TEXAS LNG EXAMINATION STUDY GUIDE

Service & Installation, Including Transport Driver & Motor Fuel Dispenser 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 a Railroad Commission LNG qualifying examination. 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 current 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because changes in technology are likely to occur that might make portions of this publication inaccurate and out-of-date.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.

Exam administration

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 23.)

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. 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. 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. 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.

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TEXAS LNG EXAMINATION STUDY GUIDE EMPLOYEE-LEVEL SERVICE AND INSTALLATION, INCLUDING TRANSPORT DRIVER AND MOTOR FUEL DISPENSER

Who should use this guide?

You should use this guide if you plan to take the Railroad Commission's employee-level qualifying examination authorizing the sale, storage, transportation for delivery and dispensing of LNG and the sale, installation, servicing and repair of LNG systems.

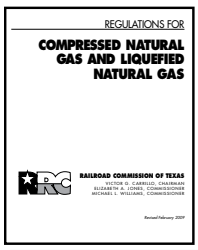
What books do I need?

This examination tests your knowledge of the laws and standards that apply to the sale, storage, transportation for delivery, and dispensing of LNG, and to the sale, installation, service and repair of LNG systems in Texas.

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?

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. 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

Before you take this examination you should know the definitions on pp. 9–11 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
§14.2104	Uniform Safety Requirements
§14.2107	Stationary LNG Storage Containers

§14.2110	LNG Container Installation Distance Requirements
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§14.2728	Extinguishers Required
§14.2731	Manifests
§14.2734	Transfer of LNG on Public Highways, Streets, or Alleys
§14.2737	Parking of LNG Transports and Container Delivery Units, and Use of Chock Blocks

§14.2740	Uniform Protection Standards
§14.2746	Delivery of Inspection Report to Licensee
§14.2749	Issuance of LNG Form 2004 Decal

Terms and definitions

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 **(February 2009)**

Aggregate water capacity means 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)

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)

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)

The **design pressure** is the pressure for which a system or 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)

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)

A **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)

A **vaporizer** is a device other than a container that receives LNG in liquid form and adds sufficient heat to convert the liquid to a gaseous state.
LNG Safety Rules, §14.2007(74)

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

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 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 STAIONARY LNG INSTALLATIONS

Uniform Protection Requirements

(c) The operating end of the container at a stationary LNG installation, including the material handling equipment, the entire dispensing system and any part of the LNG transfer system, dispensing system or storage container which is exposed to vehicular traffic must be protected from damage by the vehicular traffic.

The fencing or guardrails installed to protect a stationary LNG installation must extend at least 24 inches beyond any part of the LNG transfer system, dispensing system, or storage container.

(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 must be installed and maintained in accordance with the manufacturer's instructions.
LNG Safety Rules, §14.2101

Uniform Safety Requirements

(b) Any stationary LNG container previously in LNG service which has not been subject to continuous LNG pressure or inert gas pressure must be inspected to determine if the container must be leak-tested or recertified.
LNG Safety Rules, §14.2104

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 or 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

(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, 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

Transport Vehicle Loading and Unloading Facilities and Procedures

(a) Transport vehicle loading and unloading facilities must meet the following requirements:

(1) Rack structures must be constructed of noncombustible material such as steel or concrete.

(2) Transfer piping, pumps, and compressors must be installed with the following protective measures:

(A) protection from damage from vehicle movements in compliance with the guardrail and fencing requirements of §14.2101 of this title (relating to Uniform Protection Requirements);

(B) isolation valves at both ends of containers with less than 2,000 gallon capacity, and a remote operating valve, automatic closure, or check valve to prevent backflow on containers of 2,000 gallons or more capacity;

(C) isolation valving and bleed connections to depressurize hoses and arms and minimize venting before disconnecting;

(D) hoses and arms equipped with a shutoff valve at the free end;

(E) a check valve on piping for liquid transfer to minimize accidental release; and

(F) a line relief valve between every pair of isolation valves.

(3) Where multiple products are loaded or unloaded at the same location, loading arms, hoses, and manifolds must be marked to indicate the product or products handled by each system.

(4) Operating status indicators must be provided in the transfer area.

(b) Written procedures covering normal transfer and emergency operating procedures must be available for all transfer operations. The procedures must be kept current and available to all employees engaged in transfer operations.

(c) Prior to beginning transfer operations, the following checks must be made:

(1) Gauge readings must be obtained or inventory established to prevent overfilling of the receiving vessel.

(2) Transfer connections must be checked to ensure they are gastight and liquid tight.

(3) Unless required for transfer operations, LNG or flammable liquid transport vehicle engines must be turned off. Brakes must be set and wheels chocked to prevent movement of the vehicle prior to connecting for transfer. The engine must not be started until the transport vehicle has been disconnected and any released vapors have dissipated.

(4) Prior to loading LNG into a transport vehicle tank which does not have a positive pressure or is not in exclusive LNG service, a test must be made to determine the oxygen content in the receiving container. If the oxygen content in either case exceeds 1.0% by volume, the container must not be loaded until suitably purged.

