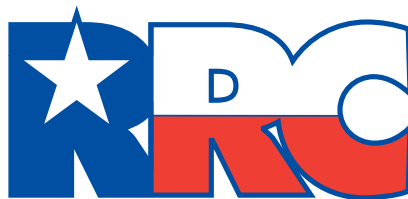


TEXAS LP-GAS EXAMINATION STUDY GUIDE

Non-Road Motor Fuel
Employee Level



RAILROAD COMMISSION OF TEXAS

September 2012

NOTICE

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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 19)

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 58, 2008 edition and the Railroad Commission’s *LP-Gas Safety Rules* to take their non-road motor fuel examination. This study guide may not be used during any employee-level examination.

The questions on the employee-level non-road motor fuel examination are not organized by topic as they are in this study guide.

Examination time limit

The employee-level non-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.

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
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LP-GAS EXAMINATION STUDY GUIDE EMPLOYEE-LEVEL NON-ROAD MOTOR FUEL

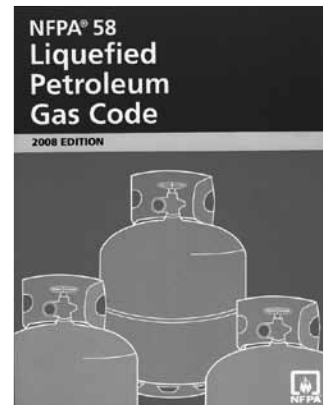
Who should use this guide?

You should use this guide if you plan to take the Railroad Commission's employee-level qualifying examination to perform LP-gas activities on vehicles such as industrial forklift trucks and commercial mowers. These activities include installing LP-gas motor-fuel tanks, cylinders and fuel systems, and replacing container valves on non-road vehicles.

The non-road motor fuel examination does not authorize you to fill LP-gas motor-fuel tanks or cylinders.

What book do I need?

This examination tests your knowledge of the laws and standards that apply to LP-gas non-road motor fuel activities in Texas. These laws and standards are found in NFPA 58: *Liquefied Petroleum Gas Code* (National Fire Protection Association, 2008)



Where do I get this book?

Printed copies of NFPA 58 are available for purchase from the Texas Propane Gas Association by calling (800) 392-0023. You may also order NFPA manuals online at www.nfpa.org; click on "Codes and Standards."

Sections and topics

Before you take this examination you should know the definitions on pp. 6-7 of this study guide and the contents of the following sections of NFPA 58. The actual examination questions may not include all of the listed sections and topics.

The questions on the non-road motor-fuel employee-level examination are not organized by topic as they are in this study guide.

NFPA 58 (2008)

§11.3	Containers
§11.4	Container Appurtenances
§11.5	Carburetion Equipment
§11.7	Installation of Containers and Container Appurtenances
§11.9	Piping and Hose Installation
§11.10	Equipment Installation
§11.12	Industrial (and Forklift) Trucks Powered by LP-Gas
§11.13	General Provision for Vehicles Having Engines Mounted on Them (Including Floor Maintenance Machines)
§11.14	Engine Installations Other Than on Vehicles

Terms and definitions

As a non-road motor fuel vehicle technician you need to know the terms and definitions relating to propane's physical characteristics and the operation of vehicle equipment.

NFPA 58 (2008)

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

Container. Any vessel, including cylinders, tanks, portable tanks, and cargo tanks, used for the transporting or storage of LP-gases.

NFPA 58, §3.3.13

Container Appurtenances. Devices installed in container openings for safety, control, or operating purposes.

NFPA 58, §3.3.14

DOT. U.S. Department of Transportation.

NFPA 58, §3.3.21

Excess-Flow Valve (or Excess-Flow Check Valve) [“check valve”]. A valve designed to close when the liquid or vapor passing through it exceeds a prescribed flow rate.

NFPA 58, §3.3.74.2

Fixed Liquid Level Gauge. A liquid level indicator that uses a positive shutoff vent valve to indicate that the liquid level in a container being filled has reached the point at which the indicator communicates with the liquid level in the container.

NFPA 58, §3.3.29.1

Fixed Maximum Liquid Level Gauge [“outage gauge,” “spitter valve,” “spew gauge”]. A fixed liquid level gauge that indicates the liquid level at which the container is filled to its maximum permitted filling limit.

