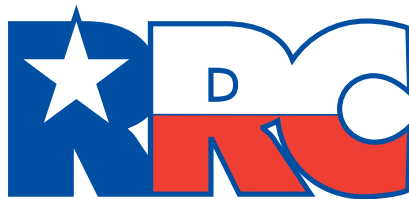


TEXAS LP-GAS EXAMINATION STUDY GUIDE

Recreational Vehicle
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 LP-gas 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 *LP-Gas Safety Rules* 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because changes in technology are likely to occur that might make portions of this publication inaccurate and out-of-date.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.

All rights reserved. No part of this publication may be reproduced or transmitted in any form without written permission from the Railroad Commission of Texas.

Exam administration

Taking an examination in Austin

You may take any LP-gas 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 AFRED Training Center. The Training Center is located at 6506 Bolm Road, at the intersection of U.S. Highway 183.

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

(See map to Training Center on page 17.)

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, a training class, or both.

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

Payment for exams; LPG Form 16; 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. LPG Form 16, “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 LP-gas employee-level qualifying examinations are open book.

Examinees may use a copy of NFPA 1192, 2005 edition, to take their RV technician examination. This study guide may not be used during any employee-level examination.

The questions on the examination are not organized by topic as they are in this study guide.

Examination time limit

The on-road motor fuel examination 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 your examination 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 LP-gas examinations.

All 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 at a remote site 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.

Required first-year training class

Certified RV technicians are subject to Railroad Commission training and continuing- education requirements. To maintain your certification, you must complete one of the following Railroad Commission eight-hour courses by the next May 31 after you pass your initial examination. (NOTE: If you pass the examination between March 1 and May 31, then you have until May 31 the next year to complete your training requirement.)

- | | |
|-----|-------------------------------------|
| 1.1 | Introduction to Propane |
| 3.5 | Residential Appliance Controls |
| 3.8 | Recreational Vehicle Gas Appliances |
| 80 | Category E Management Course |

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
--------------------------------------	----------------	--

LP-GAS EXAMINATION STUDY GUIDE EMPLOYEE-LEVEL RECREATIONAL VEHICLE

Who should use this guide?

You should use this guide if you plan to take the Railroad Commission's employee-level qualifying examination to perform LP-gas recreational vehicle installation and repair activities. The recreational vehicle examination qualifies you to install LP-gas motor or mobile fuel containers, including cylinders, and to install and repair LP-gas systems on recreational vehicles.

The recreational vehicle examination does not authorize you to fill LP-gas containers.

What book do I need?

This examination tests your knowledge of the laws and standards that apply to recreational vehicle operations in Texas. These laws and standards are found in one book:

NFPA 1192: *Standard on Recreational Vehicles* (2005)

Where do I get the book?

Printed copies of NFPA 1192 are available for purchase from the Texas Propane Gas Association by calling (800) 392-0023.

Sections and topics

Before you take this examination you should know the definitions on pages 6-7 of this study guide and the contents of the sections of the codes and standards listed below.

The actual examination questions may not include all of the listed sections and topics.

NOTE: Section (§) 9.402(c) of the LP-Gas Safety Rules states, “Container capacity, piping system, and appliance exceptions. The Commission does not adopt language in any NFPA rule, chart, figure, or table pertaining to any LP-gas container having a water capacity of one gallon (4.2 pounds LP-gas capacity) or less, or to any LP-gas piping system or appliance attached or connected to such a container.”

NFPA 1192 (2005)

Unless otherwise stated, a transport is defined in §9.2(52) as “Any bobtail or semitrailer equipped with one or more containers.”

§5.2	Propane Systems
§5.3	Propane Piping Systems
§5.4	Fuel–Burning Appliances
§5.5	Venting, Ventilation and Combustion Air
§5.6	Marking Appliances (Installation and Operational Features)
§6.4	Other Considerations

Terms and definitions

NOTE: This list is not exhaustive. You are responsible for knowing all the rules or standards that apply to the LP-gas activities you will perform, as well as the rules and standards highlighted in this guide.

As a recreational vehicle technician, you need to know the terms, definitions, facts, rules and procedures relating to propane’s physical characteristics and the propane containers, systems, appliances and venting used in recreational vehicles.

NFPA 1192 (2005)

NOTE: Informal terms that are sometimes used in the propane industry instead of formal technical terms are given in brackets.

Accessible. Having access to, but which first may require the removal of, a panel, door or similar covering of the item described.

NFPA 1192, §3.3.1

Axle Height. The distance to the lower connection of the axle spindle assembly and the outboard end of the lower control arm (lever ball joint or kingpin), excluding shock mounting, grease fitting, or similar component.

