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06-20-17

Inter-Island Propane
P.O. Box 222
815-A Spring Street-Unit 1
Friday Harbor, WA 98250

Eastsound Fire Chief & Fire Marshal,

My name is Arch Hudelson and work for Ransome Manufacturing & Meeder Equipment Company. We design and install propane storage vessels for the western half of the United States. We also are a pressure vessel manufacturer and repair facility, with both an "R" and "U" ASME Stamp. Ransome Mfg. has been in business since the late 1930's and the Meeder Equipment was started in 1953. I have been on board starting in January of 1976.

The concern for whom is the jurisdictional party in San Juan County would likely be not L & I, but the local Fire Chief and Fire Marshal. This propane storage comes under the National Fire Protection pamphlet #58, 2014 printing. Chapter Six in NFPA 58 deals specifically regarding LPG storage vessel location in Table 6.3.1.1 for specific distances to other exposures. Mandated safety equipment starts at paragraph 6.11 for vessels and continues through 6.12 for fuel transfer bulkheads. These are threshold levels of compliance and are not the final word on plant safety. That "Threshold Compliance" level is inadequate for your needs or ours.

NFPA 58 is a "Consensus Code" meaning all stake-holders have a seat at the table when the Standard is formulated and approved. Threshold compliance was followed by degrees of fire and first responders' comments, then the fire science engineers and LPG equipment manufacturers had their input listed. That elevated compliance level is what's addressed in the following paragraph.

We design and build to the highest level of compliance, which is listed in paragraph **6.28.4 Redundant Fail-safe Product Control**. This entails using a remotely operated internal-type primary shut-off valve in the 1-1/4" and larger, liquid openings in the vessel and the 1-1/4" or larger vapor openings as well. These internal valves incorporate soft-sealing media for bubble-tight product shut-off that is located up inside the vessel couplings. They are out of the way of thermal impingement and safe from mechanical damage. These internal valves also feature internal spring-loaded poppets for excessive-flow control. If out-flow of either liquid or vapor product exceeds an engineered value, the poppet will close preventing further out-flow of product. This a good feature and is mandated under NFPA 58, but the additional safety elements are even of greater value.

We design these piping and valve systems to utilize regulated nitrogen for motive pressure to engage these internal valves and fuel bulkhead safety valves. These valves are designed with both internal and external closing springs to ensure proper valve closure. The nitrogen pneumatic pressure is used only to open these valves. If the motive pressure is discharged, intentionally or accidentally, the valves automatically close. Also, the pamphlet 58 Standard requires this motive pressure to be released if the valve area on the vessel is thermally impinged upon with a temperature of 250 degrees F. The frangible elements incorporated into each pneumatic valve operator is designed to release motive pressure if impinged upon with 212 degrees F thermally.

Under the auspices of **Redundant Fail-safe Product Control**, we have to install a pneumatic shut-off switch within 15 feet of the fuel transfer bulkhead. A second one has to be placed in series with the first one at a distance of at least 25', but less than 100' distant from the fuel transfer bulkhead. By meet these more stringent equipment details, we are given preference over deluge, or water monitor systems and thermal coatings under **6.28 Alternate Provisions for Installation of ASME Containers**, with Redundant Fail-safe Product Control being the prime requisite for this section.

As water application is not a specific mandate for vessel placement, the question does come up regarding just how much water is applicable for vessel safeguards. NFPA 58 actually refers to NFPA 15 for the specific minimum water application for maintaining pressure vessel integrity. This is the specific value to prevent a Boiling Liquid Expanding Vapor Explosion, better known as a BLEVE. That water application value is listed as "**¼ GPM of Water per Square Foot of Vessel surface**". A 9 foot diameter vessel by 65 feet in length, will yield ad square footage of 1,838 square feet of surface area. Therefore dividing by a value of '4', will yield the "**¼ GPM per Square Foot of Water**" to a quantitative number of 460 gallons per minute. This is the minimum amount of water required to maintain vessel integrity.

But, take into consideration of the passive discharge of nitrogen if the valves are subjected to heat, causing the valves to close will stop any substantive release of fuel. Without fuel, you have no fire, therefore no ensuing conflagration will develop and the actual water requirement is lessened.

