

# **TEXAS LP-GAS EXAMINATION STUDY GUIDE**

Category L  
Non-Road Engine Fuel  
Management Level



## **NOTICE**

This publication is intended for use in its entirety as a guide for persons preparing to take a Railroad Commission LP-gas 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.

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## Exam administration

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### Taking an examination in Austin

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

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

(See map to Training Center on page 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](http://www.rrc.state.tx.us). From the drop-down menu under “Education and Training,” choose “Training Classes & Qualifying Exams” and click on “Class/Exam Schedule.” The online schedule has links to maps showing each class and exam location.

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

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

### Payment for exams; 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](http://www.rrc.state.tx.us). From the drop-down menu under “Education and Training,” choose “Training Classes & Qualifying Exams” and click on “Pay Online.” Be sure to print out the confirmation page in Step 6. Make a copy of the confirmation page for your records and bring a copy with you to the examination site.

### Closed-book examinations

All Railroad Commission management-level qualifying examinations are closed book. This study guide may not be used during any management-level examination.

Examinees should prepare for the Category L Non-Road Engine Fuel management-level examination by studying the applicable sections of the Railroad Commission’s LP-Gas Safety Rules (16 *Texas Administrative Code*, Chapter 9); and National Fire Protection Association 58, *Liquefied Petroleum Gas Code* (2008 edition).

### **Examination time limit**

The Category L Non-Road Engine Fuel management-level qualifying 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 both the examination itself and your answer sheet to the proctor within the two-hour limit.

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

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

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

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

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

### **Contacts**

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# LP-GAS EXAMINATION STUDY GUIDE

## MANAGEMENT-LEVEL CATEGORY L

### NON-ROAD ENGINE FUEL

#### Who should use this guide?

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You should use this guide to prepare for the Railroad Commission's management-level qualifying examination to be a company representative or operations supervisor for an active Category L Non-Road Engine Fuel licensee. Activities covered by a management-level Category L Non-Road Engine Fuel certification are the installation of LP-gas motor fuel containers, cylinders, and LP-gas motor fuel systems; and the replacement of container valves on non-road equipment such as industrial forklift trucks and lawnmowers. The Non-Road Motor Fuel examination does not authorize an individual to fill LP-gas motor fuel containers or cylinders.

#### What books do I need?

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This examination tests your knowledge of the laws and standards that apply to the installation of LP-gas motor fuel containers, cylinders, and LP-gas motor fuel systems, and the replacement of container valves on motorized vehicles licensed to operate on public roadways in Texas. These laws and standards are found in two books:

*LP-Gas Safety Rules* (Texas Railroad Commission)

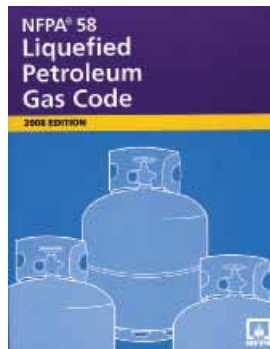
NFPA 58: *Liquefied Petroleum Gas Code* (National Fire Protection Association, 2008)

#### Where do I get the books?

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You may download the current edition of the Railroad Commission's LP-Gas Safety Rules free online at [www.propane.tx.gov](http://www.propane.tx.gov). Click on "Training and Examinations," select "Examinations and Certification" from the drop-down menu, and scroll down to "LPG 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.



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](http://www.nfpa.org); click on "Codes and Standards."

## Sections and topics

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Before you take this examination you should know the definitions on page 7 of this study guide and the contents of the following sections of the codes and standards.

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.”

