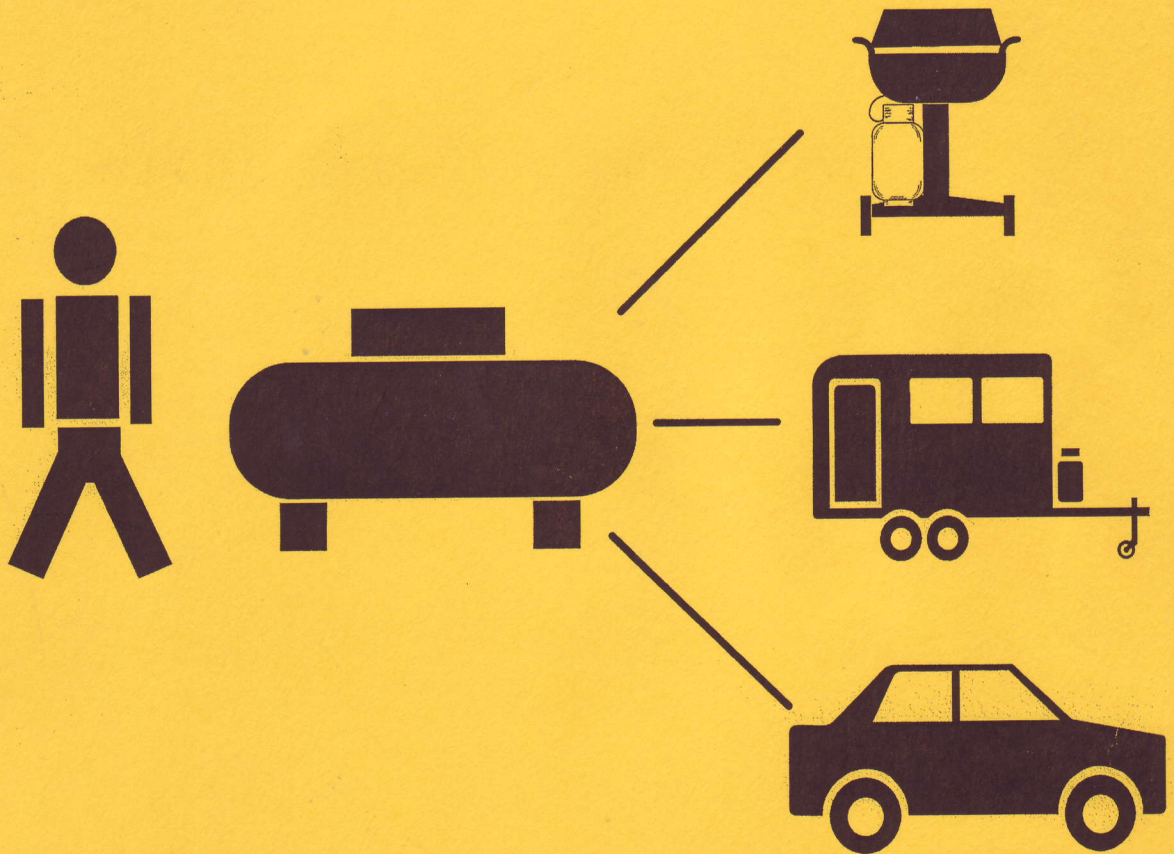


# ***Safe Dispensing of Propane***

Propane Dispensing Unit  
Operator Training Manual



Presented by

Florida Bureau of LP Gas Inspections  
Florida Department of Agriculture & Consumer Services

**CHARLES H. BRONSON, COMMISSIONER**

April 2004

## INTRODUCTION

This course is designed to introduce (or reacquaint) you, the dispensing unit operator, to the procedures, regulations, and practical aspects of propane dispensing. It covers Florida laws concerning safe handling, storage, and transportation of liquefied petroleum gas as well as the characteristics and properties of propane. The purpose of this material is to set forth general safety practices and is not meant to be an exhaustive treatment of the subject. Additionally, other procedures which could enhance safe dispensing unit operation are not meant to be precluded by this material. This material will deal primarily with propane since it is the most commonly dispensed LP gas product in the State of Florida.

The Bureau of LP Gas Inspection recommends each dispensing unit operator have a copy of the current Chapter 527, Florida Statutes; Chapter 5F-11, Florida Administrative Code and National Fire Protection Association (NFPA) Pamphlet #58 on your premises at all times, as these publications will be beneficial references when dispensing propane. Many terms used in this training manual are words and phrases commonly used among LP gas industry personnel. A glossary of these terms can be found at the end of this training manual.

The State of Florida requires that all persons involved with the dispensing of LP gas must be thoroughly trained in the proper procedures and safe handling of this product. Your safety, as well as that of your customers and your fellow employees, depends on your knowledge of Florida's code requirements and your commitment to safety.

It is very important that you meet your responsibilities under Florida law. Operators who do not comply may be subject to administrative penalties which can include fines and the possibility of suspension or revocation of your license.

## DID YOU KNOW?

- ◆ Propane is heavier than air.
- ◆ Propane is both a liquid and a gas.
- ◆ Propane is non-toxic.
- ◆ Propane is colorless and odorless in nature.
- ◆ Propane is stored under pressure as a liquid, and boils at -44° Fahrenheit.
- ◆ Liquid propane expands 270 times when exposed to the atmosphere.
- ◆ Propane is ranked as the fourth most important source of energy in the country.
- ◆ There are over 60 million users of propane nationwide.
- ◆ There are an estimated 4 million users of propane in Florida.
- ◆ 85% of all propane used in the United States is manufactured domestically.
- ◆ 92% of all recreational vehicles are fueled or equipped with propane gas or propane gas appliances.

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# SECTION 1

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## FLORIDA'S BUREAU OF LIQUEFIED PETROLEUM (LP) GAS INSPECTION

The Bureau of Liquefied Petroleum Gas Inspection is a part of the Florida Department of Agriculture & Consumer Services, Division of Standards. This office regulates the storage, handling and use of LP gases through:

- Inspections
- Regulation and Enforcement
- Accident Investigations
- Training
- Consumer Assistance

Propane, the most widely used liquefied petroleum gas, is used throughout Florida by an estimated four million consumers, which represent approximately one-third of the state's total population. It is an energy source for hotels, restaurants, schools, hospitals, nursing homes, universities, private homes, recreational vehicles, agricultural and industrial facilities. It is even used as an alternative fuel for vehicles, especially fleet vehicles such as school buses and law enforcement vehicles. Directly or indirectly, propane touches the lives of almost every Floridian.

The Bureau of Liquefied Petroleum Gas Inspection enforces laws and regulations in this state, which include the following: **Chapter 527, Florida Statutes; Chapter 5F-11, Florida Administrative Code; National Fire Protection Association Pamphlet 58; National Fire Protection Association Pamphlet 54; Title 49, Parts 191-192, Code of Federal Regulations.** Chapter 527, Florida Statutes, charges the Bureau with the inspection of liquefied petroleum gas facilities in Florida (including bulk plants, dispensing units, bulk storage sites, trucks, etc.); the investigation of accidents, fires or explosions where reason exists to believe liquefied petroleum gas is involved; licensure of persons engaged in LP gas activities in this state; training and examination of industry and emergency response personnel. These licensing, inspection, investigation and training activities enable the Bureau of Liquefied Petroleum Gas Inspection to insure that those persons engaged in LP gas business activities in this state are trained and compliance with acceptable safety codes and standards is achieved statewide.

Enforcement of LP gas safety laws and regulations is the primary concern of the Liquefied Petroleum Gas Inspection Bureau; however, everyone involved with the handling of liquefied petroleum gas shares an equally important role. Through our training and education programs,

both industry and public can be kept well-informed of the various aspects of LP gas safety. Accident prevention and safety are responsibilities that need a commitment from everyone. Working together and sharing these responsibilities will help us achieve our safety goals.

***SAFETY IS GOOD BUSINESS....MAKE IT YOURS!***

**THE DISPENSING UNIT OPERATOR LICENSE**

The Bureau of LP Gas Inspection licenses and inspects over 1,000 dispensing units in this state annually. The license category for dispensing units is known as a type and class 06-04, Category II Liquefied Petroleum Gas Dispenser Operator. A dispensing unit that requires a license in this state is one where LP gas is dispensed **for sale to the public**. A dispensing unit that would not require licensure would be a unit installed strictly for the owner's use, such as at hardware store or warehouse using LP gas as fuel for forklifts - or where LP gas is dispensed into fleet vehicles such as school buses, law enforcement patrol cars, etc.

