

# Training Program 1A

## “Filling 1 lb. Refillable Propane Cylinders”



**WARNING: MAKE SURE TO CHECK LOCAL AND STATE LAWS FOR TRAINING AND LICENSING REQUIREMENTS BEFORE FILLING THE 1 LB REFILLABLE CYLINDER**

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**FOR COMPLETE VIDEO INSTRUCTIONS, PLEASE GO TO  
[WWW.FLAMEKING.COM/REFILLABLE](http://WWW.FLAMEKING.COM/REFILLABLE)**

## 1.0 About this Training Program

### 1.1 Program Content/Examination:

The course is intended for persons who will only be filling the 1 lb. refillable propane cylinders.

The program is specifically designed for persons who are not licensed by their state or city to fill propane cylinders.

The program also contains information on propane characteristics, filling site location and the hazards of propane.

Sites where 1 lb. propane cylinders are to be refilled must be located outdoors

**Make sure to check all local rules and regulations before filling any 1 lb refillable cylinder.**

The program is designed so that the student completes a theory written examination and demonstrates to the instructor that he/she can safely fill the 1lb. refillable propane cylinder.

### 1.2 Caution/Responsibility:

By using this training program, you acknowledge all of the following.

Propane is a hazardous substance that when handled or contained improperly can explode causing serious injury or death. You are aware of the potential dangers inherent in propane, especially if it leaks, and understand you are assuming a risk in filling a propane cylinder.

You are responsible for visually inspecting the components of the cylinders and valves. If any cylinder, valve, seal or other component shows damage, wear or otherwise does not meet the pre-fill inspection requirements, you will immediately stop using the filling equipment.

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This course is not a substitute for requirements identified in any governmental specification or regulation. This course does not attempt to catalog all such requirements and you agree

that you will ensure you are complying with all governmental requirements including federal, state, and local requirements.

## **2.0 Propane Characteristics:**

Learning Objectives:

This section of the training program covers:

1. The properties of Propane.
2. Clothing required when handling Propane.
3. Potential Ignition sources.

### **2.1 Properties of Propane**

Propane is transported and stored as a liquid and is commonly identified as LPG (Liquefied Petroleum Gas) with a DOT identification of UN1075.

Propane is a flammable hydrocarbon and under normal atmospheric conditions is a gas . By storing propane in cylinders and pressure vessels we can store propane under pressure as a liquid. Storage as a liquid allows much more propane to be filled, than as a gas.

A propane cylinder contains both liquid and vapour, with the vapour space being at the top of the cylinder. Propane appliances burn propane gas. As the gas is drawn off top of the cylinder the liquid within the container boils to replace the gas being withdrawn.

Liquid propane boils at about - 40 F. It needs heat to boil, and it extracts the heat used to vaporize the liquid through the steel shell of the container from the surrounding air.

The amount of vapor a 1 lb. propane cylinder can produce is dependent on the outside temperature and the area of wetted cylinder surface The less wetted surface the less vapor is produced, likewise the lower the outside temperature the less propane gas is produced. At low liquid levels, the 1 lb. cylinder may not provide enough gas to operate appliances properly

The pressure within the propane cylinder is directly related to the temperature of the propane liquid within the cylinder. The higher the liquid propane temperature the higher the internal pressure, conversely the lower the liquid propane temperature the lower the internal pressure.

If a frost line appears on a propane container it is an indication that the gas withdrawal from the cylinder is greater than the cylinders ability to vaporize propane. Replace the propane cylinder with a full unit if the appliance does not operate properly.

If liquid propane comes into contact with your skin, it takes heat from your skin to as it vaporizes and causes freeze burns to the skin.

Propane is non-toxic, but if released in a confined space, will displace air making it difficult for you to breathe. Always transfer propane to a 1-pound refillable cylinder outdoors.

Propane is a clear liquid and gas. To warn of a propane leak an odorant is added that smells like skunk odor or rotten eggs. Normally during filling you will smell the characteristic propane smell. If you smell a strong propane odor, stop filling and leave the area immediately to allow leaked gas to dissipate.

A liquid propane leak is much more dangerous than a vapour leak in that liquid propane when released to the atmosphere expands 270 times its volume as it goes from a liquid to a gas. Propane gas is approximately 1 ½ times heavier than air and can settle in low areas. Propane vapours are extremely flammable when mixed with the correct amount of air. The flammable limits are 2.15 to 9.6 % propane in the atmosphere. In mixtures below 2.15 % volume the mixture is too lean to ignite. Above 9.5 % volume the mixture is too rich to ignite. When propane is released into the air there will be a flammable propane/air mixture somewhere.