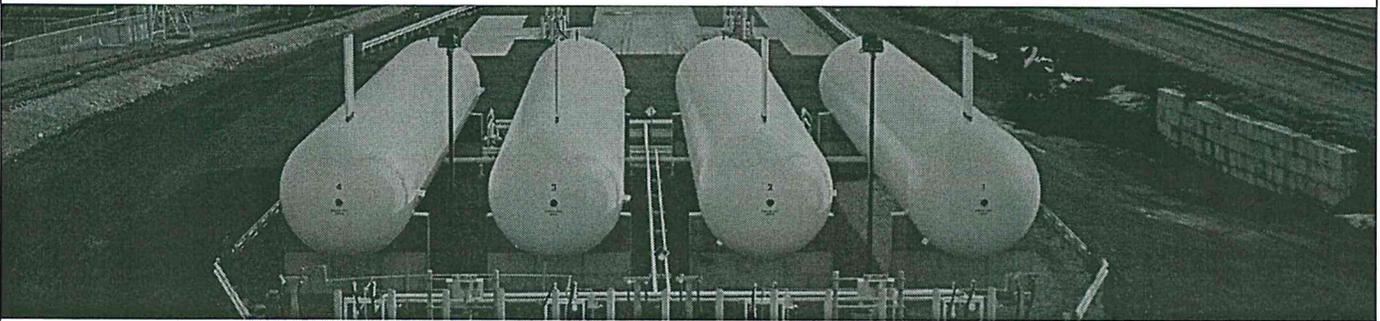
I hope this will be of some assistance in assessing the larger issues regarding fuel storage and ancillary equipment, as well as water application values.

Thank you,

Arch Hudelson
Ransome Mfg.
503-708-6146



FACT SHEET » Placing LP Gas Containers



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Container Placement

NFPA 58, *Liquefied Petroleum Gas Code*, contains the requirements pertaining to the placement of liquefied petroleum gas (LP-Gas) containers. All references to NFPA 58 refer to the 2017 edition. The requirements apply to containers installed outside of buildings, whether of the portable type replaced on a cylinder exchange basis or permanently installed and refilled at the installation.

The main focus of the separation distances in NFPA 58 is the placement of containers according to Table 6.4.1.1. This table contains the minimum distances, measured from any portion of the container surface, to several other items including other containers, important buildings, and line of adjoining property that can be built upon.

Table 6.4.1.1 Separation Distances Between Containers, Important Buildings, and Line of Adjoining Property That Can Be Built Upon

Water Capacity per Container		Minimum Distances					
		Mounded or Underground Containers ^a		Aboveground Containers		Between Containers ^b	
gal	m ³	ft	m	ft	m	ft	m
<125 ^c	<0.5 ^c	10	3	0 ^d	0 ^d	0	0
125–250	0.5–1.0	10	3	10	3	0	0
251–500	>1.0–1.9	10	3	10	3	3	1
501–2,000	>1.9–7.6	10	3	25 ^e	7.6	3	1
2,001–30,000	>7.6–114	50	15	50	15	5	1.5
30,001–70,000	>114–265	50	15	75	23		
70,001–90,000	>265–341	50	15	100	30		
90,001–120,000	>341–454	50	15	125	38		
120,001–200,000	>454–757	50	15	200	61		
200,001–1,000,000	>757–3,785	50	15	300	91		
>1,000,000	>3,785	50	15	400	122		

^aSee 6.4.2.1.

^bSee 6.4.4.5.

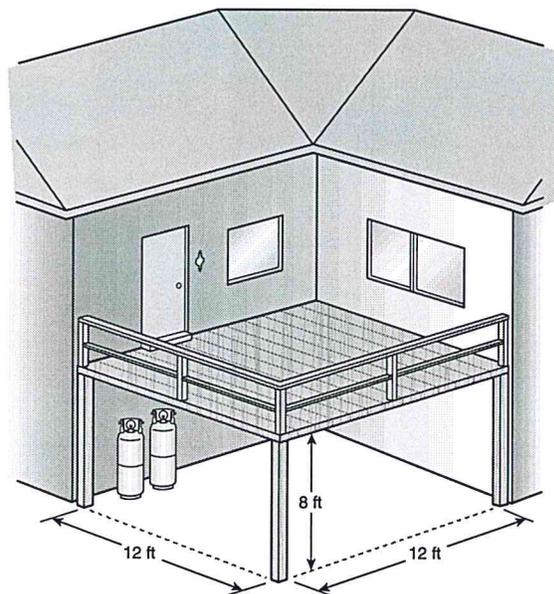
^cSee 6.4.4.4.