NFPA 1192, §3.3.6

Compartment. An enclosed volumetric space designed to provide for a separate area.

NFPA 1192, §3.3.13

Cylinder. A portable container constructed in accordance with U.S. Department of Transportation *Specifications for LP-Gas Containers* (49 CFR).

NFPA 1192, §3.3.45.1

Dry Weight. The weight of the completed finished vehicle when factory-equipped, without fluids.

NFPA 1192, §3.3.23

Frame. Chassis rail and any addition thereto of equal or greater strength.

NFPA 1192, §3.3.29

Fuel System. Any arrangement of pipe, tubing, fittings, connectors, tanks, controls, valves and devices designed and intended to supply or control the flow of fuel.

NFPA 1192, §3.3.30

Heat Appliance. An appliance for comfort heating for a recreational vehicle or for water heating.

NFPA 1192, §3.3.4.1

Heat-Producing Appliance. An appliance that produces heat by utilizing electric energy or by burning fuel.

NFPA 1192, §3.3.4.2

Propane [Liquefied Petroleum Gas, LP-Gas, LPG]. Any material having a vapor pressure not exceeding that allowed from commercial propane composed predominantly of the following hydrocarbons, either by themselves or as mixtures: propane, propylene, butane (normal butane or isobutane), and butylene.

NFPA 1192, §3.3.44

Propane Supply Connector. Tubing or pipe connections the recreational vehicle to the propane supply source.

NFPA 1192, §3.3.47

Readily Accessible. Able to be located, reached, serviced or removed without removing other components or parts of the apparatus and without the need to use special tools to open enclosures.

NFPA 1192, §3.3.48

Recreational vehicle [RV]. A vehicular-type unit primarily designed as temporary living quarters for recreational, camping, travel, or seasonal use that either has its own motive power or is mounted on or towed by another vehicle.

NFPA 1192, §3.3.50

Tank. A container constructed in accordance with the Section VIII, "Rules for the Construction of Unfired Pressure Vessels" of the Boiler and Pressure Vessel Code.

NFPA 1192, §3.3.45.2

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 LP-gas 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.

1. Containers: Capacity, Construction, Location and Installation

Where propane utilization equipment is installed by the recreational vehicle manufacturer, the recreational vehicle must be provided with one of the following:

- (1) One but not more than three cylinders having individual water capacities of 105 lb maximum [approximately 45 lb propane capacity]
- (2) One or more tanks having a maximum aggregate water capacity of 200 gallons.

NFPA 1192, §5.2.1

Cylinders must be constructed and marked in accordance with the specifications for propane cylinders of the U.S. Department of Transportation (DOT).

NFPA 1192, §5.2.2.1

Tanks utilizing vapor withdrawal must be constructed and marked in accordance with the Rules for Construction of Pressure Vessels, Section VIII, Division I, ASME Boiler and Pressure Vessel Code, and must have design gauge pressure of at least 312 psi.

NFPA 1192, §5.2.2.2

Under no circumstances may an LP-gas container be installed in front of the front axle of a recreational vehicle.

NFPA 1192, §5.2.3.3(3)(a)

Containers must not be mounted on the exterior of the rear wall or the rear bumper of a recreational vehicle.

NFPA 1192, §5.2.3.4

Tanks mounted behind the rear axle of a travel trailer or fifth wheel trailer must be installed so that the bottom of the tank and any connection thereto is not lower than either the rear axle(s) height or the lowest section of the frame to the rear of the tank, whichever is higher.

NFPA 1192, §5.2.3.3 (4)(a)

When the recreational vehicle is supplied with cylinders not secured in place, the recreational vehicle manufacturer must provide mounting instructions and required materials with the vehicle.

NFPA 1192, §5.2.4.2

Propane containers located less than 18 inches from the exhaust system, the transmission, or a heat-producing component of the internal combustion engine must be shielded by a vehicle frame member or by a noncombustible baffle, with an air space on both sides of the frame member or baffle.

NFPA 1192, §5.2.5

Containers must be equipped with a listed overfilling prevention device.

NFPA 1192, §5.2.13.1

Cylinders must be equipped with a CGA 791 (Type 1, 1 5/16 inch Acme) outlet as described in CGA V-1.

NFPA 1192, §5.2.13.2

LP-gas containers must be located so that the discharge from the pressure relief valve is not less than 3 feet measured horizontally along the surface of vehicle from any opening into the recreational vehicle, fuel-burning appliance intake and exhaust vents, and all internal combustion engine exhaust terminations located below the level of the discharge.