Propane's flammability requires that the filling area be restricted to the person filling the cylinder. Signs must be posted that indicate sources of ignition, smoking, running vehicles etc. must be at least 10 feet (3m) from the point that the filling process takes place.

## **2.2 Personal Protective Clothing:**

When filling propane cylinders, you must wear clothing that cannot build up and release static electricity. Clothing containing a high percentage of nylon can build up and release static electric charges that are capable of igniting propane vapours. Wear clothing made from cotton or other natural fibers such as wool.

You are transferring propane liquid when filling the 1 lb. propane cylinders and it is recommended that to protect your eyes, wear safety glasses or goggles and to protect your skin, wear appropriate gloves that will not freeze to your hands and long sleeves.

## **2.3 Contact with Liquid Propane:**

If exposed eyes or skin come into contact with liquid propane flush eyes with lukewarm water for 15 minutes. If there is a "freeze burn", submerge the affected area in lukewarm water and keep at this temperature until circulation returns. If fingers or hands are frost bitten hold them next to a warm part of the body such as under the arm. Seek immediate medical care.

## **2.4 Potential Ignition Sources:**

Open flames from lighters and matches are capable of igniting propane vapours. Vehicles are also considered a source of ignition. Therefore, smoking or any other source of ignition is not permitted when filling propane cylinders. As previously stated sources of ignition are not allowed within 10 feet of the filling location.

Test connections for leaks using either a commercial leak detector solution (available at hardware stores) or an electronic detector calibrated for propane.

**Warning**

**Never check for leaks with an open flame, do not check for leaks using ammoniated or chlorinated household type detergents, these can cause cracks to form on metal, tubing and brass fittings.**

**Caution**

**When using a leak detector solution, rising bubbles indicate a leak. Repair all leaks prior to continuing the filling process**

## Review Section 2.0 Propane Characteristics:

Fill in the blanks

1. Propane under normal atmospheric conditions is a \_\_\_\_\_ ( \_\_\_\_\_ ).
2. We can store propane under pressure as a \_\_\_\_\_ .
3. The \_\_\_\_\_ the liquid propane temperature the \_\_\_\_\_ the internal pressure.
4. Propane is non-toxic, but if released in a confined space, will \_\_\_\_\_ air making it difficult for you to \_\_\_\_\_.
5. To warn of a propane leak an \_\_\_\_\_ is added that smells like \_\_\_\_\_ or \_\_\_\_\_ .
6. Propane gas is approximately 1 ½ times heavier than air and have a tendency to settle in areas.
7. Propane liquid if it comes into contact with your skin takes the heat from your skin to vaporize and causes \_\_\_\_\_ to the skin.
8. Propane vapours are \_\_\_\_\_ when mixed with the correct amount of air.
9. Sources of ignition, smoking, vehicles e. must be at least \_\_\_\_\_ feet from the point that the filling process takes place.
10. To protect your eyes, wear \_\_\_\_\_ or \_\_\_\_\_ and to protect your skin, wear appropriate \_\_\_\_\_ that will not freeze to your hands and long sleeves.
11. If exposed eyes or skin come into contact with \_\_\_\_\_ flush eyes with \_\_\_\_\_ water for 15 minutes.
12. Never check for leaks with an \_\_\_\_\_ flame.

### 3.0 Propane Filling Equipment

#### Learning Objectives

This section of the training program covers:

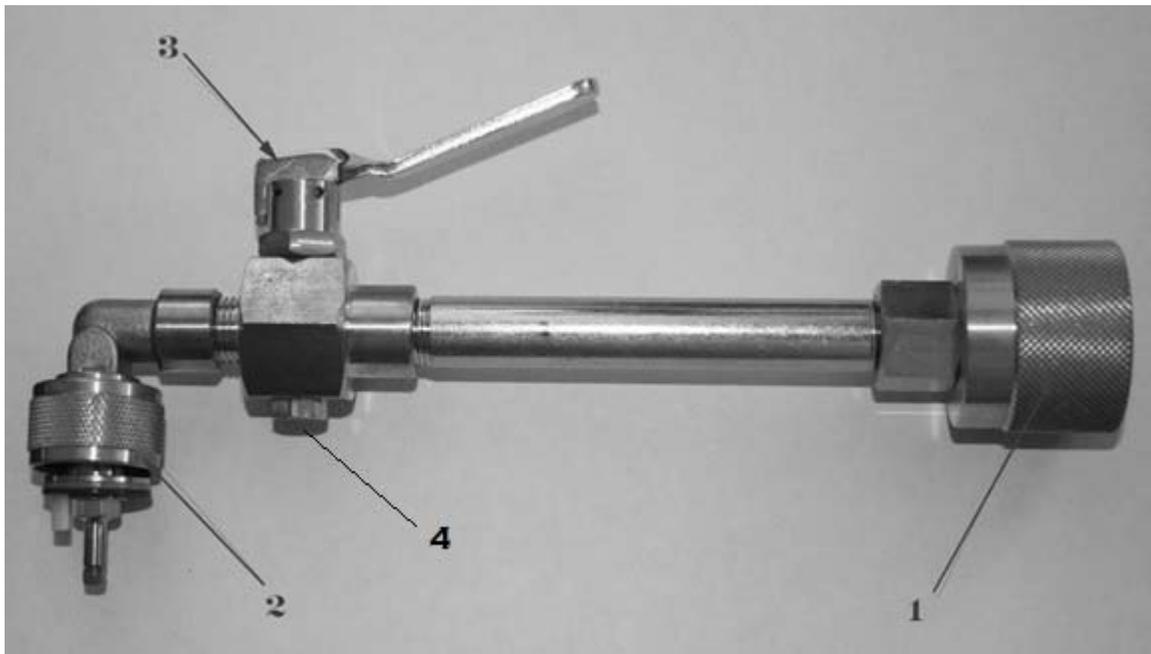
1. The filling assembly
2. The supply cylinder
3. The 1 lb. refillable cylinders.

### 3.1 Filling assembly

The filling assembly consists of a

- (a) liquid propane connection to the supply cylinder,
- (b) 1 lb. cylinder connection and,
- (c) Dead man valve

The flow of propane liquid from the supply cylinder to the 1 lb. cylinder is controlled by a dead man type valve that requires you to manually hold the valve open to fill the 1 lb. cylinder. When the valve handle is released the valve automatically closes, shutting off the flow of propane to the 1 lb. cylinder.



#### Filling Assembly

- 1 – Cylinder connection
- 2 – 1 lb. cylinder connection
- 3 – Dead man valve
- 4 – Relief valve

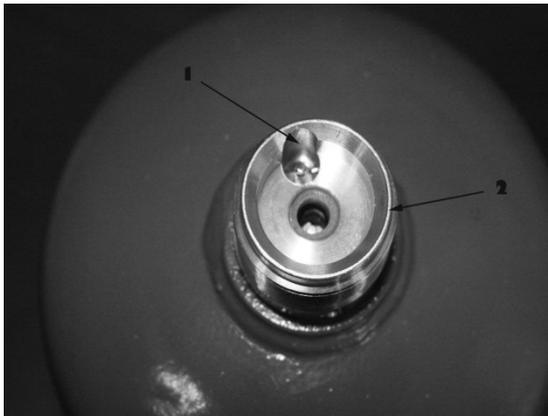


WARNING: THE REFILLABLE CYLINDERS SHOULD ***ONLY*** BE REFILLED USING AN APPROVED FLAME KING REFILL DEVICE. ***DO NOT*** MODIFY IN ANYWAY THE REFILL DEVICE OR ATTEMPT TO USE IT TO REFILL NON-REFILLABLE CYLINDERS OR ANY OTHER MANUFACTURERS CYLINDERS.



WARNING: DO NOT USE THE FILL DEVICE OR ATTEMPT TO FILL THE REFILLABLE CYLINDER WITH ANYTHING OTHER THAN PROPANE. Never add oxygen to a propane cylinder.

The connection to the 1 lb. cylinder has a plastic guide which must be aligned with the slot and pressure relief valve port. The guide is designed to keep the pressure relief valve in service while the cylinder is being filled and to prevent the filling of the disposable “single trip” cylinders.