NFPA 58, §3.3.29.2

Flexible Connector. A short [not more than 60 in. overall length] piping system component that is fabricated from a flexible material and equipped with connections at both ends.

NFPA 58, §3.3.25

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

NFPA 58, §3.3.36

NFPA. National Fire Protection Association.

NFPA 58, §3.3.47

Pressure Relief Device [“popoff valve”]. A device designed to open to prevent a rise of internal pressure in excess of a specified value due to emergency or abnormal conditions.

NFPA 58, §3.3.58

Sources of Ignition. Devices or equipment that, because of their modes of use or operation, are capable of providing sufficient thermal energy to ignite flammable LP-gas vapor-air mixtures when introduced into such a mixture or when such a mixture comes into contact with them, and that will permit propagation of flame away from them.

NFPA 58, §3.3.67

Universal Cylinder. A cylinder that can be connected for service in either the vertical or the horizontal position, so that the fixed maximum liquid level gauge, pressure gauge, pressure relief device, and withdrawal appurtenances function properly in either position.

NFPA 58, §3.3.73

Water Capacity. The amount of water at 60°F required to fill a container.

NFPA 58, §3.3.79

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. Container: Design, Capacity, Construction, Repair and Name Plate

Containers used in engine-fuel service must be designed, fabricated, tested and marked in accordance with the regulations of the U. S. Department of Transportation (DOT) and the American Society of Mechanical Engineers (ASME).

NFPA 58, §11.3.1.1

DOT 4E specification (aluminum) cylinders or composite cylinders involved in a fire must be permanently removed from service.

NFPA 58, §11.3.1.4(D)

DOT forklift cylinders must have a minimum service pressure of 240 psig.

NFPA 58, §11.3.1.6

ASME engine fuel containers constructed on or after April 1, 2001, must have a maximum allowable working pressure of 312 psig.

NFPA 58, §11.3.2.1

ASME containers installed in enclosed spaces on vehicles, and all engine fuel containers for vehicles, industrial trucks, buses (including school buses), recreational vehicles, and multipurpose passenger vehicles, must be constructed with a maximum allowable working pressure of at least 312 psig.

NFPA 58, §11.3.2.2

Containers that show excessive denting, bulging, gouging, or corrosion must be removed from service.

NFPA 58, §11.3.3.1

Field welding is permitted only on saddle plates, lugs, pads, or brackets that are attached to the container by the container manufacturer.

NFPA 58, §11.3.3.3

The container openings must be labeled on the container or valves connected to the container opening to designate whether they communicate with the vapor or with the liquid space.

NFPA 58, §11.3.6.3

Labels are not required on openings for pressure relief valves and gauging devices.

NFPA 58, §11.3.6.4

Engine-fuel containers constructed of steel must be painted or powder coated to minimize corrosion. Stainless steel cylinders are not required to be painted or powder coated.

NFPA 58, §11.3.7

SAMPLE QUESTION

Engine fuel containers constructed of steel must be _____ coated to minimize corrosion.

- A. Nickel
- B. Painted or powder
- C. Anodized
- D. Any of the above
- E. Fiberglass

Answer: B

2. Container Appurtenances (Valves and Fittings)

Container appurtenances subject to pressures in excess of 125 psig must be rated for a pressure of at least 250 psig.

NFPA 58, §11.4.1.2

Manual shutoff valves must be designed to provide positive closure under service conditions and must be equipped with an internal excess-flow check valve designed to close automatically at the rated flows of vapor or liquid specified by the manufacturers.

NFPA 58, §11.4.1.3

Double backflow check valves must:

- (1) Be of the spring-loaded type,
- (2) Close when flow is either stopped or reversed, and
- (3) Be installed in the fill opening on the container for either remote or direct filling.

NFPA 58, §11.4.1.4

Containers must be fabricated so they can be equipped with a fixed maximum liquid level gauge as follows:

- (1) The fixed maximum liquid level gauge must be capable of indicating the maximum permitted filling level in accordance with 7.4.2.2.
- (2) Fixed maximum liquid level gauges in the container must be designed so the bleeder valve maximum opening to the atmosphere is not larger than a No. 54 drill size.
- (3) The container fixed maximum liquid level gauge opening and the remote bleeder valve opening must not be larger than a No. 54 drill size where the bleeder valve is installed at a location remote from the container.

