNG fueling facility containers may be sited above or below grade. Soil susceptible to freezing from contact with containers must be heated directly or protected with an air space.

(h) Containers having outer jackets made of materials subject to corrosion must be protected against corrosion.

(i) Vehicles delivering LNG to a facility or vehicles being fueled from a facility must not be considered ignition sources.

Vehicles containing fuel-fired equipment, such as recreational vehicles and catering trucks, must be considered ignition sources unless the fuel-fired equipment is shut off completely before the vehicle enters an area in which ignition sources are prohibited.

(j) LNG fueling facilities which transfer LNG at night must have permanent lighting at points of transfer and operation, including at least two lights with a total of at least two foot candles of power.

(k) Temperature monitoring system must be provided at an LNG fueling facility where the foundations supporting cryogenic containers and equipment could be adversely affected by freezing or frost heaving of the ground.

### ***LNG Safety Rules, §14.2304***

### **Emergency Refueling**

(b) The individual performing the transfer of LNG must be properly trained in all aspects of LNG transfer.

### ***LNG Safety Rules, §14.2310***

### **Fuel Dispensing Systems**

(a) Retail LNG dispensers must comply with the applicable weights and measures requirements of the Texas Department of Agriculture relating to dispensing accuracy.

- (g) Manually operated container valves at LNG dispensers must be provided for each container.
- (h) Manually operated shutoff valves at LNG dispensers must be installed in manifolds as close as practicable to a container or group of containers.
- (i) The use of hoses or arms in a fueling installation is limited to:
- (1) a vehicle fueling hose;
  - (2) an inlet connection to compression equipment; or
  - (3) a section of metallic hose not exceeding 36 inches in length in a pipeline to provide flexibility where necessary.

Metallic hose in a fueling installation must be installed so that it will be protected against damage and be readily visible for inspection. The manufacturer's identification must be retained for each section of metallic hose used.

***LNG Safety Rules, §14.2313***

**SAMPLE QUESTION**

Fire extinguishers on a transport power unit must be mounted so that a visual inspection can determine whether the extinguisher is fully charged.

- A. True
- B. False

***Answer: A***

**Automatic Fuel Dispensing Systems**

- (a) Automatic fuel dispensers must be fabricated of material suitable for LNG and resistant to the action of LNG under service conditions.

The parts of an automatic LNG fuel dispenser that contain pressure must be made out of stainless steel, brass, or other equivalent cryogenic material.

Aluminum may be used for approved meters at an automatic LNG dispenser location.

- (b) Electric installations within dispenser enclosures and the entire pit or open space beneath dispensers must comply with NEC, Class 1, Group D, Division 1, except for dispenser components located at least 48 inches above the dispenser base which NEC states are intrinsically safe.
- (e) A device must be installed in the liquid piping at LNG fueling facilities so that displacement of an automatic dispenser will result in the displacement of such piping on the downstream side of the device.
- (f) The fueling nozzle of an LNG dispenser must prevent LNG from being discharged unless the nozzle is connected to a vehicle.
- (g) A key, card, or code system must be used to activate an automatic LNG dispenser.

(h) Automatic dispensers must incorporate cutoff valves with opening and closing devices that ensure the valves are in a closed position when dispensers are deactivated.

(i) LNG fuel storage installations that include automatic dispensers must be equipped with an emergency shut-down device for the entire LNG installation located at least 20 feet from the nearest dispenser or storage area.

The emergency shutdown device at an LNG fuel storage installation that includes an automatic dispenser must be distinctly marked for easy recognition.

(j) If automatic dispensers are to be used during hours of darkness, permanent adequate lighting must be provided to facilitate proper operations.

***LNG Safety Rules, §14.2319***

### **Protection of Automatic and Other Dispensers**

(a) Dispensers must be secured to a concrete island at least six inches above the normal grade and two inches above the grade of any other liquid fuel dispenser.

(b) Dispensers must be protected against collision damage by support columns or other such protection installed at the approach ends of the concrete island.

***LNG Safety Rules, §14.2322***

#### **SAMPLE QUESTION**

Fire extinguishers on a transport power unit must be mounted so that a visual inspection can determine whether the extinguisher is fully charged.

- A. True
- B. False

***Answer: A***

## **ENGINE FUEL SYSTEMS**

### **Vehicle Fuel Containers**

(a) Containers must be designed, tested, and marked or stamped in accordance with DOT Specification 4L or ASME Code, "Rules for the Construction of Pressure Vessels," Section VIII, Division 1, applicable on the date of manufacture.

(b) The owner of a LNG engine fuel system container must be responsible for its suitability for continued service.

(d) LNG engine fuel systems' containers must be equipped with a dip tube or other device so that the maximum filling volume of the container complies with the Railroad Commission's LNG Regulations.

(h) LNG engine fuel systems' container appurtenances must have a rated maximum allowable working pressure not less than the maximum allowable working pressure of the container.

(j) LNG engine fuel systems' valves must be readily accessible and operable without the use of tools.