- 1. Slot for plastic guide & Pressure relief valve
- 2 service valve

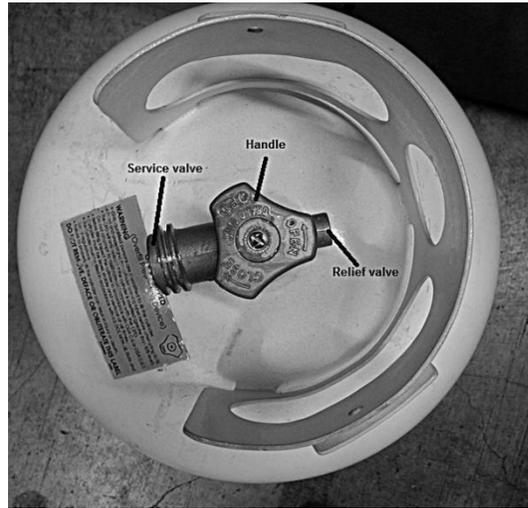


- 1. Plastic Guide
- 2 Gasket
- 2. Fill port

### 3.2 Supply Cylinder

A standard 20 lb. propane gas grill cylinder must be turned upside down to withdraw liquid propane. **It is imperative that immediately after filling, the 20 lb cylinder is returned to its upright position, but never longer than 10 minutes in the upside down position.**

The pressure within the supply cylinder provides the force to move the propane liquid from the supply cylinder to the 1 lb. propane cylinder. There are no pumps or compressors required, therefore there are no electrical connections to consider as potential ignition sources.



1. Service Valve
2. Handle
3. Pressure Relief Valve

### 3.3 1 lb. Refillable Cylinder

The 1 lb. refillable propane cylinder is constructed of painted steel with a brass valve which is opens when the cylinder is connected to an appliance, and closes when the cylinder is removed from the appliance. The cylinder is equipped with a foot ring that contains the cylinder identification stampings.

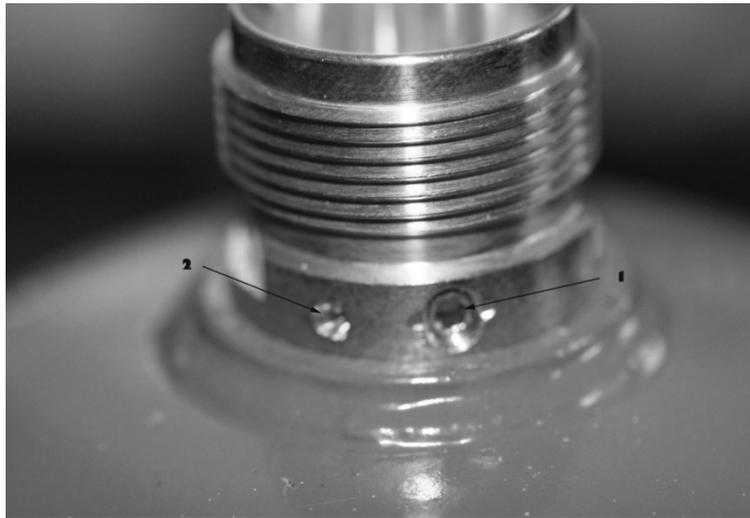
Stampings on the foot ring are:

1. DOT 4BA225
2. TW (Tare Weight) 1.5 lbs.
3. Month/year (Manufacture Date)
4. 000048 (Serial Number) – unique to each cylinder
5. Must be requalified within 12 years of manufacture
6. DT (Dip Tube) 1.4 inches.

The 1 lb refillable cylinder valve is designed to be used with portable grills and camp stoves where the propane supply connects directly to the appliance.

A pressure relief valve (PRV) is a safety device that is an integral component of the cylinder service valve. The PRV is installed so that it is in the vapor space when the cylinder is standing on its foot ring. The PRV will open to relieve excess pressure if, and when, required. The pressure relief valve has a set pressure of 375 psig.

To facilitate volume filling, the cylinder service valve also has a fixed liquid level gauge, commonly known as a “dip tube”, which terminates inside the cylinder at the 80% liquid level.



1. Fixed liquid level gauge valve with allen key socket
2. Bleed vent opening

The valve when not connected for use is protected from damage and the entrance of debris by a specially designed screw on plastic cap and carry handle.