When you apply for a dispensing unit license in Florida, certain procedures must be followed. Here are the basic steps in becoming licensed:

- ***Dispensing unit site plans must be submitted to the Bureau for approval.*** -- Prior to construction, the installer of the dispensing unit must submit site plans (along with a \$200 site plan fee) to the Bureau's regional office for approval. If approved, the Bureau will stamp site plans "Approved" and return a copy to the installer. Once approved, construction may begin.
- ***License fees and application must be submitted to the Bureau, along with proof of insurance.*** -- Currently, Florida law requires each dispensing unit to pay a license fee of \$525 for an original license, with an annual renewal fee of \$375. Proof of insurance must be submitted with the application and fee, and will be verified by the Bureau. Insurance required is a **minimum of \$1 million bodily injury and property damage liability insurance.**
- ***Qualifying examination.*** -- Each dispensing unit operator must employ one "**qualifier**" for each ten employees handling the dispenser. A qualifier is a person who has successfully completed an examination administered by the Bureau of LP Gas Inspection. Additionally, **each** individual dispensing LP gas must be adequately trained and supervised for dispensing unit operation, and must receive refresher training at least once every three years.
- ***Final inspection of your dispensing unit.*** -- Once your dispensing unit is installed and all construction is complete, the installer (or the operator) must contact the regional bureau office and request a final inspection of the unit. **No dispenser may be put into service without final approval of the bureau.**

When all license requirements are met, the Bureau of LP Gas Inspection will issue your license to operate. Your license will be received one week to 10 days from the date of approval.

Once you become a licensed dispensing unit operator in Florida, you assume many responsibilities. These responsibilities include:

- Proper operation your unit;
- Maintenance of your unit (housekeeping);
- Response to all correspondence from the Bureau concerning your license or dispensing unit;
- Reporting of accidents and/or incidents;
- Training and supervision of your dispensing unit personnel and documentation of training.

Failure to comply with any of Florida's laws governing LP gas can result in administrative action, including fines of up to \$3,000 per violation, license suspension or revocation.

Often, dispensing units are the property of the gas supplier who has installed them. If this is the case with your operation, **REMEMBER** - you (or your company) have been issued a license by the State of Florida and you (or your company) will ultimately be held responsible for the dispensing unit and its operation. You are not, however, to perform any type of service or repair work to your unit -- this is to be done only by qualified, licensed LP gas professionals.

One of your responsibilities as an operator is that of reporting to the Bureau of LP Gas Inspection any incidents that may occur involving your dispenser or your customers. Accidents that meet the reporting criteria of the bureau must be reported as required by Florida law (Chapter 527, Florida Statutes). This section of the law reads as follows:

**"527.065 Notification of accidents; leak calls.--**

**(1) Immediately upon discovery, all liquefied petroleum gas licensees shall notify the department of any liquefied petroleum gas related accident involving a liquefied petroleum gas company or customer account which:**

- (a) Caused a death or personal injury requiring professional medical treatment;**
- (b) Resulted in the uncontrolled ignition of liquefied petroleum gas; or**
- (c) Caused estimated damage to property exceeding \$1,000.**

By reporting incidents to the Bureau of LP Gas Inspection, you are helping to prevent future incidents.

Another responsibility held by operators is that of **TRAINING**. ALL employees who dispense propane must be trained in the safe operation of the dispensing unit. If your personnel are not trained, contact your propane supplier or the Bureau of LP Gas Inspection for assistance. ***YOUR SAFETY - AS WELL AS THE SAFETY OF YOUR EMPLOYEES AND CUSTOMERS - DEPENDS ON YOU.***

## SECTION 1 REVIEW

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1. When must a dispensing unit have a license to operate in the State of Florida?
2. What are the insurance requirements for dispensing units in Florida?
3. What kind of accidents or incidents must be reported to the Bureau of LP Gas Inspection?
4. When must accidents be reported?
5. Who regulates the sale of LP gas in Florida?
6. What is required for a dispensing unit to operate in Florida?
7. What is a qualifier?
8. Who is allowed to dispense LP gas in Florida?
9. Who is responsible for the safe operation and basic maintenance of your dispensing unit?
10. Who is allowed, by law, to repair leaks and replace parts on your dispensing unit?
11. What state agency is responsible for licensing LP gas dispensing unit operators in Florida?
12. What penalties may be levied by the Bureau of LP Gas Inspection for violations of Florida's LP gas laws?



### PROPANE PROPERTIES AND CHARACTERISTICS

**WHAT IS PROPANE?** -- Propane, LP gas, bottled gas, butane, and propylene are some of the names used to identify liquefied petroleum gas. LP gases are in the family of **hydrocarbons**, but not all hydrocarbons are liquefied petroleum gases.

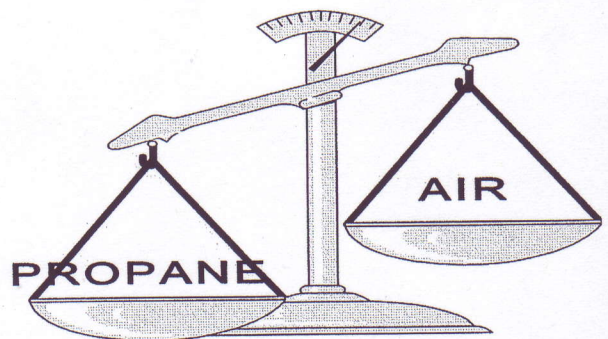
Propane is normally stored in a pressure vessel as both a vapor and a liquid under moderate pressure. In its natural state it is **colorless, tasteless, odorless and non-toxic**. It is produced through the oil refining process or is stripped out of natural gas. In most cases an odorant is added to serve as a warning agent of a possible gas leak. The odorant most commonly used is **Ethyl Mercaptan**.

**PROPANE EXPANDS** -- Propane liquid will expand **270 times** as it changes from a liquid state to vapor state. For example, 1 gallon of liquid stored under pressure in a container will expand to approximately 270 gallons of vapor if released to the atmosphere. Consequently, a small amount of liquid propane has the potential to create a serious hazard. This rapid expansion ratio of 270:1 makes propane an effective refrigerant.

**PROPANE TEMPERATURE** -- Propane boils at **44 degrees below zero (-44°)**. Through this refrigeration process, heat is rapidly absorbed. If your skin should come in contact with propane liquid, a severe freeze burn or frostbite may occur. First aid treatment for frostbite is the application of lukewarm water to the affected area. As with any serious burn, immediate medical treatment should be sought.

**PROPANE SPECIFIC GRAVITY** -- **Specific Gravity** is the weight of a product compared to the weight of water or air. The specific gravity of propane *vapor* is 1.50; air is 1. This means that **propane vapor weighs one and one-half times more than air**. The specific gravity of propane *liquid* is 0.504; water is 1.

Therefore, we know that **propane liquid is lighter than water**. Since propane is heavier than air, it will normally seek out low areas. This behavior, however, can easily be affected by air currents.



PROPANE IS HEAVIER THAN AIR

The facts that propane is heavier than air also creates the hazard of a simple asphyxiate. Oxygen needed to sustain life can be displaced by propane. If a large accumulation of liquid or vapor is present, always remain upwind. Never enter a concentrated area of propane vapor. Inhaling vapor can cause dizziness, anesthesia, and respiratory arrest.

## The Effects of Oxygen Deficiency are Life Threatening.

### POTENTIAL EFFECTS OF OXYGEN-DEFICIENT ATMOSPHERES

Oxygen content effects and Symptoms

(% by Volume)    (At Atmospheric pressure)

19.05%	Minimum permissible oxygen level.
15-19%	Decreased ability to work strenuously. May impair coordination and may induce early symptoms in persons with coronary, pulmonary, or circulatory problems.
12-14%	Respiration increases in exertion, pulse up, impaired coordination, perception, judgment.
10-12%	Respiration further increases in rate and depth, poor judgment, lips blue.
08-10%	Mental failure, fainting, unconsciousness, ashen face, blueness of lips, nausea, and vomiting.
06-08%	8 minutes, 100% fatal; 6 minutes, 50% fatal; 4-5 minutes, recovery with treatment.
04-06%	Coma in 40 seconds, convulsions, respiration ceases, death.

These values are approximate and vary as to the individual's state of health and his physical activities.