^dSee 6.4.4.1, 6.4.4.2, 6.4.4.3, and 6.4.4.4.

^eSee 6.4.1.3.

Decks and Overhangs

Tanks are permitted to be placed under an overhang provided the area is open on at least 50% of the sides. Paragraph 6.4.4.1 provides guidance to NFPA 58 users who install cylinders in outdoor areas that are protected from the weather. It establishes that a minimum of 50% of the perimeter of an enclosed area must be open to the atmosphere.



Total wall enclosure area = $(12 \text{ ft} \times 8 \text{ ft}) \times 4 = 384 \text{ ft}^2$
 Minimum required open area = $384 \text{ ft}^2 \times 50\% = 192 \text{ ft}^2$



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This Fact Sheet contains some basic information about placing LP-Gas containers in accordance with NFPA 58. It identifies some of the requirements in NFPA 58 as of the date of publication of the Fact Sheet. This material is not the complete and official position of the NFPA on the referenced topics which is represented solely by the NFPA documents in their entirety. For free access to the complete and most current version of these and all NFPA documents, please go to www.nfpa.org/docinfo. References to "Related Regulations" is not intended to be a comprehensive list. The NFPA makes no warranty or guaranty of the completeness of the information in this Fact Sheet. In using this information, you should rely on your independent judgment and, when appropriate, consult a competent professional.



FACT SHEET » Placing LP Gas Containers *(continued)*

Although NFPA 58 is not a building code, it does provide safety requirements for the installation of propane containers that help achieve the safe occupancy and use of buildings. Note that NFPA 101®, *Life Safety Code*®, prohibits LP-Gas containers from being located under egress paths from upper-level rooms. This would preclude locating containers under a stairway or ramp that is the best practical way to evacuate — for example, a second-floor apartment or elevated beach house.

➔ DID YOU KNOW? A building can be considered “important” for reasons including replacement value, human occupancy, value of contents, vital role to a business, and effect on fire control activities.

Restaurant Exemption

Paragraph 6.4.1.3, often called the “restaurant exemption,” provides a special case that allows the installation of one LP-Gas container of 1200 gal (4.5 m³) or less to be 10 ft (3 m) from a building, rather than the 25 ft (7.6 m) required in Table 6.4.1.1. The 10 ft (3 m) spacing of one container with 1200 gal (4.5 m³) or less water capacity is allowed only if one such container is installed and there are no other LP-Gas containers of more than 125 gal (0.5 m³) water capacity within 25 ft (7.6 m).

The provision was created because of the limited space often found in commercial areas, and it has continued to be used because fire records do not indicate a problem with the reduced distance. Note that the 25 ft (7.6 m) separation distance to other LP-Gas containers is applicable in all cases, even if two different users would like to install containers less than 25 ft (7.6 m) apart.

Disconnected Containers

In the 2017 edition, the NFPA 58 committee has added requirements for ASME

containers disconnected from use. Cylinders awaiting use, resale, or exchange are still covered by Chapter 8, but the new requirements for ASME containers can be found in Section 6.3. These containers can be placed in a bulk plant or approved area in accordance with 6.3.2(1), or they can be placed according to a list of requirements in 6.3.2(2).

Some of these new requirements in 6.3.2(2) are prohibitions on placing these containers on roofs or balconies, separation requirements according to Table 6.4.1.1, and placing the containers to prevent physical damage. This section also requires that the containers’ valve outlets be plugged and that the containers always be oriented so that the pressure relief valve communicates with the vapor space of the container.

Container Appurtenances

In NFPA 58, the term *container appurtenances* refers to devices installed in container openings for safety, control, or operating purposes — for example, a relieve valve. These need to be oriented to ensure that LP-Gas is not accidentally released into buildings. Since LP-Gas is heavier than air, if it were to flow downward into a building it could accumulate and create a hazardous situation in a building. NFPA 58 contains these required separation distances in Table 6.4.4.3.