**1 lb. refillable cylinders with protective caps in place**

### Review Section 3.0 Propane Filling Equipment

1. The filling assembly consists of a \_\_\_\_\_ propane connection to the supply cylinder, and a 1 lb. cylinder connection.
2. The flow of propane \_\_\_\_\_ from the supply cylinder to the 1 lb. cylinder is controlled by a \_\_\_\_\_ type valve that requires you to \_\_\_\_\_ hold the valve open to fill the 1 lb. cylinder.
3. . When the valve handle is \_\_\_\_\_ the valve automatically closes, \_\_\_\_\_ the flow of propane to the 1 lb. cylinder
4. The connection to the 1 lb. cylinder has a \_\_\_\_\_ guide which must be \_\_\_\_\_ with the slot and pressure relief valve port.
5. A propane cylinder equipped with a \_\_\_\_\_ for \_\_\_\_\_ propane withdrawal is used to provide propane liquid to fill the refillable 1 lb. propane cylinders.
6. A \_\_\_\_\_ (PRV) is an integral component of the cylinder service valve.
7. The cylinder service valve has a \_\_\_\_\_, commonly known as a dip tube, which terminates inside the cylinder at the \_\_\_\_\_ % level.

## **4.0 Location of Filling Site**

NFPA 58, Liquefied Petroleum Gas Code in conjunction with State and local regulations governs where propane can be stored, handled, and transferred.

While not a comprehensive list, as a general rule, you cannot fill or gauge the 1 lb. propane cylinders:

- (a) inside a building, other than a building designed for such purpose;
- (b) in a location that is not well ventilated;
- (c) within 10 ft. (3 m) measured horizontally from the air intake of any appliance or air-moving equipment; or
- (d) within 25 ft. measured horizontally from any source of ignition.

The supply cylinder, transfer system and refillable 1 lb. cylinders must be protected against damage.

Do not fill cylinders in an area that does not provide protection from motor vehicles on any street used by motor vehicles.

Readily ignitable materials, including weeds and long dry grass, must be removed from the area within 10 ft. (3 m) of a transfer container, and the area kept clear of such material at all times.

## **4.1 Storage of Propane Cylinders**

Up to two 1 lb. cylinders can be stored in homes and other residences. Storage of any additional cylinders in homes or residences must be outdoors.

Any cylinder in storage shall not be exposed to temperatures in excess of 125°F , an open flame, or other source of ignition, and shall be protected from tampering or damage by fencing or equivalent means.

A 1 lb. refillable cylinder, either empty or filled, must be equipped with the specially designed screw on cap provided with the cylinder. The cap must be in place whenever the cylinder is not connected for use.

In case the allen key wrench is lost, it should be replaced by a standard 5/32 allen key wrench





**No smoking and ignition off signs**

**Cylinder Transfer & Storage Location Checklist:**

The following Checklist is an aid to assist you to determine the correct propane transfer and cylinder storage location. The Checklist is not to be solely relied upon to determine the correct transfer and cylinder storage location. It is each person's responsibility to familiarize yourself with the regulatory requirements as they pertain to the transfer of propane from one container to another and the storage of propane cylinders.

**CYLINDER TRANSFER & STORAGE LOCATION CHECKLIST**

**Location:**

Answer the following questions. "no" to a question indicates that the transfer facility or cylinder storage area does not comply with Code requirements	Yes	No	N/A
1. Is the transfer location & cylinder storage area located outdoors or in a building designed for the purpose?			
2. Is the transfer location & cylinder storage area at least 25 feet from a source of ignition, appliance air intake, air moving equipment, long grass & combustible materials? 3. Is the transfer location at least 10 ft. from appliance air intake, air moving equipment, long grass & combustible materials?			
4. Is the transfer location & cylinder storage area protected from damage?			
5. Are the caps in place on cylinders in storage?			
6.			
7.			
8.			

Name of person completing checklist :

Date:

**Retain a copy of the Checklist at the transfer & cylinder location**

## Review Section 4.0 Location of Filling Site:

Fill in the blanks

1. You \_\_\_\_\_ fill or gauge a propane cylinders in a \_\_\_\_\_ , other than a building designed for such purpose.
2. You cannot fill or gauge a propane cylinder in a location that is not well \_\_\_\_ .
3. You cannot fill or gauge a propane cylinder in within \_\_\_\_\_ ft. measured horizontally from the air intake of any appliance or air-moving equipment.
4. You cannot fill or gauge a propane cylinder in within \_\_\_\_\_ ft. measured horizontally from any source of ignition.
5. Any cylinder in storage shall not be exposed to temperatures in excess of 125°F , an flame, or other source of \_\_\_\_\_ .
6. A 1 lb. refillable cylinder, either \_\_\_\_\_ or \_\_\_\_\_ , must be equipped with the specially designed screw on cap.
7. The cap must be in place whenever the cylinder is not \_\_\_\_\_ for use.
8. Propane cylinders must be protected from \_\_\_\_\_ and \_\_\_\_\_ .

