TEXAS LNG EXAMINATION STUDY GUIDE

Service and Installation 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because changes in technology are likely to occur that might make portions of this publication inaccurate and out-of-date.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.

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 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. 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.

Contacts

Alternative Fuels Research and Education (AFRED)

Rayfield Hearne, Certification Manager	(512) 463-6845	rayfield.hearne@rrc.state.tx.us
Amber Flaherty, Examination Coordinator	(512) 463-6933	amber.flaherty@rrc.state.tx.us
Carol Goodman, Training Coordinator	(512) 463-2682	carol.goodman@rrc.state.tx.us

LP-Gas Operations

April Dawn Richardson, LP-Gas Safety	(512) 463-6935	april.richardson@rrc.state.tx.us

TEXAS LNG EXAMINATION STUDY GUIDE EMPLOYEE-LEVEL SERVICE AND INSTALLATION

Who should use this guide?

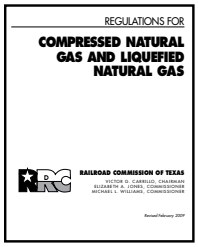
You should use this guide if you plan to take the Railroad Commission's employee-level qualifying examination authorizing the sale, repair, service, and installation of stationary containers and LNG systems.

What books do I need?

This examination tests your knowledge of the laws and standards that apply to the sale, repair, service, and installation of stationary containers and LNG systems.

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. 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
§14.2104	Uniform Safety Requirements
§14.2107	Stationary LNG Storage Containers
§14.2110	LNG Container Installation Distance Requirements

§14.2304	General Facility Design
§14.2313	Fuel Dispensing Systems
§14.2404	Piping Materials
§14.2407	Fittings Used in Piping
§14.2413	Installation of Piping
§14.2416	Installation of Valves
§14.2419	Welding and Piping installations
§14.2422	Pipe Marking and Identification
§14.2428	Inspection and Testing of Piping
§14.2431	Welded Pipe Tests
§14.2437	Pressure and Relief Valves in Piping
§14.2440	Corrosion Control
§14.2501	Liquid Level Gauging
§14.2504	Pressure Gauges
§14.2510	Emergency Failsafe
§14.2513	Electrical Equipment
§14.2516	Electrical Grounding and Bonding

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

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)

Container appurtenances are defined as components installed in containers 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)

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)

The **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)

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 **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)

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 STATIONARY 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.

(d) When installed for use, containers must not be stacked one upon another except when designed by the manufacturer for stacking.
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

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.

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

(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 footcandles 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

Fuel Dispensing Systems

(f) Emergency shut-down devices must be distinctly marked for easy recognition must activate a valve installed at the dispensing area that shuts off the power and gas supply to the dispensers.

ESD devices must be located as follows:

(1) For containers with water capacity of 93,240 gallons or less, an ESD device must be located between 35 and 50 feet from the container.

(2) For containers with water capacity of 93,241 gallons or more, an ESD device must be located between 60 and 75 feet from the container.

(g) Manually operated container valves must be provided for each container.

(h) Manually operated shutoff valves 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.

(j) When a hose or arm of nominal three-inch diameter or larger is used for liquid transfer, or nominal four-inch diameter or larger is used for vapor transfer, an emergency shutoff valve must be installed in the piping of the transfer system less than ten feet from the nearest end of the hose or arm. If the flow is away from the hose, a check valve may be used as the shutoff valve. If a liquid or vapor line has two or more legs, an emergency shutoff valve must be installed
in each leg.

(k) The fill line on storage containers must be equipped with a backflow check valve to prevent discharge of LNG from the container in case of line, hose, or fitting rupture.

(l) A fueling connection and mating vehicle receptacle must be used to transfer LNG or gas vapor to or from the vehicle.

(m) An interlock device must be provided so that the hose coupling cannot be released while the transfer line is open. Interlock devices are not required for transports when transferring fuel to a stationary tank.

(n) The maximum delivery pressure must not exceed the maximum allowable working pressure of the vehicle and fuel tanks.

(o) Where excess flow check valves are used, the closing flow must be less than the flow rating of the piping system that would result from a pipeline rupture between the excess flow valve and the equipment downstream of the excess flow check valve.
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

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

Fittings Used in Piping

(a) Cast iron, malleable iron, and ductile iron must not be used in fittings.

(b) Threaded nipples must be at least schedule 80.

(c) Bends are permitted only in accordance with ANSI B31.3, 329.

(d) Solid plugs or bull plugs made of at least schedule 80 must be used for threaded plugs.