NFPA 58, §11.4.1.5

Permanently mounted ASME containers must be equipped with a valve or combination of valves in the liquid outlet connection that has automatic closure features, manual shutoff and excess-flow.

NFPA 58, §11.4.1.8

SAMPLE QUESTION

Container appurtenances subject to pressures in excess of _____ psig must be rated for a pressure of at least _____ psig. NFPA 58, §11.4.1.2

- A. 125 / 250
- B. 135 / 273.1
- C. 150 / 312
- D. 165 / 415

Answer: A

3. Carburetion Equipment

Carburetion equipment subject to a pressure of 125 psig or greater must be designed for a pressure rating of 250 psig, or for the maximum allowable working pressure of the container where the maximum allowable working pressure of the container is greater than 250 psig.

NFPA 58, §11.5.1

Vaporizers must be fabricated of materials resistant to corrosion by LP-gas under service conditions.

NFPA 58, §11.5.2.1

Vaporizers must be designed for engine fuel service.

NFPA 58, §11.5.2.2

Vaporizers subjected to pressures up to the maximum allowable working pressure of the supply container must have a pressure rating of 250 psig, or the maximum allowable working pressure of the container where the maximum allowable working pressure of the container is greater than 250 psig.

NFPA 58, §11.5.2.3

Vaporizers must be marked with the design pressure of the fuel-containing portion in psig. The marking must be visible when the vaporizer is installed.

NFPA 58, §11.5.2.4

The vaporizer must not be equipped with a fusible plug.

NFPA 58, §11.5.2.5

Each vaporizer must be capable of having the water or heating fluid drained from the engine cooling system drain or water hoses or must have a valve or plug located at or near the lowest portion of the section occupied by the water or other heating fluid to allow drainage of the water or heating fluid.

NFPA 58, §11.5.2.6

Where engine exhaust gases are used as a direct source of heat to vaporize the fuel, the materials of construction of those parts of the vaporizer in contact with the exhaust gases must be resistant to corrosion by these gases, and the vaporizer system must be designed to prevent a pressure in excess of 200 psig.

NFPA 58, §11.5.2.7

Devices that supply heat directly to the fuel container must be equipped with an automatic device to cut off the supply of heat before the pressure in the container reaches 200 psig.

NFPA 58, §11.5.2.8

An automatic shutoff valve must be provided in the fuel system as close as practical to the inlet of the gas regulator.

NFPA 58, §11.5.3.1

The automatic shutoff valve must prevent the flow of fuel to the carburetor when the engine is not running, even if the ignition switch is in the “on” position.

NFPA 58, §11.5.3.2

SAMPLE QUESTION

The automatic shutoff valve must minimize the flow of fuel to the carburetor when the engine is not running, even if the ignition switch is in the “on” position.

- A. True
- B. False

Answer: B

4. Installation of Containers and Container Appurtenances (Such as Valves and Fittings)

Containers must be located to minimize the possibility of damage to the container and its fittings.

NFPA 58, §11.7.1.1

Containers located less than 18 inches from the exhaust system, the transmission, or a heat-producing component of an 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 58, §11.7.1.3

After an LP-gas motor/mobile fuel container is permanently installed on a vehicle, the container markings must be readable directly or with a portable lamp and mirror.

NFPA 58, §11.7.1.4

Protection of container valves, appurtenances, and connections must be provided by one of the following:

- (1) By locating the container so that parts of the vehicle furnish the necessary protection
- (2) By the use of a fitting guard furnished by the manufacturer of the container
- (3) By other means to provide equivalent protection.

NFPA 58, §11.7.2.2

LP-gas containers installed behind the rear axle and extending below the frame must comply with 11.7.3.7 or must not be lower than the lowest of the following points and surfaces:

- (1) Containers must not be lower than the lowest point of a structural component of the body, engine, or transmission (including clutch housing or torque converter housing, as applicable) forward of the container.
- (2) Containers must not be lower than lines extending rearward from each wheel at the point where the wheels contact the ground directly below the center of the axle to the lowest and most rearward structural interference.