Table 6.4.4.3 Separation Distance Between Container Pressure Relief Valve and Building Openings

Container Type	Exchange or Filled on Site at Point of Use	Distance Horizontally from Relief Valve Discharge to Opening Below Discharge		Discharge from Relief Valve, Vent Discharge, and Filling Connection to Exterior Source of Ignition, Openings into Direct-Vent Appliances, and Mechanical Ventilation Air Intakes	
		ft	m	ft	m
Cylinder	Exchange	3	0.9	5	1.5
Cylinder	Filled on site at the point of use	3	0.9	10	3.0
ASME	Filled on site at the point of use	5	1.5	10	3.0



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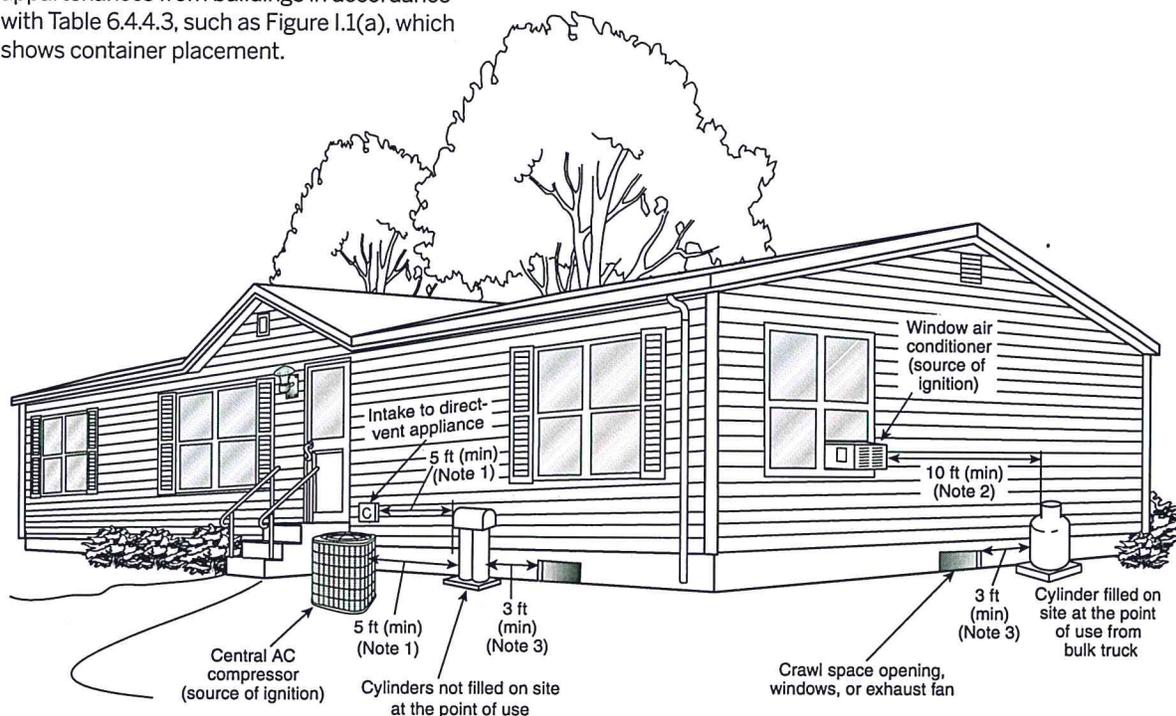
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FACT SHEET » Placing LP Gas Containers *(continued)*

Container and Appurtenance Separation Distances from Buildings

Annex I of NFPA 58 contains several examples of how to separate containers and their appurtenances from buildings in accordance with Table 6.4.4.3, such as Figure I.1(a), which shows container placement.



For SI units, 1 ft = 0.3048 m.

Notes:

- (1) 5 ft minimum from relief valve in any direction away from any exterior source of ignition, openings into direct-vent appliances, or mechanical ventilation air intakes. Refer to Table 6.3.4.3.
- (2) If the cylinder is filled on site at the point of use from a cargo tank motor vehicle, the filling connection and vent valve must be at least 10 ft from any exterior source of ignition, openings into direct-vent appliances, or mechanical ventilation air intakes. Refer to 6.3.4.4.
- (3) Refer to 6.3.4.3.