NFPA 1192, §5.2.19.1

SAMPLE QUESTION

An LP-gas regulator must be installed with the pressure relief vent opening pointing downward within 50 degrees of vertical to vertical to allow for drainage of any moisture collected on the diaphragm of the regulator.

- A. True
- B. False

Answer: B

2. Propane Systems

Any recreational vehicle compartment containing propane containers must be vented at or near the top and at the extreme bottom to facilitate diffusion of vapors.

NFPA 1192, §5.2.6.1

LP-gas cylinders are required to be secured against working loose during transit; hoods or housings covering cylinder valves must not be equipped with locks or require special tools to open.

NFPA 1192, §5.2.7.2

Propane containers must not be installed in compartments or under hoods or housing that contain flame-or spark-producing equipment.

NFPA 1192, §5.2.9

The manual control of the LP-gas tank's shutoff valve, the fill connection, and the fixed maximum liquid level outage gauge of a permanently mounted LP-gas tank must be located no more than 18 inches from the vehicle's outside wall.

NFPA 1192, §5.2.10.2

The LP-gas regulator(s) must have a capacity of not less than the total input of all propane appliances installed in the recreational vehicle.

NFPA 1192, §5.2.15.3

The LP-gas regulator(s) must be installed with the pressure relief vent opening pointing downward within 45 degrees of vertical to vertical to allow for drainage of any moisture collected on the diaphragm of the regulator.

NFPA 1192, §5.2.15.4

A regulator installed below floor level must be installed in a compartment that provides protection against the weather and wheel spray.

NFPA 1192, §5.2.15.5

Cylinders must have a manual shutoff valve for vapor service that does not allow propane to flow until a positive seal is achieved between that valve and its mating connection.

NFPA 1192, §5.2.16.2

In multiple-cylinder systems, a backflow check valve must be provided anywhere from the cylinder outlet to the automatic changeover regulator inlet.

NFPA 1192, §5.2.16.3

The pipeaway (piping) system connections must be mechanically fastened and must not depend on adhesives or sealing compounds.

NFPA 1192, §5.2.19.3 (L)

Vapor, at a pressure not over 14 inches water column, must be delivered from the system into the propane appliance supply connection.

NFPA 1192, §5.2.21.1

The appliance must be listed for recreational vehicle use at the specified operating pressure.

NFPA 1192, §5.2.21.5

SAMPLE QUESTION

Vapor, at a pressure not over _____ inches water column, must be delivered from the system into the propane appliance supply connection.

- A. 10
- B. 12
- C. 13
- D. 14

Answer: D

3. Propane Piping Systems

Piping materials for the installation, extension, alteration, or repair of LP-gas piping system in a recreational vehicle must be new and free from defects or internal obstructions.

NFPA 1192, §5.3.2.1

Brass flare nuts must be stress relieved or of the forged type.

NFPA 1192, §5.3.2.5(6)

Where tubing passes through walls, floors, partitions or roofs, or similar installations, such tubing must be protected by the use of weather-resistant grommets that must fit snugly both the tubing and the hole through which the tubing passes.

NFPA 1192, §5.3.2.8.2

A recreational vehicle's LP-gas piping system must be sized so that the pressure drop to any appliance inlet connection from the LP-gas supply connection or connections, when all appliances are in operation at maximum capacity, is not more than 0.5 inches water column.

NFPA 1192, §5.3.4.1

Threaded joints must be made up tight with approved pipe joint material that is insoluble in propane.

NFPA 1192, §5.3.7.1

Threaded pipe joint material must be applied to only male threads.

NFPA 1192, §5.3.7.2

Pipe or tubing joints must not be located in any floor, wall, partition, or concealed construction space.

NFPA 1192, §5.3.9.1

All recreational vehicle LP-gas piping must be supported at intervals of not more than 4 feet, except where adequate support and protection is provided by structural members.

NFPA 1192, §5.3.18.1

After appliances are connected to the system, the entire piping system must be proven by test to be leak-free by maintaining an air pressure of not less than 10 inches water column or more than 14 inches water column.

NFPA 1192, §5.3.20.1

An air pressure test must be measured over a period of 3 minutes with a manometer or with a pressure-sensing device designed to indicate a pressure loss due to leakage during the pressure test period.

NFPA 1192, §5.3.20.6 (1)(c)

Before the testing of the low-pressure system for propane leaks after appliances are connected, the temperature of both the air and piping must be approximately the same, and a uniform temperature must be maintained throughout the test period.