## 5.0 Filling a 1 lb. propane cylinder

### Learning Objectives

This section of the training program covers:

1. General rules for refilling 1 lb. propane cylinders.
2. 12-year inspection and requalification.
3. Pre-fill inspection and filling the 1 lb. propane cylinder

## 5.1 General

Refillable cylinders are manufactured, tested, inspected, and marked in accordance with the requirements NFPA 58, Liquefied Petroleum Gas Code, the Department of Transportation Regulations. The 1 lb. refillable propane cylinder meets these requirements.

**WARNING**  
**A cylinder manufactured to DOT Specification 39, 2P, or 2Q and known as a “single-trip” or “non-refillable” cylinder must not be refilled**

The regulations require that while propane is being transferred from one container to another, the person transferring must remain at the container being filled.

The person filling the 1 lb. propane cylinder is responsible for ensuring that the maximum permitted filling level is not exceeded.

## 5.2 12 Year Inspection and Requalification

Refillable propane cylinders must be examined and requalified every 12 years starting with the date of manufacture by a requalifier licenced by the Department of Transportation (DOT). The requalification date will be marked on the cylinders foot ring.

## 5.3 Pre-Fill Visual Inspection

The 1 lb. refillable cylinders should be kept painted with light colors that are reflective.

A cylinder that is damaged, leaking, or corroded, or is due for a prescribed re-examination, must not be filled until it is re-qualified or repaired.

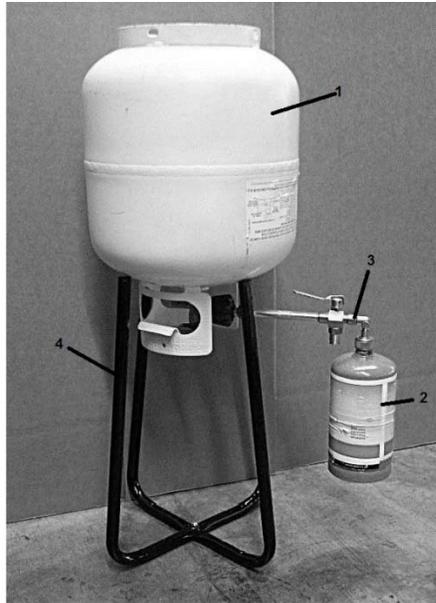
**!WARNING!**  
**NEVER PUT THE 1 LB REFILLABLE CYLINDER IN A FREEZER.**  
**NEVER USE A CYLINDER THAT HAS BEEN IN A FRIDGE OR**  
**FREEZER**

## 5.5 Cylinder Filling Procedure – Volume Method

### CAUTION

**Do not fill a cylinder that you consider to be unsafe, does not pass the pre-fill visual inspection or is out of date.**

The following photograph shows a 1 Lb. refillable propane cylinder connected to the 20 lb liquid propane supply cylinder ready to be filled.



- 1- Liquid supply cylinder
- 2- 1 lb. refillable cylinder
- 3- Fill assembly
- 4- cylinder stand

Propane cylinders equipped with a dip tube, such as the 1 lb. refillable propane cylinder, can be filled by the volume method. The maximum permitted liquid propane volume is 80%. This leaves a 20% vapor space for expansion of the liquid propane.

The supply cylinder service valve has a back check valve that prevents the flow of liquid propane until the back check is pushed open by the probe of the fill assembly connection. If the cylinder service valve is in the “open” position when you go to connect the fill assembly to the service valve you could be sprayed with liquid propane.

**WARNING**

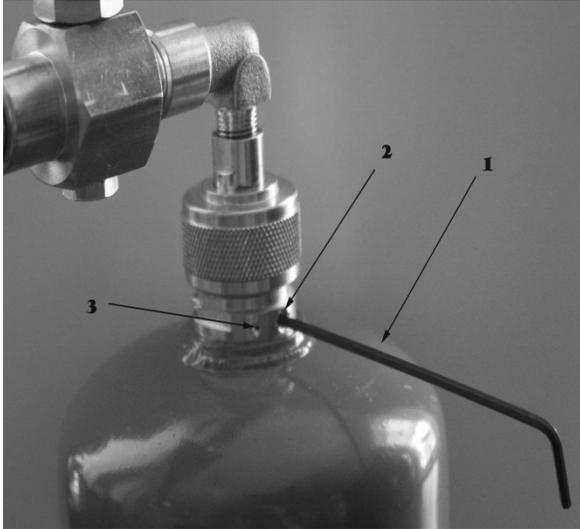
**Failure to ensure that the propane liquid supply cylinder service valve is in the “closed” position prior to connecting the fill assembly could result in being sprayed with liquid propane.**