Additional NFPA Resources

- ▶ *LP-Gas Code Handbook* (NFPA 58)
- ▶ *National Fuel Gas Code Handbook* (NFPA 54)
- ▶ Customized training classes (classroom, onsite, and online)

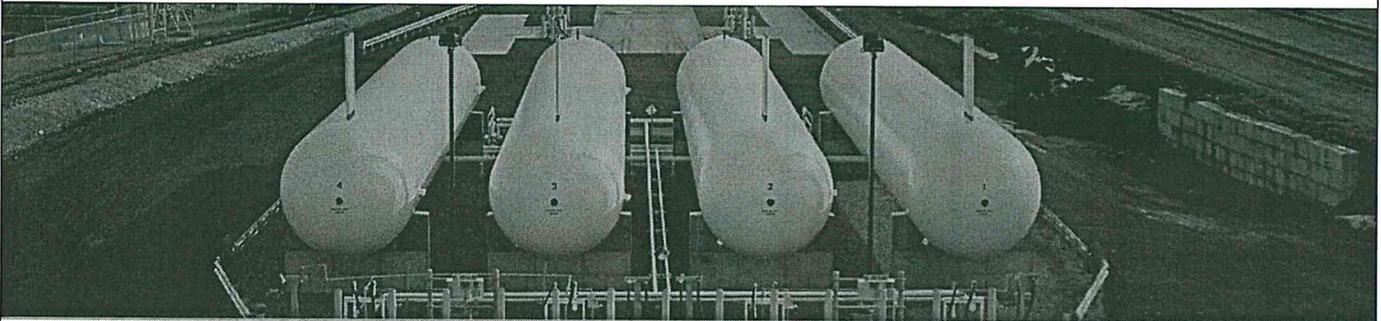


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FACT SHEET » Liquefied Petroleum Gas



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WHAT IS LP-GAS? Liquefied petroleum gas (LP-Gas) is a colorless, odorless liquid that readily evaporates into a gas. LP-Gas is composed predominantly of the following hydrocarbons, either by themselves (except propylene) or as mixtures: propane, propylene, butane (normal butane or isobutane), and butylenes.

NFPA LP-Gas Hazard Controls

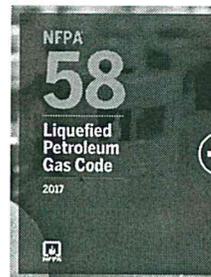
NFPA 54, 58, and 59 codes include engineering, work practice and administrative controls. They are applicable to U.S. and international markets.

- ▶ NFPA 54, *National Fuel Gas Code*, 2015 edition.
- ▶ NFPA 58, *Liquefied Petroleum Gas Code*, 2017 edition
- ▶ NFPA 59, *Utility LP-Gas Plant Code*, 2015 edition

Highlights from NFPA 58, Liquefied Petroleum Gas Code

- ▶ General information on fire extinguishers, training, and odorization (*Chapter 4, General Requirements*)

- ▶ Construction of various LP-Gas applications including containers, valves, and appliances (*Chapter 5, LP-Gas Equipment and Appliances*)
- ▶ Location of LP-Gas applications including piping, valves, and appliances (*Chapter 6, Installation of LP-Gas Systems*)
- ▶ How to transfer LP-Gas liquid from container to container (*Chapter 7, LP-Gas Liquid Transfer*)
- ▶ Storing cylinders including cabinets for selling cylinders (*Chapter 8, Storage of Cylinders Awaiting Use, Resale, or Exchange*)



LP-Gas Hazards

When LP-Gas is stored under pressure it changes phases to a liquid. If there is a loss in pressure it may leak temporarily as a liquid before converting to a heavier-than-air gas.

LP-Gas is flammable at a wide range of concentrations, and due to its physical properties it presents several unique hazards. First, it can cause a large decrease in temperature when converting from a liquid to a gas. This can cause hazards to personnel and materials. Second, it is colorless and odorless, making detection of leaks difficult. Finally, due to being heavier than air, it can accumulate in ditches and below grade confined spaces.

LP-Gas has been used in the United States and globally for over a hundred years safely through the use of proper regulations and application of safety standards.

DID YOU KNOW?

NFPA 58 was developed to cover the storage, handling, transportation, and use of LP-Gas.



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This Fact Sheet contains some basic information about Liquid Petroleum gas (LP Gas). It identifies some of the NFPA documents and requirements in these documents regarding (LP Gas) as of the date of publication. This material is not the complete and official position of the NFPA on the referenced topics which is represented solely by the NFPA documents in their entirety. For free access to the complete and most current version of these and all NFPA documents, please go to nfpa.org/standards. The NFPA makes no warranty or guaranty of the completeness of the information in this Fact Sheet. In using this information, you should rely on your independent judgment and, when appropriate, consult a competent professional and your local authority having jurisdiction.