(5) An LNG transport vehicle must be positioned prior to transfer so that it can exit the area without backing when the transfer operation is complete.

(d) During transfer operations, the following checks must be made:

(1) Levels must be checked during the transfer operations.

(2) Pressure and temperature conditions must be observed during the transfer operations. If any unusual variance in pressure occurs, transfer must be stopped until the cause has been determined and corrected.

(e) No repair may be performed on the transfer system while transfer is taking place.
LNG Safety Rules, §14.2119

Transfer Systems, Including Piping, Pumps, and Compressors, Used for LNG and Refrigerants

(a) Transfer systems and pumps used to transfer LNG and refrigerants must be provided with a means for pre-cooling, to reduce the effect of thermal shock and overpressure.

(b) Check valves must be provided as required to prevent backflow in transfer systems and must be located as close as practicable to the point of connection to any system from which backflow might occur.

(c) At a stationary LNG installation, in addition to a locally mounted device to shut down the pump or compressor drive, a readily accessible, remotely located device must be provided at least 25 feet away from the equipment to shut down the pump or compressor in case of an emergency.
LNG Safety Rules, §14.2122

Hoses and Arms

(d) Hoses must be tested at least annually to the setting of the relief valve that protects the hose.

(e) Hoses must be visually inspected for damage or defects before each use and must not be used if any damage or defect is found.
LNG Safety Rules, §14.2125

Communications and Lighting

(a) Emergency communications must be provided near transfer locations, so that the operator can contact remotely located personnel who are associated with the transfer operations

(b) Transfer areas must be illuminated during hours of darkness.
LNG Safety Rules, §14.2128

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

(b) Structures and support of LNG fueling facility equipment, piping, controls, and tanks must be constructed of noncombustible material.

(c) Dikes, grading, or diversion curbs must be provided to prevent combustible or hazardous liquids from encroaching on the LNG refueling facility.

(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.

(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

Fuel Dispensing Systems

(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

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.
LNG Safety Rules, §14.2319

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

PIPING SYSTEMS AND COMPONTENTS FOR ALL STATIONARY LNG INSTALLATIONS

Piping Materials

(a) Piping materials, including gaskets and thread compounds, must be suitable for use with LNG throughout the range of temperatures to which they will be subjected.

(c) Piping insulation used in areas where the mitigation of fire exposure is necessary must be made of material which will not propagate fire and must maintain any properties which are necessary during an emergency when exposed to fire, heat, cold, or water.

(f) All threaded piping must be at least Schedule 80.
LNG Safety Rules, §14.2404

Installation of Piping

(a) An LNG piping system with bolted connections at a stationary LNG installation must be designed to withstand thermal contraction and expansion.

(b) LNG pipe joints of four-inch nominal diameter or less may be threaded where necessary for special connections to equipment, provided that the connection is not subject to fatigue-producing stresses.

(d) Piping and tubing must be installed as directly as possible with provisions for expansion, contraction, jarring, vibration, and settling.

Underground LNG piping must be buried at least 18 inches below the ground surface unless otherwise protected.
LNG Safety Rules, §14.2413

Installation of Valves

(a) Cryogenic liquid valves must be installed at an angle greater than 45 degrees from horizontal.

(b) Isolation valves must be provided on container, tank, and vessel connections, except connections that are blind-flanged or plugged.

(f) Piping systems must be designed to limit the contained volume that could be discharged in the event of a piping system failure.

(g) Container connections larger than one-inch pipe size through which liquid can escape must be equipped with:
(1) A valve that closes automatically if exposed to fire ; or
(2) A remotely controlled, quick-closing valve that must remain closed except during the operating period; or
(3) A fail-closed valve ; or
(4) A check valve on filling connections.
LNG Safety Rules, §14.2416

Pipe Marking and Identification

(c) Piping must be identified by color-coding, painting or labeling so as to be readily readable for piping systems and components at stationary LNG installations.
LNG Safety Rules, §14.2422

Welding Pipe Tests

(e) Nondestructive examination methods, limitations on defects, qualifications of the authorized inspector and personnel performing the examination must meet the requirements of ANSI B31.3, 336.

(f) The test records and written procedures required when conducting nondestructive examinations of welded pipe at a stationary LNG installation must be maintained for the life of the piping system or until such time as a reexamination is conducted.
LNG Safety Rules, §14.2431

Liquid Level Gauging

(a) At least one liquid level gauge on an LNG container at a stationary installation must be replaceable without taking the container out of operation.
LNG Safety Rules, §14.2501

Pressure Gauges

All LNG containers at stationary LNG installations must be equipped with a pressure gauge connected to the container at a point above the Maximum intended liquid level.
LNG Safety Rules, §14.2504

Emergency Failsafe

Stationary LNG installations must be designed so that if power or instrument air fails, the system will go into a fail-safe condition that will be maintained until the operator can take appropriate action to either reactivate or secure the system.
LNG Safety Rules, §14.2510

Electrical Equipment

(a) All electrical equipment and wiring at an LNG refueling station must be installed in accordance with the applicable sections of the N.E.C electric code.
LNG Safety Rules, §14.2513

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

Engine Fuel Delivery Equipment

(a) Vaporizers must completely vaporize the LNG and heat the vapor to the appropriate temperature prior to the vapor entering the pressure regulator when the vaporizer is subjected to the maximum fuel flow rate.