NFPA 1192, §5.3.20.2

SAMPLE QUESTION

All recreational vehicle LP-gas piping must be supported at intervals of not more than _____ feet, except where adequate support and protection is provided by structural members.

- A. 3
- B. 4
- C. 5
- D. 6

Answer: B

4. Fuel-Burning Appliances

Propane appliances must be listed for use with propane only or for use with both natural gas and propane where convertible from natural gas to propane and vice versa.

NFPA 1192, §5.4.3

All fuel-burning appliances, except ranges and ovens, must be designed and installed to provide for complete separation of the combustion system from a recreational vehicle's interior atmosphere.

NFPA 1192, §5.4.6.1

Fuel burning appliances must not be converted from one fuel to another unless in accordance with the terms of its listing and the appliance manufacturer's instructions.

NFPA 1192, §5.4.4

The installation of each fuel burning appliance must conform to the terms of its listing and the appliance manufacturer's instructions.

NFPA 1192, §5.4.5.1

Floor-mounted fuel burning appliances must not be installed on carpeting unless the appliance is listed for such installation.

NFPA 1192, §5.4.5.2

Every fuel-burning appliance must be mounted in place to avoid displacement.

NFPA 1192, §5.4.5.3

SAMPLE QUESTION

All fuel-burning appliances, except _____, must be designed and installed to provide for complete separation of the combustion system from a recreational vehicle's interior atmosphere.

- A. Floor-mounted appliances
- B. Ranges
- C. Ovens
- D. Both B and C

Answer: D

5. Venting, Ventilation and Combustion

In a recreational vehicle, venting and combustion air systems must be installed in accordance with the following:

(1) Components must be assembled and properly aligned using the methods shown in the appliance manufacturer's instructions.

(2) Vent connectors must be firmly attached to the flue collars by sheet metal screws, their equivalent, or as specified in the manufacturer's instructions.

(3) Every joint of a vent, vent connector, exhaust duct and combustion air intake must be secured and in alignment.
NFPA 1192, §5.5.1

Flue gas outlets from fuel-burning heating appliances must not be less than 3 feet from any motor-driven air intake discharging into habitable areas of a recreational vehicle.
NFPA 1192, §5.5.2.1

Flue gas outlets must not terminate under a recreational vehicle.
NFPA 1192, §5.5.2.2

Any portion of a combustion air inlet or flue gas outlet of a fuel-burning heating appliance must be located at least 3 feet from any gasoline filler spout on the vehicle if the inlet or outlet is located above or at the same level.
NFPA 1192, §5.5.3.1

The space where any fuel-burning cooking appliance is located must be ventilated by a gravity or mechanical vent extending through the roof to the outside.
NFPA 1192, §5.5.4.1

SAMPLE QUESTION

In a recreational vehicle, venting and combustion air systems must be installed in accordance with which of the following?

- A. Components must be assembled and properly aligned as shown in the manufacturer's instructions.
- B. Vent connectors must be firmly attached to the flue collars by sheet metal screws or as specified in the manufacturer's instructions.
- C. Every joint of a vent, vent connector, exhaust duct and combustion air intake must be secured and in alignment.
- D. All of the above

Answer: D

6. Marking Appliances (Installation and Operational Features)

Information on clearance, input rating, lighting, and shutdown must be attached to the appliance.

NFPA 1192, §5.6.1.1

Each fuel burning appliance must bear the appliance manufacturer's permanent marking designating the type(s) of fuel for which it is listed.

NFPA 1192, §5.6.2.1

Every appliance must be accessible for inspection, service, repair and replacement.

NFPA 1192, §5.6.3.1

All propane clothes dryers must be exhausted to the outside by a moisture-lint exhaust duct and termination fitting.

NFPA 1192, §5.6.7.1

Fuel-burning clothes dryers must receive their combustion air and drying air from outside the vehicle and must exhaust the combustion products and drying air from inside the vehicle.

NFPA 1192, §5.6.7.4

Each recreational vehicle must be provided with an owner's manual that must contain as a minimum the information contained in 5.9.1.2(A) through 5.9.1.2(G).

NFPA 1192, §5.9.1.2

SAMPLE QUESTION

Information on clearance, input rating, lighting, and shutdown of appliances must be attached to the driver's side dash panel on any recreational vehicle. NFPA 1192, §5.6.1.1

- A. True
- B. False

Answer: B

6. FIRE AND LIFE SAFETY PROVISIONS

All recreational vehicles equipped with a propane appliance and electrical system must be equipped with a listed propane detector listed as suitable for use in recreational vehicles under the requirements of UL 1484 and installed according to the terms of its listing.

NFPA 1192, §6.4.8

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