***LNG Safety Rules, §14.2607***

### **Installation of Vehicle Fuel Containers**

(a) Vehicle fuel containers must comply with the following specifications:

(1) Fuel containers on vehicles other than school buses, mass transit, or other vehicles used in public transportation may be located within, below, or above the driver or passenger compartments, provided all connections to the containers are external to or sealed and vented from those compartments.

Motor fuel containers installed on a special transit vehicle may be installed in the passenger compartment, provided all connections to the containers are external to or sealed and vented from those compartments.

(2) Fuel supply components and containers must be mounted in a location to minimize damage from collision.

No part of a container or its appurtenances must protrude beyond any part of the vehicle at the point of installation.

(3) Fuel systems must be installed with as much road or ground clearance as practicable, but not less than the minimum road or ground clearance of the vehicle when loaded to its gross vehicle weight rating.

The minimum distance must be measured from the lowest part of the fuel system.

(4) No portion of a fuel supply container or container appurtenance must be located ahead of the front axle or behind the rear bumper mounting face of a vehicle.

Fuel container valves must be protected from physical damage using the vehicle structure, valve protectors, or a suitable metal shield.

(5) Fuel supply containers located less than eight inches from the exhaust system must be shielded from direct heat.

(6) Mountings must minimize fretting corrosion between the fuel container and the mounting system by means of rubber insulators or other suitable means.

(7) Fuel containers must not be installed where they would adversely affect the driving characteristics of the vehicle.

(8) Fuel containers on school buses or mass transit vehicles must be installed on the underside of the vehicle, except as specified in the Railroad Commission's *Regulations for LNG*.

Fuel containers on special transit vehicles must be installed in a location which will not interfere with vehicle operation.

(9) Fuel containers, appurtenances, and connections may be enclosed in a shroud-type structure, provided it is securely attached to the container and liquid-tight.

The shroud access doors must be secured in place by fasteners such as wing nuts or spring-loaded latches and must not require the use of tools for removal.

The use of locks on shroud access doors is prohibited.

(b) Fuel supply containers must be connected or mounted to comply with the following specifications:

(1) Fuel supply container connections must be external to or sealed and vented from the driver and passenger compartments or any space containing radio transmitters or other spark-producing equipment.

(2) Fuel supply container mounting brackets must prevent the container from jarring loose, slipping or rotating.

(c) Roof-mounted containers are allowed if the vehicle was originally designed and manufactured to have roof-mounted containers or if the original manufacturer approves the design of the structure mounting.

(d) Container markings must be readable after a container is permanently installed on a vehicle.

***LNG Safety Rules, §14.2610***

### **Installation of Venting Systems and Monitoring Sensors**

(a) Pressure relief devices and pressure-carrying components installed within a closed compartment must be vented to the outside of the vehicle in a suitable location for engine fuel systems.

(c) Vents in an LNG engine fuel system must not restrict the operation of a fuel container's pressure relief device or pressure relief device channel.

(g) The number of sensors to be installed on all LNG-fueled vehicles must comply with the area of coverage for each sensor and the size of the vehicle.

***LNG Safety Rules, §14.2616***

### **Vehicle Fueling Connection**

(a) Vehicle fueling connections must provide for the reliable and secure connection of the fuel system containers to a source of LNG.

(b) Fueling connections must be designed for the pressure expected under normal conditions and corrosive conditions which might occur.

(c) Fueling connections must prevent escape of gas when the connector is not properly engaged or becomes separated.



(d) Refueling receptacles on engine fuel systems must be firmly supported and must:

(1) receive the fueling connector and accommodate the maximum allowable working pressure of the vehicle fuel system;

(2) incorporate a means to prevent the entry of dust, water, and other foreign material. If the means used is capable of sealing system pressure, it must be capable of being depressurized before removal; and

(3) have a different fueling connection for each pressure base vehicle fuel system.

***LNG Safety Rules, §14.2634***

### **Signs and Labeling**

(a) Signs or labels must be readily visible before and during transfer operations, must be weather-resistant, and must be located as specified.

(b) Vehicles must be identified with a weather-resistant diamond-shaped label located on an exterior vertical or near vertical surface on the lower right rear of the vehicle (excluding the bumper) inboard of any other markings.

The vehicle label must be at least 4 3/4 inches by 3 1/4 inches. The marking must consist of a border and the capital letters, "LNG"; the letters must be at least one inch tall, and be silver or white reflective luminous material on a blue or black background.

(c) Upon completion of a vehicle conversion, the licensee making the conversion must affix to the vehicle an identification tag or decal in a location that is easily readable. The tag or decal must contain letters that indicate the licensee's name, current license number, and the year and month the conversion was made.

***LNG Safety Rules, §14.2637***

#### **SAMPLE QUESTION**

The emergency shutdown device at an LNG fuel storage installation that includes an automatic dispenser must be distinctly marked for easy \_\_\_\_\_.

- A. Maintenance
- B. Recognition
- C. Actuation
- D. Inspection

***Answer: B***

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