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

### Railroad Commission LP-Gas Safety Rules

§9.6	Licenses and Fees
§9.7	Application for License and License Renewal Requirements
§9.8	Application for a New Certificate
§9.9	Requirements for Certificate Renewal
§9.10	Rules Examination
§9.11	Previously Certified Individuals
§9.12	Trainees
§9.17	Designation and Responsibilities of Company Representatives and Operations Supervisors
§9.36	Report of LP-Gas Incident/ Accident

### NFPA 58 (2008)

11.1	Scope
11.2	Training
11.3	Containers
11.4	Container Appurtenances
11.5	Carburetion Equipment
11.6	Piping, Hose, and Fittings
11.7	Installation of Containers and Container Appurtenances
11.8	Installation in the Interior of Vehicles
11.9	Pipe and Hose Installation
11.10	Equipment Installation
11.11	Marking
11.12	Industrial (and Forklift) Trucks Powered by LP-Gas
11.13	General Provisions for Vehicles Having Engines Mounted on Them (Including Floor Maintenance Machines)
11.14	Engine Installation Other Than on Vehicle
11.15	Garaging of Vehicles

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## Terms and definitions

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

### ***NFPA 58 (2008)***

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

A **container** is 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** are devices installed in container openings for safety, control, or operating purposes.

### ***NFPA 58, §3.3.14***

**DOT** means the U.S. Department of Transportation.

### ***NFPA 58, §3.3.21***

A **fixed liquid level gauge** is 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***

A **flexible connector** is a short [60 in. maximum length] component of a piping system that is made of flexible material (such as hose) and equipped with suitable connections on both ends.

### ***NFPA 58, §3.3.25***

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

### ***NFPA 58, §3.3.29.2***

**Liquefied petroleum gas** [**“LP-Gas, LPG”**] is any material having a vapor pressure not exceeding that allowed for commercial propane 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***

The **point of transfer** is the location where connections and disconnections are made or where LP-gas is vented to the atmosphere during transfer operations.

### ***NFPA 58, §3.3.54***

A **universal cylinder** is 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** is the amount of water at 60°F required to fill a container.

### ***NFPA 58, §3.3.79***

## Key topics

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**NOTE:** The list below is not exhaustive. You are responsible for knowing all the facts, rules, standards and procedures that apply to the 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 topics. Then when you take the examination, read each question very carefully.

## GENERAL REQUIREMENTS ADMINISTRATIVE

### LP-GAS SAFETY RULES

#### Application for License and License Renewal Requirements

(a) No person, except a trainee as defined in the LP-Gas Safety Rules, may perform work, directly supervise LP-gas activities, or be employed in any capacity requiring contact until he or she has passed an applicable rules examination.

(e) LP-gas licenses expire one year after issuance at midnight on the last day of the month prior to the month in which they are issued.

(h) If a person's license expires, that person must immediately cease performance of any LP-gas activities authorized by the license.

***LP-Gas Safety Rules, §9.7***

#### Application for a New Certificate

(a) An applicant for a new certificate must:

(1) file a properly completed LPG Form 16 and the applicable nonrefundable rules examination fee;

(2) pass the applicable rules examination with a score of at least 75%

(b) An individual who holds an employee-level certificate who wishes to obtain a management-level certificate must comply with the requirements of the LP-Gas Safety Rules.

***LP-Gas Safety Rules, §9.8***

#### Certificate Renewal

(c) Certificate holders must remit the nonrefundable \$35 annual certificate renewal fee to AFRED on or before May 31 of each year. Individuals who hold more than one certificate must pay only one annual renewal fee.

(1) Failure to pay the nonrefundable annual renewal fee by the deadline will result in a lapsed certification.



To renew a lapsed certification, the individual must pay the nonrefundable \$35 annual renewal fee plus a nonrefundable \$20 late-filing fee.

If a person's certification expires, that person must immediately cease performance of any LP-gas activities authorized by the certification.

If an individual's certificate has been expired for more than two years from May 31 of the year in which certification lapsed, that individual must comply with the requirements for a new certificate.

***LP-Gas Safety Rules, §9.9***

**Rules Examination**

(d) Failure of any LP-gas qualifying examination immediately disqualifies the examinee from performing any LP-gas related activities covered by the failed examination, except activities that are covered by a separate examination the individual has passed.