**Exposure to atmospheres containing 12% or less oxygen can bring about unconsciousness without warning, and so quickly that the individual cannot help or protect himself.**

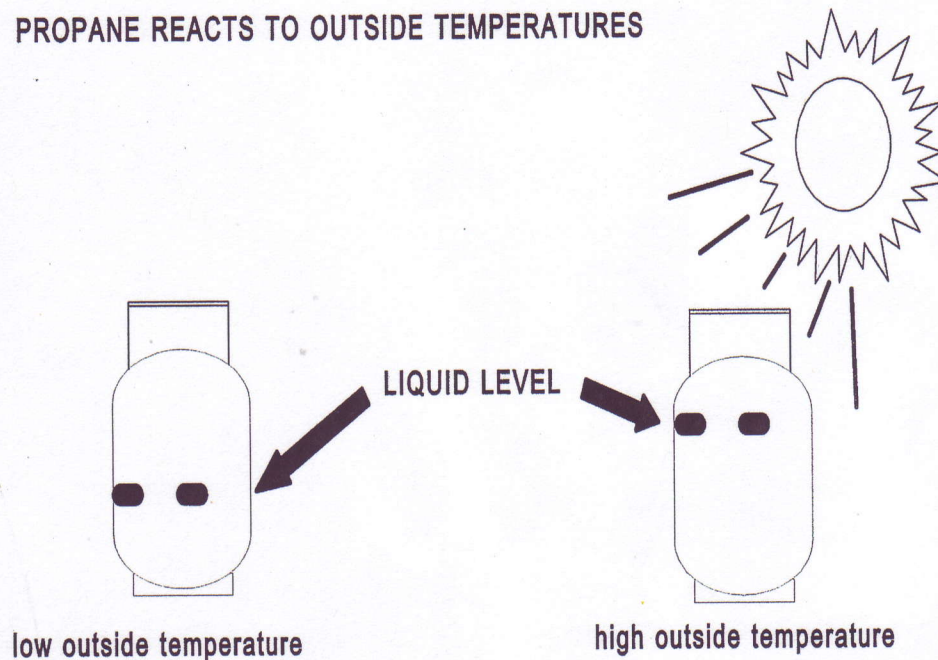
**APPROXIMATE PROPERTIES OF LP GASES**  
**(Commercial Propane)**  
**Properties of Propane from NFPA 58 Appendix B**

Vapor Pressure in PSIG at:	
70° F	127 PSIG
100° F	195 PSIG
104° F	210 PSIG
130° F	287 PSIG
Specific Gravity of Liquid at 60° F	0.504
Initial Boiling Point at 14.7 PSI	-44° F
Weight per Gallon of Liquid at 60° F	4.20
Specific Heat of Liquid, Bulb at 60° F	0.630
Cubic Ft. of Vapor per Gallon at 60° F	36.38
Cubic Ft. of Vapor per Pound at 60° F	8.66
Specific Gravity of Vapor at 60° F (air = 1)	1.50
Ignition of Temperature in Air (range)	920° F to 1120° F
Maximum Flame Temperature in Air	3,595° F
Limits of Flammability in Air, Percent of Vapor in Air/Gas Mixture:	
a) Lower	2.15%
b) Upper	9.60%
Latent Heat of Vaporization at Boiling Point	
a) BTU Per Pound	184
b) BTU Per Gallon	773
Total Heating Values after Vaporization:	
a) BTU Per Cubic Foot	2,488
b) BTU Per Pound	21,548
c) BTU Per Gallon	91,502

**PROPANE WEIGHT** -- One gallon of propane weighs 4.2 pounds.

**HOW OUTSIDE TEMPERATURE AFFECTS PROPANE** -- Temperature has a direct relationship to propane pressure. A pot of water placed on a stove at a high temperature will eventually boil over. In the same way, an **increase in outside temperatures will cause an increase in the pressure** in an LP gas container. As the pressure increases, the volume of the liquid will also expand in the container. For example, water expands 2.2%. At a temperature rise from 160° F to 600° F, liquid propane would expand 25% and steel would expand only 0.19%. The fact that propane reacts more quickly to outside temperature changes and expands more rapidly emphasizes the importance of **NEVER** overfilling an LP gas container. **No LP gas container should ever be filled more than 80% full.**

### PROPANE REACTS TO OUTSIDE TEMPERATURES



**PROPANE FLAMMABILITY** – **Range of flammability** is a term used to describe that certain mixture of air and LP gas which will readily burn. Any mix outside this range will not burn easily. Propane has a relatively narrow range of flammability when compared to other petroleum products. It has a flammable range of 2.15 to 9.60. This means if propane is released to the atmosphere, a propane/air mixture containing less than 2.15% gas is too lean to burn. If the mixture contains more than 9.6% gas, it is too rich to burn.

This range of flammability is important to remember when LP gas is being transferred or discharged. If the propane/air mixture is within the flammability range, sources of ignition could include fans, electrical switches, auto ignition, static electricity, or cigarettes.

**MATERIAL SAFETY DATA SHEET\***

**Section 1.**

Suppliers Name \_\_\_\_\_ Emergency Phone No. \_\_\_\_\_  
 Address \_\_\_\_\_

Chemical Name Liquefied Petroleum Gas or Propane CAS Registry No. 74-98-6  
 Chemical Family Hydrocarbon Formula C<sub>3</sub>H<sub>8</sub>

**Section 2. HAZARDOUS INGREDIENTS**

Hazardous Mixtures Air with 2.15 to 9.60 percent propane

**Section 3. PHYSICAL DATA**

Boiling Point -44° F Specific Gravity (H<sub>2</sub>O=1) 0.51 Vapor Pressure (mm HG) at 100°F 9825 Percent, Volatile by Volume (%) 100 Vapor Density (Air = 1) 1.52 Evaporative Rate None Solubility in Water Slightly Appearance and Odor Clear - unpleasant odor caused by odorant

**Section 4. FIRE AND EXPLOSION HAZARD DATA**

Flammable Limits

Flash Point N/A Classification Flammable Gas UN 1075 LEL 2.15 UEL 9.60  
 Extinguishing Media Water Spray: Class A-B-C or BC Fire Extinguishers  
 Special Fire Fighting Procedures Stop flow of gas. Use water to keep fire-exposed containers cool. Use water spray to disperse unignited gas or vapor. If ignition has occurred and no water available, tank metal may weaken from overheating. Evacuate area. If gas has not ignited, LP-gas liquid or vapor may be dispersed by water spray or flooding.

**Section 5. HEALTH HAZARD**

Threshold Limit Value 1,000 PPM Permissible Exposure Limit 1,000 PPM Effects of Overexposure Inhalation -- concentration can lead to symptoms ranging from dizziness to anesthesia and respiratory arrest. Eyes -- moderate irritation. Emergency and First Aid Procedures Inhalation -- remove to fresh air. Guard against self-injury. Apply artificial respiration if breathing has stopped.

**Section 6. REACTIVITY DATA**

Stable  Unstable \_\_\_\_\_ Hazardous Decomposition Products None  
 Incompatibility (materials to avoid) Mixing with oxygen or air, except at burner  
 Hazardous Polymerization: May Occur \_\_\_\_\_ Will Not Occur

**Section 7. SPILL OR LEAK PROCEDURES**

Steps to be taken in case material is released: Keep public away. Shut off supply of gas. Eliminate sources of ignition. Ventilate the area. Disperse with water spray. Contact between skin and these gases in liquid form can cause freezing of tissue causing injury similar to thermal burn.  
 Waste Disposal Method Controlled burning. Contact supplier.

**Section 8. SPECIAL PROTECTION INFORMATION**

Respiratory Protection Stay out of gas or vapor (because of fire hazard)  
 Ventilation Explosion-proof motors and keep sources of ignition at safe distances.  
 Personal Protective Equipment and Apparel Heavy duty gloves, goggles for protection against accidental release of pressurized products.

**Section 9. SPECIAL PRECAUTIONS**

Precautions to be taken when handling and storing Keep containers away from heat sources and store in upright position. Containers should not be dropped. Keep container valve closed when not in use.  
 Other precautions Install protective caps when not connected for use.

**Section 10. TOXICOLOGICAL INFORMATION**

OSHA Carcinogen Classification (29 CFR 1910) Not listed/applicable

**Section 11. DOT LABELING INFORMATION (49 CFR 100-199)**

Proper Shipping Name Liquefied Petroleum Gas Hazardous Classification Flammable Gas Identification No. UN 1075  
 Label(s) Required Flammable, Class 2

\* This is a sample Material Safety Data Sheet that should be provided by your propane supplier in compliance with the federal Community Right-To-Know Act, and is not meant to act as a substitute for this form or to be used in compliance with this Act. This is not to be used for purposes other than this training class.

## SECTION 2 REVIEW

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1. Name three characteristics of propane.
2. What is the maximum amount of propane that a tank may contain?
3. What does one gallon of liquid propane weigh in pounds?
4. How heavy is propane vapor compared to air? Propane liquid to water?
5. What happens when liquid propane comes into contact with human skin?
6. Why is an odorant added to propane?
7. What is the most commonly used odorant in LP gases?
8. When liquid propane is released to the atmosphere, does it remain in a liquid state?
9. When liquid propane is released to the atmosphere, what is its expansion ratio?
10. Is propane poisonous?
11. Name several potential sources of ignition.
12. Would a running car engine near a dispensing unit be considered a source of ignition?
13. When the outside temperature increases, what happens to propane inside a container?