Engine exhaust gases may be used as a direct source of heat to vaporize the fuel if the materials of construction of those parts of the vaporizer in contact with the exhaust gases are resistant to corrosion from those gases.

(b) Pressure regulator inlets and chambers must have a maximum allowable working pressure of at least the maximum allowable working pressure of the container.

(d) Pipe, tubing, and fittings between the vehicular fuel container and the pressure regulator must be designed to withstand a pressure of at least two times the maximum allowable working pressure of the container.

(d)(4) Pipe joints used in an LNG engine fuel system must be threaded, welded or brazed.
LNG Safety Rules, §14.2613

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

Installation of Valves

(a) Valves, valves packing, gaskets, and seats must be suitable for the intended service and must comply with the following:

(1) Shutoff valves for engine fuel systems must have a maximum allowable working pressure of at least the maximum allowable working pressure of the container.
LNG Safety Rules, §14.2622

Installation of Pressure Gauges

(a) Pressure gauges located within driver or passenger compartments must be installed so that no gas will flow through the gauge in the event of failure.

Installed pressure gauges must be readily visible by the driver.

(b) Pressure gauges installed outside driver or passenger compartments must be equipped with a limiting orifice, a shatter-proof dial lens, and a body relief.

(c) Gauges must be securely mounted, shielded, and installed in a protected location to prevent damage from vibration and unsecured objects.
LNG Safety Rules, §14.2625

Installation of Pressure Regulators

(b) Means must be provided in an LNG engine-fuel system to prevent regulator malfunctions due to low temperatures.

(c) Regulators in an LNG engine-fuel system must be installed so that their weight is not placed on or supported by the attached gas lines.
LNG Safety Rules, §14.2628

Wiring

(a) Wiring in an LNG engine-fuel system must be installed, supported, and secured in a manner to prevent damage due to vibration, shock, strains, wear or corrosion.
LNG Safety Rules, §14.2631

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

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

LNG TRANSPORTS

Testing Requirements

(a)(3) If evidence of any unsafe condition is discovered in an LNG transport container unit as a result of any tests performed, the unit must be immediately removed from LNG service and not returned to service until the Railroad Commission notifies the licensee in writing that the unit may be returned to LNG service.

(c) An LNG container must be inspected for corroded areas, dents, other conditions (including leakage under test pressure) which could render the container unsafe for LNG service.
LNG Safety Rules, §14.2707

Marking

(a) LNG transports and container delivery units in LNG service must be marked with the name of the licensee or ultimate consumer operating the unit.
LNG Safety Rules, §14.2710

Pressure Gauge

LNG transport containers must be equipped with an isolation valve installed between the container and the pressure gauge.
LNG Safety Rules, §14.2713

Liquid Level Gauging Devices

Truck and trailer containers must be equipped with a liquid level gauging device of approved design, such as a fixed tube device.

Fixed tube devices must be arranged so that the maximum liquid level to which the container may be filled is set at the maximum permitted for the container, based on an initial liquid temperature not to exceed 40 degrees Fahrenheit.
LNG Safety Rules, §14.2722

Extinguishers Required

(b) Fire extinguishers on a transport power unit must be mounted so that a visual inspection can determine whether the extinguisher is fully charged.
LNG Safety Rules, §14.2728

Manifests

Manifests or bills of lading must be covered by permanent shipping papers authorized by the DOT.
LNG Safety Rules, §14.2731

Parking of LNG Transports and Container Delivery Units, and Use of Chock Blocks

(a) LNG transport or container delivery units must not be parked on any public street, highway or alley, except in an emergency or in connection with normal duties or meals or with normal rest stops.

LNG transport or container delivery units must not be parked in a congested area and must be parked at least 50 feet from any building except a building devoted exclusively to LNG operations.
LNG Safety Rules, §14.2737

Uniform Protection Standards

(b) Any transport unit or container delivery unit discovered to be in an unsafe condition while being operated on a public roadway may be continued in operation only to the nearest place where repairs can safely be made.
LNG Safety Rules, §14.2740

Delivery of Inspection Reports to Licensee

If a transport driver receives an inspection report from the Railroad Commission, the driver must deliver that report to the licensee in whose name the transport unit is registered
LNG Safety Rules, §14.2746

Issuance of LNG Form 2004 Decal

(a) A Railroad Commission Form 4 LNG decal must not be issued to any transport that has not been tested as required at least once during the preceding five years.
LNG Safety Rules, §14.2749

SAMPLE QUESTION

The operating end of the container at a stationary LNG installation, including _____, which is exposed to vehicular traffic, must be protected from damage by the vehicular traffic.

A. The material handling equipment
B. The entire dispensing system
C. Any part of the LNG transfer system, dispensing system or storage container
D. All of the above

Answer: D

RRC ALTERNATIVE FUELS TRAINING CENTER 4044 PROMONTORY POINT DR., AUSTIN