NFPA 58, §11.7.3.6(1)(2)

An LP-gas container substituted for the fuel container installed by the original vehicle manufacturer must either fit within the original fuel container's space or must comply with other NFPA 58 installation requirements.

NFPA 58, §11.7.3.7

The main liquid and vapor shutoff valves on an LP-gas motor/mobile fuel container must be readily accessible without the use of tools.

NFPA 58, §11.7.4.3

Where the pressure relief valve discharge must be piped away, the pipeaway system must have a breakaway adapter.

- (A) The breakaway adapter must have a melting point of not less than 1500°F.
- (B) The adapter either must be an integral part of the pressure relief valve or must be a separate adapter attached directly to the pressure relief valve.
- (C) The pipeaway system must have a length of nonmetallic hose.
- (D) Hose that is used to pipe away the relief valve discharge must be able to withstand the down stream pressure from the relief valve in the full open position.

NFPA 58, §11.7.5.2

The pressure relief valve pipeaway (piping) system connection must be mechanically secured, must not depend on adhesives or sealing compounds, and must not be routed between a bumper system and the vehicle body.

NFPA 58, §11.7.5.2(I)

SAMPLE QUESTION

Containers located less than _____ inches from the exhaust system, the transmission, or a heat-producing component of an 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.

- A. 16
- B. 12
- C. 10
- D. 8
- E. None of the above

Answer: E

5. Pipe and Hose Installation

The piping system must be designed, installed, supported, and secured in such a manner as to minimize damage due to expansion, contraction, vibration, strains, and wear.

NFPA 58, §11.9.1.1

Piping (including hose) must be installed in a protected location.

NFPA 58, §11.9.1.2

Fastenings or other protection on the piping system must be installed to prevent damage due to abrasion or vibration.

NFPA 58, §11.9.1.4

At each point where piping passes through sheet metal or a structural member, a rubber grommet or equivalent protection must be installed to prevent chafing.

NFPA 58, §11.9.1.5

Fuel line piping that must pass through the floor of a vehicle must be installed to enter the vehicle through the floor directly beneath or adjacent to the container.

NFPA 58, §11.9.1.6

Exposed parts of the piping system must be of corrosion-resistant material or must be protected to minimize exterior corrosion.

NFPA 58, §11.9.1.9

A vehicle's LP-gas engine fuel piping system, including hose, must be tested and proved free of leaks at not less than the normal operating pressure.

NFPA 58, §11.9.1.10

In an LP-gas engine fuel system, a hydrostatic relief valve is required to be installed in each section of piping (including hose) in which liquid LP-gas can be isolated between shutoff valves.

NFPA 58, §11.9.2.1

Hydrostatic relief valves must have a pressure setting of not less than 400 psig or more than 500 psig.

NFPA 58, §11.9.2.2

SAMPLE QUESTION

Fastenings or other protection on the piping system must be installed to prevent damage due to _____.

- A. Collisions
- B. Corrosion
- C. Abrasion or vibration
- D. All of the above
- E. A or B

Answer: C

6. Equipment Installation

Approved automatic pressure-reducing equipment must be installed between the fuel supply container and the carburetor.

NFPA 58, §11.10.1.2(2)

7. Industrial Truck Cylinders

Industrial truck cylinders must be designed, constructed, or fitted for installation and filling in either the vertical or horizontal position or, if of the universal type, in either position.

NFPA 58, §11.12.2.1

Industrial truck cylinders must be in the design position while being filled. Universal-type cylinders may be filled in either position.

NFPA 58, §11.12.2.2

The fixed maximum liquid level gauge on an industrial truck cylinder must indicate the maximum permitted filling level in either position.

NFPA 58, §11.12.2.3

The pressure relief valves for industrial truck cylinders must be in direct communication with the vapor space of the cylinder in either position.

NFPA 58, §11.12.2.4

The vapor or liquid withdrawal valves on an industrial truck cylinder must function in either position.

NFPA 58, §11.12.2.5

The discharge from the pressure relief valve on an industrial truck cylinder must be directed upward within 45 degrees of vertical and otherwise must not impinge on the cylinder, the exhaust system, or any other part of the industrial truck.