(e) Compression-type couplings must not be used where they will be subjected to temperatures below -20 degrees Fahrenheit unless such couplings meet the requirements of ANSI B31.3, 318.
LNG Safety Rules, §14.2407

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.

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

The number of threaded or flanged joints must be kept to a minimum.

Dissimilar metals must only be joined by flanges or transition joint techniques which will not be adversely affected by LNG.

(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.

Refrigerated piping must not be buried unless the surrounding soil is heated.
LNG Safety Rules, §14.2413

Installation of Valves

(a) Valves must be installed to prevent leaking or malfunction due to freezing.

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

Welding at Piping Installations

Qualification and performance of welders must comply with ANSI B31.3. Oxygen-fuel gas welding is prohibited on piping for service temperatures below -20 degrees Fahrenheit. Electric arc or inert gas-shielded welding is permissible.
LNG Safety Rules, §14.2419

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

Inspection and Testing of Piping

(a) Pressure tests must be conducted in accordance with ANSI B31.3, 337.

(b) Pressure, test medium temperature, and ambient temperature must be recorded for the duration of each test and these records must be maintained for the life of the facility or until such time as a retest is conducted.
LNG Safety Rules, §14.2428

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.

(g) Records and certifications pertaining to materials, components, and heat treatment as required by ANSI B31.3, 336.5.1(c) and 336.5.3(d) must be maintained for the life of the system.
LNG Safety Rules, §14.2431

INSTRUMENTATION AND ELECTRICAL SERVICES

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.

(b) When the container filling rate is greater than 1.0% per day, the container must be provided with a high-liquid-level alarm which must be separate from the liquid level gauging device.

When the container filling rate is such that an alarm system is required, the alarm must be set so that the operator will have sufficient time to stop the flow without exceeding the maximum permissible filling height, and must be located so that it is visible and audible to personnel controlling the filling.

A high-liquid-level flow cutoff device, if used, must not substitute for the alarm.

(c) Containers with a capacity of 93,240 gallons or less which are continuously attended during the filling operation may be equipped with trycocks in lieu of the high-liquid-level alarm.
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

Vacuum Gauges

Vacuum-jacketed containers must be equipped with instruments or connections for checking the absolute pressure in the annular space.
LNG Safety Rules, §14.2507

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.

(b) Fixed electrical equipment and wiring installed within the areas specified in Table 1 of subsection (h) of this section must comply with the requirements specified.

(c) Seals, barriers, or other means used to comply with this section must be designed to prevent the passage of flammable fluids through the conduit, stranded conductors, and cables. Such means may include but not be limited to:

(1) a physical interruption of the conduit run and of the stranded conductors through the use of an adequately vented junction box containing terminal strip or bus bar connections;

(2) an exposed section of MI cable using suitable fittings; or

(3) an exposed section of single conductor which is incapable of transmitting gases or vapors.

(d) A primary seal must be provided between the flammable fluid system and the electrical conduit wiring system. If the failure of the primary seal would allow the passage of flammable fluids to another portion of the conduit or wiring system, an additional seal must be provided to prevent the passage of the flammable fluid beyond the additional device or means.

(e) Unless specifically designed and approved for the purpose, the seals specified in this section are not intended to replace the conduit seals required in NEC.

(f) Where primary seals are installed, drains, vents, or other devices must be provided for monitoring purposes to detect flammable fluids and leaking.

(g) Primary seals must be designed to withstand the service conditions to which they may be exposed. Additional seals or barriers and interconnecting enclosures must meet the pressure and temperature requirements of the condition to which they could be exposed in the event of failure of the primary seal, unless other approved means are provided to accomplish this purpose.

(h) The classified areas described in Table 1 of this section must not extend beyond an unpierced wall, roof, or solid vapor-tight partition.
LNG Safety Rules, §14.2513

Electrical Grounding and Bonding

(a) Electrical grounding and bonding must be provided as recommended by NFPA 77, Static Electricity, Sections 5.4 and 6.1.3, and as required by the NEC.

(b) Static protection is not required when container vehicles are loaded or unloaded by conductive or nonconductive hose, flexible metallic tubing, or pipe connections through or from tight top or bottom outlets where both halves of metallic couplings are in contact.

(c) If stray currents may be present or if impressed currents are used on loading and unloading systems such as for cathodic protection, protective measures to prevent ignition must be taken in accordance with API RP 2003, Protection Against Ignitions Arising Out of Static, Lightning and Stray Currents.

(d) Grounding must be provided for tanks supported on nonconductive foundations. Metal storage containers and tanks do not require lightning protection.
LNG Safety Rules, §14.2516

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

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