## SECTION 3

### PROPANE CONTAINERS

As a dispensing unit operator, you will encounter two common types of LP gas containers - ASME tanks, and more frequently, DOT cylinders.

**ASME TANKS** are manufactured according to specifications of the **American Society of Mechanical Engineers**. This type of propane container will most frequently be encountered in mobile installations such as recreational vehicles, and as motor fuel containers on vehicles. ASME tanks are more commonly used in residential, industrial and commercial applications to store propane for use in various heating and cooking applications. ASME containers used in these applications are fixed in place and are considered stationary tanks.

**DOT CYLINDERS** are portable and are manufactured according to **U.S. Department of Transportation** specifications. Prior to 1967, specifications for these cylinders came under the authority of the **Interstate Commerce Commission (ICC)**, therefore, many times DOT cylinders are also referred to as DOT(ICC) cylinders. These cylinders are the type you will most commonly encounter, as they are extremely portable and are used to store propane for gas grills, fork lift motor fuel, and various other heating and cooking activities.

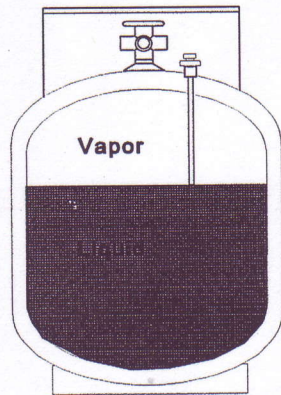
Regardless of their construction specifications, both ASME and DOT tanks have basic parts that share common functions as shown in the table below:

#### BASIC CONTAINER COMPONENTS

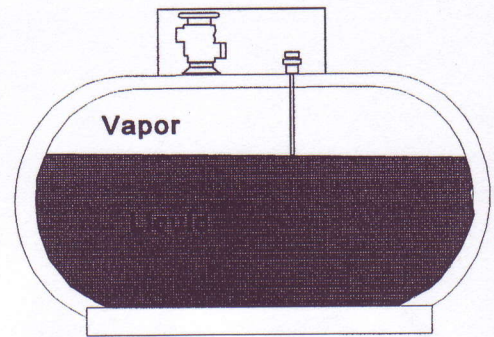
ASME CONTAINER	DOT(ICC) CONTAINER	FUNCTION
Valve Protection	Neck Ring/Protective Cap	Protection of Container Fittings and Openings
Data Plate	Container Markings	Container Information (design/use/capacity)
Container Openings	Container Openings	Filling connections/valves
Container Body	Cylinder Body	Product Storage Area
Mounting Hardware	Foot Ring	Mounting or Placement of Container

Propane containers are constructed for the safe storage of this product under pressure. Containers are marked with a **maximum allowable working pressure** which tells you the highest pressure a container is designed to hold safely.

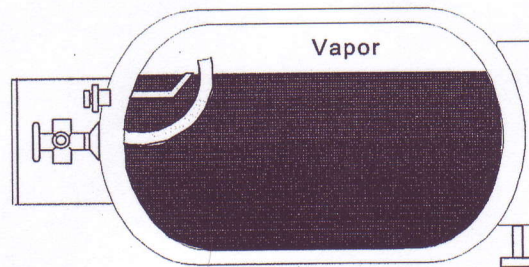
As you know, propane under pressure is stored as a liquid, however, **no container may be filled to more than 80% of its capacity**. This means that a container filled to the legal limit will have propane stored inside as **both a vapor and a liquid**, allowing for expansion within the container.



STANDARD VERTICAL (DOT/ICC)



ASME - STANDARD HORIZONTAL



DOT/ICC HORIZONTAL

## STORAGE OF PROPANE IN CONTAINERS

### ASME CONTAINERS

Here are some things to remember about ASME containers:

- All ASME containers are made of steel
- All ASME containers are required to have a legible, metal data plate attached that gives you valuable information about the container
- ASME containers used in mobile service **MUST ALWAYS** be securely fastened - **NEVER** fill a container that is unsecured
- All ASME container capacities are expressed in the **maximum** amount of water gallons the tank can hold



ASME TANK DATA PLATES

One of the most important parts of any propane container is the container markings. On an ASME container, this information is on a **data plate**. The data plate carries information vital to the identification and safe use of the container and should be securely attached to the container. If a customer should request that you fill an ASME tank with a missing or illegible data plate and cannot produce a data sheet for the tank, you should refuse -- for their protection and yours.

Container data plates are required to give you the following information about the propane container:

- NAME AND ADDRESS OF MANUFACTURER
- TYPE OF SERVICE OR INTENDED USE
- MAXIMUM ALLOWABLE WORKING PRESSURE
- WATER CAPACITY IN GALLONS
- OUTSIDE SURFACE AREA OF TANK (IN SQUARE FT.)

Also, the data plate must contain the wording: "THIS CONTAINER SHALL NOT CONTAIN A PRODUCT HAVING A VAPOR PRESSURE IN EXCESS OF \_\_\_ PSIG AT 100° F."

Other information, such as the year of manufacture, head and shell thickness, length of the tank, serial number, material of construction, dip tube length, etc, may also be found on the container data plate.

12345		UL	
<b>MANUFACTURER, INC.</b>			
DALLAS, TEXAS			
ASME LABEL	250 P.S.I. @ 125° F		WELDING & TESTING INFO
MAX. ALLOWABLE WORKING PRESSURE			
R T 3		ABC 12345678	
MFG. SERIAL NO.			
O.S. SURFACE AREA	174 SF	D.R.	HEMI
WATER GALS.	1000	WATER LBS.	8333
86	.2894	2306	193.6
O.S. DIA.	SHELL THK.	HEAD THK.	LENGTH
THIS CONTAINER SHALL NOT CONTAIN A PRODUCT HAVING A VAPOR PRESSURE IN EXCESS OF 215 # @ AT 100 ° F.			
UG	1978	27.8	R
TYPE	YR. BUILT	D.T.	MFG. AT

SAMPLE DATA PLATE - ASME CONTAINER

## DOT CONTAINERS

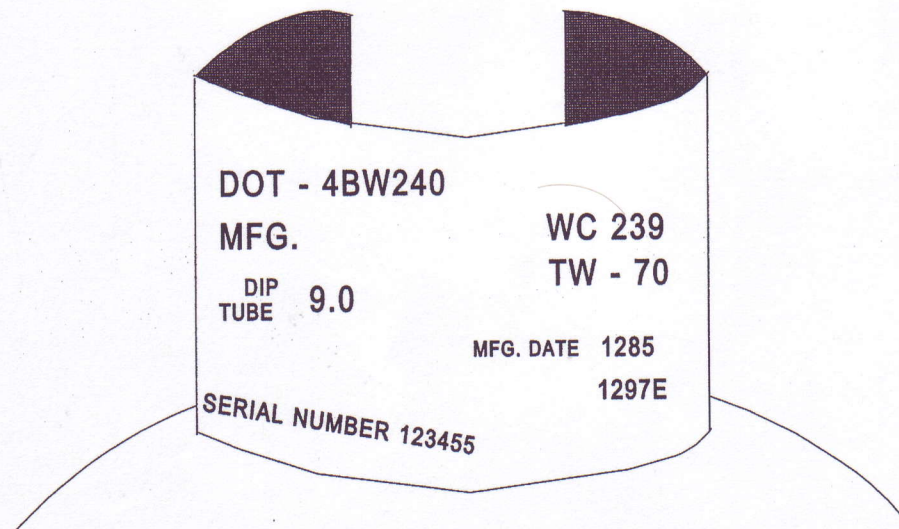
DOT(ICC) containers:

- Have all container data stamped into the body or collar (neck ring) of the container
- Are made of steel or aluminum
- Must be retested for use according to DOT specifications
- DOT(ICC) container capacities are expressed in the amount of propane in pounds they can contain

The container markings on a DOT cylinder can be found permanently stamped into the container collar, neck ring or on the cylinder body. Occasionally a metal plate will carry this information, much like the ASME tank data plate, and will be attached to the body of the DOT cylinder. Information required for DOT(ICC) cylinders is:

DESIGN OR MANUFACTURE CODE  
WATER CAPACITY  
TARE WEIGHT  
RETEST DATE

As is the case with missing or illegible ASME data plates, DOT cylinders without all required markings or with illegible markings should never be filled.



SAMPLE DOT CYLINDER MARKINGS

The **tare weight** of a container is what the container weighs when it is empty. This weight includes the weight of the valves, and is important to know when filling containers by weight.

The **water capacity** of a container is the weight of water needed to completely fill the container. **DO NOT CONFUSE WATER CAPACITY OF A CONTAINER WITH ITS PROPANE CAPACITY.** To determine the propane capacity of a container, simply multiply its water capacity by 42% (.42).