***LP-Gas Safety Rules, §9.10***

**Trainees**

(a) A licensee or ultimate consumer may employ an individual as a trainee for a period not to exceed 45 calendar days without that individual having successfully completed the rules examination.

A trainee must be directly and individually supervised at all times by an individual who has successfully completed the Commission's rules examination for the areas of work being performed by the trainee.

***LP-Gas Safety Rules, §9.12***

**Designation and Responsibilities of Company Representatives and Operations Supervisors**

(a) Each licensee must have at least one company representative for the license.

(2) A licensee may have more than one company representative.

(3) An individual may be operations supervisor at more than one outlet provided that:

(A) each outlet has a designated LP-gas certified employee responsible for the LP-gas activities at that outlet;

(B) the certified employee's and/or operations supervisor's telephone number is posted at the outlet on a sign with lettering at least 3/4-inch high, visible and legible at all times; and

(C) the certified employee and/or the operations supervisor monitors the telephone number and responds to calls during normal business hours.

(a)(5)(A) A licensee must cease all LP-gas activities if, at the termination of its company representative, there is no other qualified company representative of the licensee who has complied with the Commission's requirements.

***LP-Gas Safety Rules, §9.17***

## Report of LP-Gas Incident/Accident

(a) At the earliest practical moment or within two hours following discovery, a licensee owning, operating, or servicing the equipment of an installation must notify the Railroad Commission by telephone of any accident involving an LP-gas installation.

### ***LP-Gas Safety Rules, §9.36***

#### **SAMPLE QUESTION**

If a person's LP-gas license is not renewed by the annual renewal deadline, the license \_\_\_\_\_ and the person must \_\_\_\_\_ performance of any LP-gas activities authorized by the license.

- A. Is revoked / immediately cease
- B. Expires / immediately cease
- C. Is suspended / substantially cease
- D. Expires / substantially cease

***Answer: B***

## **CONTAINER: DESIGN, CAPACITY, CONSTRUCTION, REPAIR AND NAME PLATE**

### **NFPA 58**

#### **Containers**

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***

Containers that have been involved in a fire and show no distortion must be requalified in accordance with CGA Publication C-6, *Standard for the Visual Inspection of Steel Compressed Gas Cylinders*, or C-6.3, *Guidelines for Visual Inspection and Requalification of Low Pressure Aluminum Compressed Gas Cylinders*, for continued service before being used or reinstalled.

**(A)** Cylinders must be requalified by a manufacturer of that type of cylinder or by a repair facility approved by DOT.

**(B)** ASME or API-ASME containers must be retested using the hydrostatic test procedure applicable at the time of the original fabrication.

**(C)** All container appurtenances must be replaced.

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

***NFPA 58, §11.3.1.4***

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

***NFPA 58, §11.3.1.6***

### **Container Maximum Allowable Working Pressure**

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***

### **Container Repair and Alteration**

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***

### **Container Capacity**

The maximum water capacity of an individual LP-gas container installed on a passenger vehicle is 200 gallons.

***NFPA 58, §11.3.5.1***

### **Container Connections**

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***

### **Container Corrosion Protection**

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 \_\_\_\_\_ to minimize corrosion.

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

***Answer: B***

## **CONTAINER APPURTENANCES (VALVES AND FITTINGS)**

### **General Requirements for Appurtenances**

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
- (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***

## **CARBURETION EQUIPMENT**

Pressure. 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**

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***

When an LP-gas motor fuel container has a maximum allowable working pressure greater than 250 psig, the vaporizer must have a minimum pressure rating of 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***

## Fuel Shutoff Valves

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 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**

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

- A. 125 / 250
- B. 125 / 312
- C. 250 / 312
- D. 250 / 500

***Answer: A***

## **PIPING, HOSE, AND FITTINGS**

### **Piping and Tubing**

Pipe must be wrought iron or steel (black or galvanized), brass or copper and must comply with the following:

- (1) Wrought-iron: ASME B36.10M, *Welded and Seamless Wrought Steel Pipe*
- (2) Steel pipe: ASTM A53, *Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless*
- (3) Steel pipe: ASTM A106, *Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service*
- (4) Brass pipe: ASTM B43, *Standard Specification for Seamless Red Brass Pipe, Standard Sizes*
- (5) Copper pipe: ASTM B42, *Standard Specification for Seamless Copper Pipe, Standard Sizes*

### ***NFPA 58, §11.6.1.1***

(1) Steel tubing may be used for a motor fuel application, if the tubing complies with ASTM A539, *Standard Specification for Electric-Resistance-Welded Coiled Steel Tubing for Gas Fuel Oil Lines*.

(3) (a) (b) Copper tubing used for LP-gas motor-fuel applications must comply with Type K or L ASTM B88, *Specification for Seamless Copper Water Tube*, or ASTM B280, *Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service*.

### ***NFPA 58, §11.6.1.2***

**SAMPLE QUESTION**

Which of the following pipe materials may be used in LP-gas engine fuel system installations?

- A. Wrought iron
- B. Steel
- C. Brass or copper
- D. All of the above
- E. A or C only

*Answer: D*

## **INSTALLATION OF CONTAINERS AND CONTAINER APPURTENANCES (VALVES AND FITTINGS)**

### **Location of Containers**

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 Containers and Appurtenances**

Container valves, appurtenances, and connections must be protected in one of the following ways:

- (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, or
- (3) By other means to provide equivalent protection.

***NFPA 58, §11.7.2.2***

## Container Clearances

Containers must not be mounted directly on roofs or ahead of the front axle or beyond the rear bumper of the vehicle.

### ***NFPA 58, §11.7.3.1***

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, 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***

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 installation requirements.

### ***NFPA 58, §11.7.3.7***

## Container Installations

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***

## Pressure Relief Valve Discharge System

The pressure relief valve discharge from fuel containers on vehicles other than industrial and forklift trucks must:

(1) Be directed upward or downward within 45 degrees of vertical.

(2) Not directly impinge on the vehicle fuel container(s), the exhaust system, or any other part of the vehicle.

(3) Not be directed into the interior of the vehicle.

### ***NFPA 58, §11.7.5.1***

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 as short as practical and able to withstand the downstream pressure from the relief valve in the full open position and be fabricated of materials resistant to the actions of LP-gas.
- (E) When hose is used to pipe away the relief valve discharge on containers installed on the outside of a vehicle, the breakaway adapted and attached fitting must deflect the discharge upward or downward within 45° of vertical and must meet the other requirements without the hose attached. If an additional fitting is necessary, the fitting must have a melting point not less than 1500°F.
- (F) The pipeaway system must have a protective cover to minimize the possibility of introducing water or dirt into either the relief valve or into the discharge system.
- (G) No portion of the system may have an internal diameter less than the internal diameter of the breakaway adapter.
- (H) The breakaway adapter must be threaded for direct connection to the relief valve and must not interfere with the operation of the relief valve, or must be an integral part of the pressure relief valve and must break away without impairing the function of the relief valve.
- (I) The pressure relief valve pipeaway 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.
- (J) Where a pipeaway system is not required, the pressure relief valve must have a protective cover .

***NFPA 58, §11.7.5.2***

**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***

## **PIPE AND HOSE INSTALLATION**

### **General Requirements**

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***

If piping is installed outside the vehicle, it must be under the vehicle and below any insulation or false bottom.

***NFPA 58, §11.9.1.3***

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***

### **Hydrostatic Relief Valves**

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*

## **EQUIPMENT INSTALLATION**

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

***NFPA 58, §11.10.1.2***

## **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***

## **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***

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***

## **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***

## **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***

## **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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