NFPA 58, §11.12.2.6

The discharge opening for the cylinder pressure relief valve must have a protective cover to minimize the possibility of the entry of water or any extraneous matter.

NFPA 58, §11.12.2.7

8. Industrial Truck (Including Forklift Truck) Operations

Industrial trucks must be refueled outdoors.

NFPA 58, §11.12.4.1

Where cylinders are exchanged indoors, the fuel piping system must be equipped to minimize the release of fuel when cylinders are exchanged, in accordance with either of the following:

- (1) Using an approved quick-closing coupling in the fuel line, or
- (2) Closing the shutoff valve at the fuel cylinder and allowing the engine to run until the fuel in the line is exhausted.

NFPA 58, §11.12.4.2 (1)(2)

Where LP-gas-fueled industrial trucks are used in buildings or structures, the following must apply:

- (1) The number of fuel cylinders on such a truck must not exceed two.
- (2) The use of industrial trucks in buildings frequented by the public, including those times when such buildings are occupied by the public, must be approved by the authority having jurisdiction.
- (3) The total water capacity of the fuel cylinders on an individual truck must not exceed 105 lb [45 lb propane capacity].
- (4) Trucks must not be parked and left unattended in areas occupied by or frequented by the public without the approval of the authority having jurisdiction. If left unattended with approval, the cylinder shutoff valve must be closed.
- (5) In no case must trucks be parked and left unattended in areas of excessive heat or near sources of ignition.

NFPA 58, §11.12.4.3

All cylinders used in industrial truck service (including forklift truck cylinders) must have the cylinder pressure relief valve replaced by a new or unused valve within 12 years of the date of manufacture of the cylinder and every 10 years thereafter.

NFPA 58, §11.12.4.4

9. General Provisions for Vehicles Having Engines Mounted on Them (Including Floor Maintenance Machines)

Industrial trucks (including forklift trucks) and other engines on vehicles operating in buildings, other than those used exclusively to house engines, must have an approved automatic shutoff valve installed in the fuel system.

NFPA 58, §11.13.2.1

The source of air for combustion for industrial trucks (including forklift trucks) and other engines on vehicles operating in buildings, other than those used exclusively to house engines, must be isolated from the driver and passenger compartment, ventilating system, or air-conditioning system on the vehicle.

NFPA 58, §11.13.2.2

Non-self-propelled floor maintenance machinery (floor polishers, scrubbers, buffers) and other similar portable equipment must be listed.

(A) A label must be affixed to the machinery or equipment, with the label facing the operator, with the text denoting that the cylinder or portion of the machinery or equipment containing the cylinder must be stored in accordance with Chapter 8.

(B) The use of floor maintenance machines in buildings frequented by the public, including the times when such buildings are occupied by the public, must require the approval of the authority having jurisdiction.

NFPA 58, §11.13.2.3(A) (B)

10. Engine Installation Other Than on a Vehicle

The use of portable engines in buildings must be limited to emergencies.

NFPA 58, §11.14.1.1

Air for combustion and cooling for use of portable engines in buildings must be supplied.

NFPA 58, §11.14.1.2

When using portable engines in buildings, exhaust gases must be discharged to a point outside the building or to an area in which they will not constitute a hazard.

NFPA 58, §11.14.1.3

Where atmospheric-type regulators (zero governors) are used on engines operated only outdoors, a separate automatic shutoff valve is not required.

NFPA 58, §11.14.1.4

Engines used to drive portable pumps and compressors or pumps must be equipped in accordance with 5.17.6.

NFPA 58, §11.14.1.5

11. Garaging of Vehicles

Where vehicles with LP-gas engine fuel systems mounted on them, and general-purpose vehicles propelled by LP-gas engines, are stored or serviced inside garages, the following conditions must apply:

- (1) The fuel system must be leak-free.
- (2) The container must not be filled beyond the limits specified in Chapter 7.
- (3) The container shutoff valve must be closed when the vehicle or the engine is being repaired, except when the engine is required to operate. Containers equipped with an automatic shutoff valve as specified in 11.4.1.8 satisfy this requirement.
- (4) The vehicle must not be parked near sources of heat, open flames, or similar sources of ignition, or near inadequately ventilated pits.

NFPA 58, §11.15

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