**DOT containers are required to be certified for safe continued use at specific intervals.** The first test is required 12 years after the manufacture date. After the 12-year test, the container must be tested every 5, 7 or 12 years, depending on the type of examination. There are three methods of retesting and requalification of DOT cylinders:

### 1. Visual Requalification

The recorded visual requalification is documented on a DOT form. If suitable for continued use, the month and year of the visual requalification is then stamped on the container near the original date of manufacture or the previous requalification date, followed by the letter "E" indicating visual (external) retest. **This type of requalification is valid for a period of five (5) years.**

### 2. Simple Hydrostatic Test

The simple hydrostatic is performed by pressurizing the ICC/DOT cylinder with water with at least two times the design working pressure of the cylinder. This test is also documented on a DOT form. If suitable for continued use, the month and year of the test is stamped on the container near the original date of manufacture or the previous requalification date (with the testing company's federal DOT identification number between the month and year), followed by the letter "S" indicating simple hydrostatic test. **This type test is generally valid for a 7-year period.**

### 3. Water Jacket Hydrostatic Test

As with the simple hydrostatic test, the ICC/DOT cylinder is pressurized with water (with at least two times the design working pressure). During this test, however, a metal jacket filled with water surrounds the cylinder. This water jacket is used to measure the amount of expansion of the cylinder body when under pressure. Once this test is completed, an extensive inspection of the cylinder is conducted. After this method of requalification and if the container is suitable for continued use, the date only is stamped on the cylinder (no letters) with the testing company's federal DOT identification number between the month and year. **The hydrostatic test is valid for a 12-year period.**

These periodic testing procedures are designed to detect leaks or damage to cylinders which could pose a safety hazard if the cylinder is allowed to remain in service.

**ONLY THOSE PERSONS/COMPANIES LICENSED BY THE FLORIDA BUREAU OF LIQUEFIED PETROLEUM GAS AS A 'REQUALIFIER OF CYLINDERS' OR A CATEGORY I LP GAS DEALER MAY RETEST OR RECERTIFY CYLINDERS.**

**EFFECTIVE OCTOBER 1, 2002, ALL COMPANIES REQUALIFYING CYLINDERS MUST REGISTER WITH THE U.S. DEPARTMENT OF TRANSPORTATION, RESEARCH AND SPECIAL PROGRAMS ADMINISTRATION, AND OBTAIN A REGISTRATION IDENTIFICATION NUMBER (RIN) FROM THAT AGENCY - THIS INCLUDES VISUAL REQUALIFICATION!**

**NEW REGULATION  
EFFECTIVE 10/1/02!**



**COMPANIES PERFORMING EITHER THE SIMPLE OR WATER JACKET HYDROSTATIC TEST MUST ALSO HOLD A U.S. DEPARTMENT OF TRANSPORTATION LICENSE FOR THIS WORK.**

The DOT cylinder type code will play an important part in the length of time any of these three methods is valid. This code tells the design code of the tank and its service pressure. Note the table below:

<b>INSPECTION &amp; TEST PERIODS FOR DOT/ICC PROPANE CYLINDERS</b>				
<b>CYLINDER TYPE</b>	<b>FIRST TEST DATE</b>	<b>NEXT REQUIRED TEST DATE &amp; TEST LETTER</b>		
		<b>WATER JACKET HYDROSTATIC- NO LETTER</b>	<b>SIMPLE HYDROSTATIC TEST - "S"</b>	<b>VISUAL INSPECTION "E"</b>
4B	12 YEARS	12 YEARS	7 YEARS	5 YEARS
4BA	12 YEARS	12 YEARS	7 YEARS	5 YEARS
4BW	12 YEARS	12 YEARS	7 YEARS	5 YEARS
4E	12 YEARS	12 YEARS	7 YEARS	5 YEARS

N/A\* - NOT APPLICABLE

TEST DATE REQUIREMENT SHOULD BE BASED ON MOST RECENT DATE STAMPED ON CONTAINER

Although ASME containers are not required to be tested in the same manner as DOT cylinders, ASME containers should be visually inspected prior to filling to determine their suitability for continued use.

## SECTION 3 REVIEW

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1. Name two types of specifications which propane containers are manufactured under.
2. What does DOT stand for?
3. What does ASME stand for?
4. How long after manufacture may a DOT cylinder be used before recertification is required?
5. How long after manufacture may an ASME propane container be used before recertification is required?
6. Where can identification information about a DOT cylinder be found?
7. Where can identification and information concerning an ASME container be found?
8. If a DOT cylinder bears the marking WC 239, what is the maximum amount of propane that can be dispensed into it?
9. A visual DOT cylinder requalification is valid for how many years?
10. If an ASME container does not have a data plate, but appears to be in good condition, can it be filled?
11. Can a licensed dispensing unit operator requalify DOT cylinders for continued use?
12. What is the maximum amount of propane that can legally be dispensed into a container?
13. Name 3 types of requalification that can determine if a DOT cylinder is acceptable for safe continued use.
14. How do you determine the propane capacity of a DOT cylinder?
15. What is the proper procedure before filling any tank or cylinder?

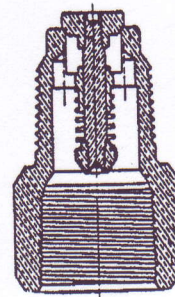
## SECTION 4

### VALVES AND FITTINGS

As a dispensing unit operator, you should be able to identify the different valves and fittings on propane containers and know their purposes. Your instructor will show you examples of these valves and fittings and discuss the purpose of each.

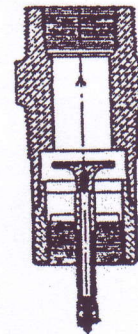
#### **FILL VALVE OR BACK FLOW CHECK VALVE**

This type valve will always remain closed except when fuel flow from outside forces it open (as happens during the filling process).



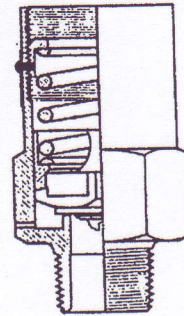
#### **EXCESS FLOW CHECK VALVE**

This valve permits flow of gas in either direction, but closes automatically when the outward gas flow exceeds a safe rate.



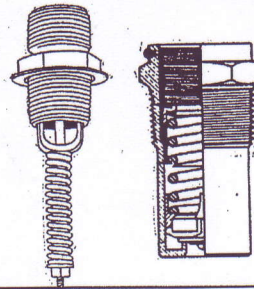
**PRESSURE RELIEF VALVE** - external type.

This valve is held closed by a coil spring unless the tanks internal pressure becomes higher than the maximum working pressure. Always check this valve for damage before filling.

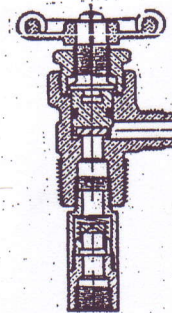


**PRESSURE RELIEF VALVE** - internal

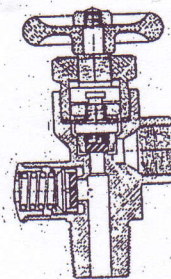
type. This valve is held closed by an internal spring. This internal type valve is not as susceptible to damage as the external pressure relief valve.



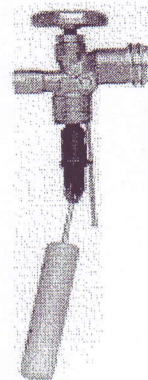
**LIQUID SERVICE VALVE** - With integral excess flow check valve, for customer bulk tanks and motor vehicle fuel tanks (also used on some roofing tank applications).



**POL VALVE** - Service valve with built-in pressure relief for vapor withdrawal from cylinders. In portable DOT cylinders (such as those used with gas grills) this must be plugged or capped whenever the container is disconnected from use. Always check the relief valve for damage before filling.



**OPD VALVE**-A new valve is now found on all DOT cylinders 4 to 40 lbs. This device is called an overfill prevention device, commonly known as OPD. OPD is designed to detect the liquid level of product inside a DOT container and help prevent overfilling of the container. OPD's are NOT a substitute for weighing a cylinder and should NEVER be relied on as the sole method of determining the amount of product in a cylinder.