**Warning**

**Failure to wear the proper protective clothing when filling the 1 lb. propane cylinder could result in freeze burns to exposed skin or creating an ignition source by arcing static electricity.**

1. Check to ensure that the supply cylinder service valve is in the closed position by turning the valve handle wheel clockwise until tight.
2. Make sure the cylinder stand is securely built and on a flat stable surface.
3. Turn the 20 lb ‘supply cylinder’ carefully upside-down into the cylinder stand.
4. Connect the liquid fill assembly to the supply cylinder service valve by turning the fill assembly’s knurled connector clockwise, hand tighten.
5. Remove the plastic cap and carrying handle from the 1 lb. refillable cylinder by turning the cap counterclockwise.
6. Line up the plastic guide and connect the 1 lb. refillable cylinder to the fill assembly by turning the fill assembly’s knurled connector clockwise, hand tighten.
7. Slowly open the supply cylinder service valve and check for leaks. Repair any leaks prior to proceeding.
8. Using the allen key wrench provided, open the fixed liquid level gauge valve by turning the allen key wrench counterclockwise.
9. Push down on the dead man valve to allow propane liquid to flow into the 1 lb. refillable propane cylinder.
10. When a white fog (liquid propane) is observed escaping from the fixed liquid level gauge bleed vent, immediately release the dead man valve handle to stop the flow of liquid propane into the 1 lb. cylinder.
11. Immediately close the fixed liquid level gauge valve of the 1 lb. propane cylinder by turning the allen key clockwise until the valve is closed, stopping the escape of propane.
12. Close the supply cylinder service valve by turning the valve handle clockwise until tight.
13. Slowly disconnect the 1 lb. refillable cylinder from the fill assembly, replace the plastic cap and carrying handle.

- Carefully lift the supply cylinder off of the stand and return to the right side up position. The cylinder must not be inverted on the stand for more than 10 minutes.



- Allen Key
- Fixed Liquid Level Gauge
- Fixed Liquid Level Gauge Bleed Port



Depressing Dead Man Valve to fill 1 lb. Cylinder

**WARNING**  
**NEVER USE A CYLINDER THAT IS LEAKING OR OVERFILLED**

If a cylinder is leaking or has been overfilled place outdoors in a secure well-ventilated area away from ignition sources etc., and contact your propane supplier for assistance in dealing with the problem.

**WARNING**  
**Never leave the 20 Lb propane cylinder in the inverted, upside-down position, for more than ten (10) minutes.**

## Review Questions Section 5 - Filling a 1 lb. propane cylinder

Please fill in the blanks

1. While propane is being transferred from one container to another, the person transferring must \_\_\_\_\_ at the \_\_\_\_\_ being filled.
2. The person filling the propane cylinder is responsible for ensuring that the maximum permitted \_\_\_\_\_ density is not \_\_\_\_\_ .
3. Refillable propane cylinders must be examined and requalified every \_\_\_\_\_ years starting with the date of manufacture.
4. A cylinder that is \_\_\_\_\_ , \_\_\_\_\_ , or \_\_\_\_\_ beyond DOT limits, or is due for a prescribed re-examination, must not be filled but shall be \_\_\_\_\_ from service.
5. If the supply cylinder service valve is in the “\_\_\_\_\_” position when you go to connect the fill assembly to the service valve you could be \_\_\_\_\_ with liquid propane.
6. When a \_\_\_\_\_ (liquid propane) is observed escaping from the fixed liquid level gauge bleed vent, \_\_\_\_\_ the dead man valve handle to stop the flow of liquid propane.
7. Close the fixed liquid level gauge valve by turning the \_\_\_\_\_ until the valve is shut stopping the \_\_\_\_\_ of propane.

## 6.0 Fire

**If a propane leaks happens a fire could occur. If this happens, leave the area immediately and call the fire department. Do not attempt to fight the fire unless you have been trained to do so.**