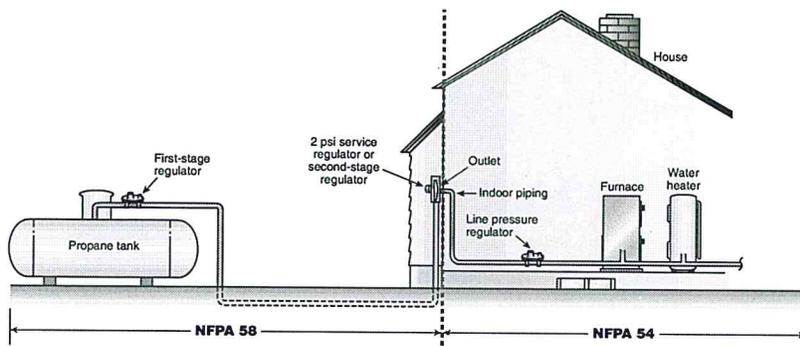
FACT SHEET » Liquefied Petroleum Gas (continued)

When To Use NFPA 58 or NFPA 54

"58 at the Gate, 54 under the Floor"

NFPA 54 applies interior to a home (or after point of delivery or meter).

NFPA 58 applies outside the home (or before the final pressure regulator).



Highlights from NFPA 54, National Fuel Gas Code

- ▶ Piping provisions, valves, expansion and flexibility (*Chapter 5, Gas Piping System Design, Materials, and Components*)
- ▶ Sizing piping for applications via tables and equations (*Chapter 6, Pipe Sizing*)
- ▶ Installing pipes, outlets, and inside concealed spaces (*Chapter 7, Gas Piping Installation*)
- ▶ Requirements for process air, installation of appliances, and safety shutoffs

(*Chapter 9, Gas Appliance, Equipment, and Accessory Installation*)

- ▶ Minimum safe performance, general requirements and specification for venting (*Chapter 12, Venting of Gas Appliances*)

When To Use NFPA 59

NFPA 59 only applies to Utility LP-Gas Plants

A plant that stores and vaporizes LP-Gas for distribution that supplies either LP-Gas or LP-Gas gas-air mixtures to a gas distribution system of 10 or more customers.

FAQ What restrictions apply to the storage of propane cylinders in buildings?

In NFPA 58, buildings frequented by the public are limited to cylinders with a propane capacity of 1 pound. The total quantity stored is limited to 200 pounds of propane. Buildings not frequented by the public are limited to a maximum quantity of 300 pounds of propane. The cylinder size is not restricted.

- ▶ More NFPA 58 FAQs at nfpa.org/58

FAQ What are the requirements for electrical area classification for areas where fuel gas piping is installed in buildings?

NFPA 54 has no requirements for electrical area classification. That means that there are no electrical area classification requirements for buildings in which fuel gas piping, both propane and natural gas are installed. See NFPA 70 and NFPA 497 for more information on classified areas for flammable liquids and gases.

- ▶ More NFPA 54 FAQs at nfpa.org/54
- ▶ For the latest information on food truck safety, visit www.nfpa.org/foodtrucksafety

Additional NFPA Resources

- ▶ *The National Fuel Gas Code Handbook* (NFPA 54)
- ▶ *The LP-Gas Code Handbook* (NFPA 58)
- ▶ Customized training classes (classroom, onsite, and online)
- ▶ NFPA 30A, *Motor Fuel Dispensing Facilities and Repair Garages*, 2016 edition
- ▶ NFPA 70®, *National Electrical Code (NEC®)*, 2017 edition
- ▶ NFPA 30, *Flammable and Combustible Liquids Code*, 2016 edition

Related Regulations

- ▶ Title 49, Code of Federal Regulations, Parts 173.301(h)(3), 173.315(n), and 192.283(b)
- ▶ Title 49, Code of Federal Regulations, Part 192, Appendix D
- ▶ Title 49, Code of Federal Regulations, Part 192.281(e), "Transportation"
- ▶ Title 49, Code of Federal Regulations, Parts 171-180, 393, 396, and 397
- ▶ Interstate Commerce Commission (ICC), Rules for Construction of Unfired Pressure Vessels



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