# OPD

## OVERFILL PREVENTION DEVICES

A new valve is now found on all DOT cylinders 4-40 lbs. manufactured after September 30, 1998. This valve is called an overfill prevention device, commonly known as the OPD. The OPD is designed to detect the liquid level of product inside a DOT container and **help** prevent overfilling of the container. **OPD's are NOT a substitute for weighing a cylinder and should NEVER be relied on as the sole method of determining the amount of product in a cylinder.**

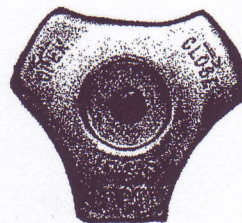
As of June 8, 1999, the following became law in the State of Florida:

- New Section 2-3.1.5, NFPA 58, requires OPD's and on cylinders 4 lbs. through 40 lbs. propane capacity for vapor service.
- As of July 1, 1999, all cylinders which are out of qualification date must be retrofitted with an overfill prevention device before they may be filled.
- All cylinders used in industrial truck applications, including forklifts, cylinders for industrial welding or cutting gases, and floor maintenance machines, are specifically *exempt* from this requirement.
- **After April 1, 2002, no cylinder may be filled unless it is equipped with a listed OPD** (*except* those cylinders used in industrial truck applications, including forklifts, cylinders for industrial welding or cutting gases, and floor maintenance machines, or similar applications as noted by exemption in the code).

**IDENTIFYING OPD'S** – Cylinders equipped with the OPD are identifiable by the different hand wheel configuration. Diagram #1 below represents the common round handwheel configuration for older cylinders; Diagram #2 is representative of the OPD triangular-shaped handwheel configuration. **IMPORTANT: Old-style handwheels may be different from manufacturer to manufacturer. The new OPD handwheels will be uniform and will bear the OPD stamp.**



Typical old-style handwheel



New OPD handwheel

## SECTION 4 REVIEW

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1. What is the primary purpose of a fill valve?
2. How does a back flow check valve work?
3. What is the purpose of a relief valve?
4. What information does a fixed liquid level gauge give you?
5. What is a "bleeder" or "spit" valve and how is it used?
6. What should a vapor service valve (POL) be equipped with when disconnected?
7. What is the purpose of a liquid or vapor service valve?
8. What does the excess flow in a liquid service valve do?
9. What is an OPD and what is its purpose?
10. Can you rely on an OPD valve for accurate filling of a D.O.T cylinder?
11. Is the float gauge alone a suitable method for filling?

## SECTION 5

### FILLING PROPANE CONTAINERS

**Only fully trained and qualified persons should be authorized to transfer propane gas.**

Your liquefied petroleum gas supplier will give you hands-on training on the filling of propane containers for portable cylinders, recreational vehicles, motor fuel tanks, forklifts, etc. Filling procedures may differ slightly since tanks and cylinders vary. Adapters may be needed in order to connect some types of containers. This section will give you valuable safety information concerning these procedures.

It is the responsibility of the licensed operator to have only qualified persons filling containers. A qualified person is one who understands the types of containers and the conditions under which they may be filled. That person must be well trained in the use of dispensing equipment and in the actual transfer of liquid propane gas. Emergency training is also a vital part of these activities.

*BEFORE YOU CONNECT - INSPECT!*

#### REFILLING CONTAINERS

Each container's specifications and condition must be visually inspected to determine if it is suitable for propane service.

Always visually inspect the container for excessive corrosion, dents, gouges, leaks, exposure to fire, damaged relief valves, and damaged collars/footrings. Also, make certain that all identifying marks are complete and legible.

By Florida law, propane containers **MAY NOT** be filled if:

1. You do not have the owner's permission.
2. Identifying marks are missing or not legible.
3. A DOT cylinder has not been requalified within the 12 year date of manufacture period, or as periodically required by the requalification method.
4. The container has excessive pitting, dents, gouges, or other damage.

5. The container has a visible bulge(s).
6. The container has been exposed to fire.
7. The container is not approved for propane gas.
8. The container or fitting possesses leaks.
9. The container is damaged or has obstructed relief valves.
10. There is no collar (or the collar is damaged) or cap to protect the valves\* in transit.
11. There is no footring or the footring is damaged. If it is a motor fuel tank, it must be securely fastened in place.

\*NOTE: If the container is under 108 lb. WC (45 lbs. propane), the valves must be plugged or sealed or equipped with a listed quick-closing coupling, or a listed quick-connect coupling.

Each propane cylinder must be visually inspected every time it is filled. The bottom, footrings, and legs are the most susceptible areas for corrosion and rust.

DOT containers are required to be retested at specific intervals and **may not be refilled if they do not meet this requirement.** Before filling a DOT container, you must first determine whether it needs to be requalified. **Requalification is required within 12 years from the date the container is manufactured and then every five, seven or twelve years, depending on the method of the previous testing.** Periodic testing procedures are designed to detect leaks or damage to cylinders which could pose a safety hazard if the cylinder is allowed to remain in service.

#### **BEFORE FILLING:**

**Motor Fuel Containers:** Make sure the vehicle ignition is OFF and the brakes are set (or chock blocks are in place). All passengers must be out of the vehicle BEFORE you begin. NEVER OVERFILL!

**Recreational Vehicles:** All appliance valves must be off (all pilots out) and all passengers must be out of the vehicle. After filling, check for leaks BEFORE relighting the pilots. NEVER ATTEMPT TO REPAIR ANY LEAKS YOU MAY FIND. Contact your gas supplier or local licensed RV repairman.

#### **NEW CONTAINERS - PURGING BEFORE FILLING**

Purging of new containers is required for efficient and safe use with propane.

1. A new container may possess water, air, or other contaminants. These must be removed before filling.

2. If the container is pressurized, this pressure must be vented and reduced to zero pound pressure.
3. Pressurize the tank with propane vapor approximately 15 to 25 p.s.i. Vent the air/gas mixture through a vent stack. Repeat 3 or 4 times for total purging.
4. If water appears to be present, methanol must be used to remove it. Contact your propane supplier for assistance.
5. The container is ready for filling with liquid propane.
6. Some tanks are delivered pre-purged by using the vacuum method, another alternative for purging.

Failure to purge a container may create other hazards. A higher than normal pressure could cause the relief valve to operate, releasing a gas/air mixture. Failure to purge could also result in appliance malfunction, burner outage or internal corrosion of the cylinder.

The purging process must be done in compliance with Section 4-3.2.1(b), NFPA 58, which reads as follows:

"(b) When outdoors, container venting shall be done under conditions that will result in rapid dispersion of the product being released. Consideration shall be given to such factors as distance to buildings, terrain, wind direction and velocity, and use of a vent stack so that a flammable mixture will not reach a point of ignition."

For the dispensing unit operator, container venting must always be performed out-of-doors. Make sure all sources of ignition are eliminated. Smoking should not be allowed within 25 feet of the purging operation.

On the job training and a demonstration of the actual purging procedure will be provided by your propane supplier.

# CONTAINER FILL PROCEDURE

These fill procedures are a general guideline for the safe filling of propane containers. These procedures are not meant to preclude other safety procedures.

## BEFORE YOU FILL:

1. If your dispenser is located inside a fenced area, make sure both gates are open.
2. Make sure that:
  - Ignition sources within 25 ft. are eliminated.
  - Vehicle motors are turned off.
  - All pilots and burners in RV's, motor homes, travel trailers, etc., are turned off.
  - All electrical circuits are turned off.
  - All occupants have stepped out of the vehicle.
  - All other ignition sources have been eliminated (*watch out for smokers!*)
3. If your dispensing unit container is larger than 2,000 gallons water capacity, vehicles with permanently mounted LP gas containers must be at least 10 feet from the unit while container are being filled. Again, make sure all ignition sources are eliminated (see #2 above).
4. Smoking must not be permitted within 25 ft. of the filling operation or equipment.
5. Use protective gloves while filling cylinders.
6. Check the cylinder valves to determine their suitability for LP gas service.
7. Visually inspect the condition of each container for the following:
  - Excessive corrosion
  - Deep Dents or Gouges
  - Leaks of any kind
  - Evidence of exposure to fire
8. Check container dates to verify it has been requalified in accordance with U.S. Department of Transportation regulations (see Section 3 for requalification information).
9. Check the tare weight of the cylinder (empty) and water capacity of the cylinder - these will be found stamped on the cylinder body or collar.
10. Determine propane capacity by multiplying water capacity by 0.42. For example, if the water capacity of a container is 48 pounds, the propane capacity will be 20 pounds, and so forth.
11. Add the tare weight and propane capacity together to determine the total filled weight of the cylinder.
12. Set scales to indicate the total filled weight of the container, hose and connector.
13. Stop filling when the scale balances. Disconnect and check for leaks.

## **FILLING PORTABLE CYLINDERS**

1. Open liquid outlet valve on storage tank and valves in by-pass return line.
2. Connect hose to cylinder fill valve.
3. Start pump.
4. Open valve on cylinder.
5. Open valve on end of hose.
6. Close hose valve as soon as scale beam or indicator tips.
7. Close cylinder valve.
8. Disconnect hose.
9. Check weight of filled cylinder after filling connector has been disconnected. If overfilled, bleed off excess propane AT A SAFE LOCATION or contact your gas supplier for assistance.
10. Check container valves for leaks.

**NEVER LEAVE A FILLING PROCESS UNATTENDED-REMAIN ON SITE AT ALL TIMES!**

## **FILLING PERMANENTLY MOUNTED CONTAINERS (ASME)**

1. Visually inspect the container before filling - only ASME containers having a minimum design pressure of 250 PSI or 200 PSI under U-68 or U-69 may be filled. This information will be found on the ASME container data plate.
2. Before filling, check to determine that the container is not already full by observing the discharge from the vent valve of the fixed liquid level gauge. If you observe a cloud of visible LP gas liquid vapor, the container is full.
3. Open liquid outlet valve on storage tank and valve in by-pass return line.
4. Connect hose to container fill valve.
5. Start pump.
6. Open vent valve of fixed liquid level gauge.
7. Open valve on end of hose.
8. If container fill valve is hand operated, open valve. (Most open automatically when connected or when filling starts).
9. Fill until vapor coming from vent valve is visible; then immediately turn off hose end valve and close vent valve.
10. Shut off pump.
11. Turn off container valve if hand operated.
12. Disconnect hose.
13. Check container valves for leaks.

## **AFTER CONTAINER FILLING OPERATION IS COMPLETED OR ANY TIME STATION IS UNATTENDED**

1. Shut off pump.
2. Close valves at storage tank.
3. Coil hose on rack inside fence or protected area and install dust cap or plug in hose filling adapter.
4. Lock fence protected area to secure installation against tampering.

### **THINGS TO REMEMBER**

1. Fill only approved containers.
2. Fill DOT cylinders that are within the proper requalification time limits.
3. You (the attendant) must remain at the transfer area during the filling operation.
4. Wear protective clothing, eye protection, gloves, and footwear.
5. Double check tank for overfilling.
6. Check all valves and fittings with leak detector solution for leaks.
7. Be sure containers are transported in the proper position.
8. Be sure that the container has transportation/warning labels and POL plug or cap, if required.
9. Be sure valves are protected by collar or cap.
10. Follow proper filling and safety procedures all the time.



## SECTION 5 REVIEW

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1. What must be done before a new DOT container may be filled?
2. Before filling a motor home, what steps should you take?
3. What is the maximum amount of propane you may dispense into a container?
4. What must be done before a propane container may be refilled?
5. What may happen if a container is overfilled?
6. Sources of ignition, including cigarettes, should be eliminated within how many feet of the filling procedure?
7. How far from a building opening should the hose end be?
8. How do you determine the gas capacity of a DOT(ICC) cylinder?
9. If a customer presents a container for filling and the container bears the name of a propane company (belongs to that company), can it be filled?
10. The cylinder marking 4BW-240 tells you what?
11. What is the most accurate filling procedure for filling DOT Cylinders?

### TRANSPORTATION OF CONTAINERS

Cylinders under 45 lbs. propane capacity may be transported in enclosed vehicles. The cylinder and its valves must be protected and determined to be leak free and securely fastened, with warning or shipping labels must be attached.

If your customer is transporting a propane container in an enclosed vehicle, you should recommend that the vehicle be kept cool and ventilated and that the cylinder be removed as soon as possible. If a hissing noise or odor of propane is noticed, the cylinder must be removed at once, taking special precautions to avoid all possible sources of ignition.

By law, the largest amount (total pounds) of propane that may be transported at one time in an enclosed vehicle is 90 pounds aggregate; however, no single container can exceed 45 lbs. propane capacity.

Cylinders must be transported in a position where the relief valve is in direct contact with the vapor space. With most cylinders, this is an upright (vertical) position, standing on the container footing. Some cylinders, however, are designed to "lay down" or be positioned horizontally (see Section 3).

If the relief valve comes in contact with the liquid stored in the cylinder, a rise in tank pressure would cause the escape of propane liquid. The expansion of this liquid released to the atmosphere (270 times) could create an immediate safety hazard due to the large amount of propane present and the possibility of ignition.

#### **REMEMBER:**

- Containers shall not be transported inside vehicles where ignition sources (pilot lights, burners, etc.) are present.
- Smoking shall be prohibited when containers are transported in the space opened to the passenger area.
- Containers should be secured and transported only in an upright position (with relief valve in contact with the vapor space of the container).
- A leaking container should never be placed inside a vehicle.
- Cylinder valve outlet must be plugged to avoid accidental release of propane.
- Cylinders should not be transported without valve protection by use of cap, collar or other acceptable method.

## SECTION 6 REVIEW

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1. What is the largest amount of propane that can be transported in an enclosed vehicle at one time?
2. What is the largest size propane container that can be transported in an enclosed vehicle?
3. In what position should a container be transported?
4. After filling a propane container and placing it in an enclosed vehicle, you observe a white vapor and hear a slight hissing sound. What should you do?
5. It's a hot July day, and you just finished loading a filled container into the trunk of a car. Your customer tells you that he is headed to a nearby mall to shop for several hours before heading home. What should you do?

### CARE AND MAINTENANCE OF YOUR DISPENSING UNIT

Proper care and maintenance of your dispensing unit will ensure the safe continual use of the unit. If you are a licensed LP gas dispensing unit operator, your unit will be inspected at least annually by the Bureau of LP Gas Inspection. Additionally, your gas supplier may inspect the unit prior to each filling operation. As the unit operator, however, you should routinely inspect your unit for any leaks or potential problems.

#### Housekeeping

Simple good housekeeping around your dispensing area is a good common sense approach to safety. Keep the area free of flammable materials such as weeds and trash, and don't use your unit as a storage rack for rags, pails, etc. Section 3-2.2.7(b) of NFPA 58 states as follows:

**"(b) Loose or piled combustible material and weeds and long dry grass shall not be permitted within 10 ft. (3 m) of any container."**

#### Leaks

No leaks of any size or type should be permitted at a container filling area. Leaks at your dispensing unit may be indicated by:

- An oily residue around fittings;
- A hissing sound; or
- A smell of propane when first opening the dispensing cabinet.

Any leak should be reported to your gas supplier immediately. By law, leak calls must be responded to within 24 hours of the first report. Never attempt to repair your dispensing unit -this should be left to trained, licensed professionals. A major leak at your dispenser is an immediate hazard - the area should be evacuated and emergency responders contacted as well as your gas supplier.

**THE BUREAU RECOMMENDS CHECKING YOUR DISPENSER FOR LEAKS AT LEAST MONTHLY WITH A LEAK DETECTOR SOLUTION.** Check with your gas supplier for a recommended solution - never use a solution that contains ammonia, as it may damage your equipment.

### Fire Extinguishers

Make sure your fire extinguisher(s) are fully charged, tagged and easily accessible, within at least 50 ft. of the dispensing unit.

### Posting of Signs

Dispensing units are required to be marked for safety. Filling procedures must be posted at each dispenser. "No Smoking," "Propane" or "Flammable Gas" signs must be prominently posted on all four sides of the container (if they are visible or approachable). Smoking, or other open flames are not permitted within 25 ft. of the unit.

### Dispensing Unit Equipment

Routinely check remote and emergency shut off valves to affirm that they are operational and accessible. Your propane supplier will advise you on the proper operation of this equipment.

Make sure all gates are open during transfer operations.

### Training

By law, all dispensing unit personnel must be adequately trained in proper LP gas transfer procedures. Make sure all new employees receive the training they need and that proof of this training is available on-site.

## DISPENSING UNIT OPERATOR CHECKLIST

Use this list as a safety reminder and inspect your unit regularly.

- The area around the dispensing unit is free of flammable materials.
- The area around the dispensing unit is free of weeds and tall grass.
- The dispensing unit has been checked for leaks.
- Any leaks found have been reported to gas supplier for repair.
- Fire extinguisher is readily accessible and fully charged.
- Filling procedures are properly posted in a prominent position.
- Required signs are properly posted and visible from all approachable sides.
- Dispensing unit hoses are in good shape with no visible signs of wear.
- Remote and emergency shutoff valves are accessible and operational.
- All employees who dispense product have received proper training in filling procedures, safety practices and emergency procedures.
- Emergency phone numbers are clearly posted.

## SECTION 7 REVIEW

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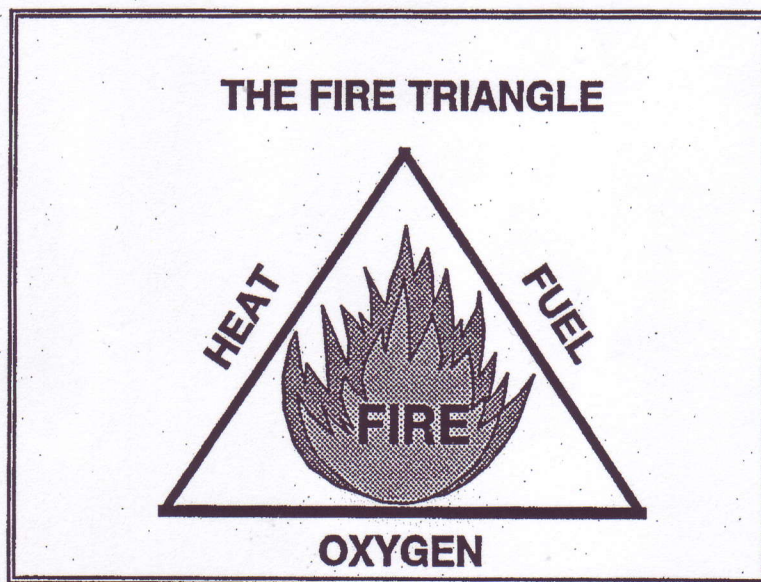
1. Can your dispensing area be used as a temporary storage space for building materials?
2. How many feet around the dispensing unit must be kept free of debris and trash?
3. What type of repairs are dispensing unit operators allowed to make to their unit?
4. If you suspect a leak, what signs should you look for?
5. How would you check for a leak around a fitting?
6. Where must your fire extinguisher be located?
7. Personnel dispensing propane gas must have what?
8. If you detect a leak, who would you call?
9. When must a leak be investigated by your gas supplier?

### SAFETY PRECAUTIONS AND HANDLING OF EMERGENCY SITUATIONS

#### SAFETY PRECAUTIONS WHEN FILLING

Liquid propane will expand 270 times as it converts from liquid to vapor. This rapid conversion of liquid to vapor causes intense chilling and literally freeze whatever it comes in contact with. For this reason, precautions should be taken to **protect eyes and skin from the liquid since freeze burn or frostbite is possible.**

Proper clothing and eye protection should be available at any transfer operation. Long sleeve shirts and gloves should be used to protect exposed skin. Safety glasses, goggles, or a face shield should be used when inspecting relief valves or tanks. Foot protection is useful as a protection against injury should a tank, cylinder, or hose end be dropped.



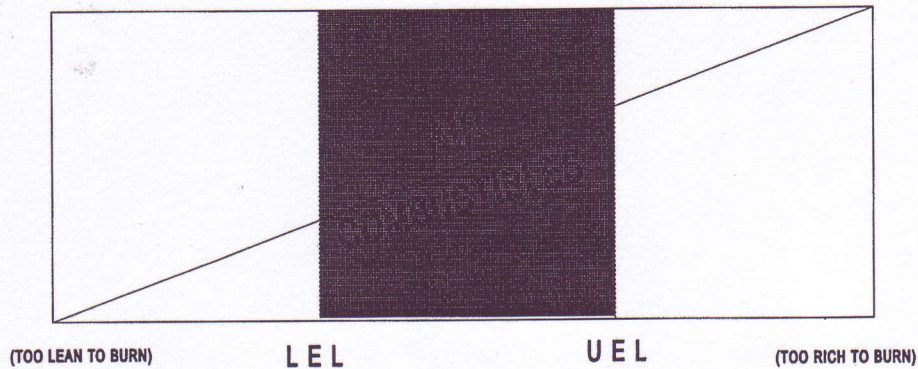
#### PROPANE FLAMMABILITY

For any fire to occur, three ingredients are needed -- fuel, heat and oxygen. LP gas vapor makes an excellent fuel, and heat can exist in the form of an open flame, a lighted cigar or cigarette, an arc formed by an electrical switch, ignition arc on an auto, or static electricity. In the right combination with oxygen, these three ingredients make up the necessary components of the "fire triangle."



While propane vapor is readily ignitable, it has a very narrow flammability range when compared to other petroleum products. In order to ignite, the propane/oxygen mix must contain from 2.15 to 9.60 percent propane vapor. This means that a propane/air mixture containing **less than 2.15** percent gas is too lean to burn. If the mixture contains **more than 9.6** percent gas, it is too rich to burn.

LOWER EXPLOSIVE LIMIT (L E L) VS. UPPER EXPLOSIVE LIMIT (U E L)



The **range of flammability** is important to remember when LP gas is transferred or discharged. If the propane/air mixture is within the flammability range, sources of ignition could include fans, electrical switches, auto ignition, static electricity or cigarettes. The ignition temperature of propane is approximately 920° F to 1120° F. By comparison, a cigarette will burn at approximately 600° F to 1350° F, and a light switch will arc at 2000° F.

Propane is **non-toxic** and is not harmful to breathe in small concentrations. However, breathing large concentrations may result in suffocation. Inhaling propane vapor may produce dizziness, loss of coordination, unconsciousness, or death. This depends upon the level of concentration and the time of exposure. **Never enter an area if a vapor cloud is present, or if the area is suspected of having a high vapor concentration.**

Should a propane leak occur, **eliminate all possible sources of ignition immediately**. Try to stop the flow by shutting off all valves. Remember to approach with the wind at your back.

If propane reaches a source of ignition, a flash, fire, or explosion may result. The fire should **never** be extinguished until the flow of gas has been turned off. Should the fire be extinguished and the supply of fuel is not turned off, a greater fire hazard may exist or an explosion may occur. If the fire is small, you may be able to control it with a BC fire extinguisher. When using an extinguisher, always approach the fire from upwind. After use, make sure your extinguisher is recharged immediately.

Florida law requires that an 18 lb. BC fire extinguisher be readily available for use at LP gas dispensing units. Large quantities of water or water spray is also an acceptable control method. Water helps cool the container and disperse the vapor. If the fire is not controlled, immediately notify the fire department and evacuate all personnel to a safe area.

## SECTION 8 REVIEW

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1. If you observe a propane vapor cloud around the dispensing unit or area, what should you not do?
2. If a leak occurs, what is the first thing you should do?
3. What 3 things are needed for a fire to occur?
4. If a propane fire occurs, what should you attempt to do first?
5. When fighting a small propane fire with a fire extinguisher, from which direction should you approach the fire? Why?
6. Why should gloves, eye protection and protective clothing be worn during filling procedures?

## SECTION 9

### GLOSSARY OF COMMONLY USED TERMS

<b>ASME</b>	American Society of Mechanical Engineers
<b>BC FIRE EXTINGUISHER</b>	A type of fire extinguisher required at dispensing stations.
<b>DATA PLATE</b>	Plate attached to ASME containers with all pertinent information for the container.
<b>DOT</b>	United States Department of Transportation
<b>ETHYL MERCAPTAN</b>	An odorant used in liquefied petroleum gases to aid in detecting leaks.
<b>FLOAT GAUGE</b>	Device which indicates the percentage of gas in a container based on an internal float located at and moving with the liquid inside the tank.
<b>ICC</b>	Interstate Commerce Commission which formerly set forth specifications for the manufacture of portable cylinders. This responsibility now lies with the U.S. Department of Transportation (DOT).
<b>LPG</b>	(Liquefied petroleum gases) - gases belonging to the hydrocarbon family. Commonly referred to as propane, LP gas, bottled gas, butane, propylene, etc.
<b>NFPA</b>	Abbreviation for "National Fire Protection Association," who promulgates and publishes fire safety standards
<b>NPGA</b>	Abbreviation for "National Propane Gas Association," formerly the National Liquefied Petroleum Gas Association (NLPGA).
<b>OPD</b>	Overfill prevention device. A device which causes the service valve to close when the container becomes filled
<b>POL</b>	This abbreviation (commonly referred to as 'put on left') is used to describe different types of fittings, service valves, plugs, filler couplings, adapters, etc., all with a lefthand thread.
<b>POL PLUG</b>	A metal or plastic plug for the service valve required to be used during the transportation of propane containers.
<b>POL VALVE</b>	A vapor service valve with built-in pressure relief for vapor withdrawal from cylinders.
<b>PSIG</b>	Pounds per square inch gauge - measurement of pressure inside a container

<b>QUALIFIER</b>	A supervisor, manager or employee who has passed the required state Bureau of LP Gas Inspection examination.
<b>RANGE OF FLAMMABILITY</b>	A term used to describe that certain mixture of air and propane required achieving combustion.
<b>RELIEF VALVE</b>	A fitting designed to release vapor pressure to atmosphere to maintain a predetermined level of pressure inside the container.
<b>REQUALIFICATION</b>	The testing, certifying, retesting or recertifying ICC/DOT cylinders to determine suitability for continued safe use
<b>SERVICE VALVE</b>	The container valve that turns the gas on or off.
<b>SPECIFIC GRAVITY</b>	Product weight compared to air (vapor) or water (liquid).
<b>TARE WEIGHT (TW)</b>	Weight of an empty container, including its valve
<b>TRANSFER OPERATION</b>	Act of transferring liquid product from one container (dispensing device) to another
<b>WC</b>	Water capacity. The amount of <u>water</u> in gallons that an LP gas container can hold when full