Propane Safety Guide Book

Propane is a safe, reliable fuel. Like other fuels, it is highly flammable and can be dangerous if not handled properly.

Unlike other fuels, it is a gas stored under pressure in liquid form. This adds a different dimension to storage and handling.

This guide will provide you with some basic information about propane and propane-powered lift trucks.

Read this guide now. Keep it in a handy place for future reference by you and your fellow employees.

THE PRESSURE CONDITION – AN IMPORTANT DIFFERENCE

Unlike gasoline, the propane in the gas cylinder on your lift truck is stored under pressure. This pressure works to our advantage. For instance, a fuel pump is not needed to move propane to the engine in your forklift.

When propane is stored and handled properly, it is a safe product. It will burn cleanly and efficiently at a steady rate and do useful work, such as power a forklift engine.

But in the event that a fuel system develops a leak, propane (under pressure) will become a gas, spread rapidly and create a potential hazard. A flame or spark could ignite the leaked propane. If that happens, a fire or an explosion could result. Although such occurrences are rare, we want you to be aware of the possibility.

As with any fuel or equipment, no matter how much safety is designed into the system, disregard for safe practices can creep into day-to-day operations.

Poor work practices cause far more accidents than equipment failures. YOU are the key! Safety is up to YOU! Learn and follow all recommended operating procedures – all the time, every time.

CHARACTERISTICS OF PROPANE GAS

1. At ordinary temperatures, propane is stored as a liquid under moderate pressure. For instance, the pressure of propane at 70°F is about 120 pounds per square inch (psi).

2. Pressures within the propane cylinder increase as the temperatures increase. When the propane temperature increases from 70°F to 80°F, the pressure increases from 120 psi to 140 psi.

3. Propane liquid expands rapidly in a cylinder when the temperature rises. The volume increases 1.5% for every 10°F rise in temperature. That's why propane containers should never be completely filled with liquid.

4. Propane liquid is only one-half the weight of water, burns cleanly and has an octane number near 100.

5. Propane is not poisonous; however, high concentrations in air can displace the oxygen supply. Oxygen starvation (asphyxia) could lead to unconsciousness and even death.

6. Propane liquid is colorless and odorless in its natural state. An odorant smell (a rotten egg smell) is added to propane for your protection and to aid in the detection of leaks.

7. Propane liquid is extremely volatile and will convert to a gas quickly if spilled into the atmosphere.

8. Propane vapor leaking into the atmosphere cannot always be detected by the eye.

9. Propane liquid leaking in the atmosphere can be smelled, heard (a "hissing" sound) or often seen as a white fog caused by freezing of moisture in the air.

10. Propane vapor is heavier than air and will accumulate in low spots. It will diffuse slowly into the atmosphere unless assisted by air current.

POTENTIAL HAZARDS OF USING PROPANE

1. Leaking propane may lead to one or more of the following incidents:

    a) Fire due to burning of the gas

    b) Explosion due to ignition of combustible mixture of gas and air in a confined space

    c) Asphyxiation due to the displacement of oxygen

    d) Freeze burn from direct contact of propane liquid with the skin

2. If a gas leak occurs, all possible sources of ignition must be considered and eliminated.

3. Direct contact with propane liquid produces rapid freezing of skin tissue and causes a “chemical burn” very similar to frostbite. (Wearing eye goggles and gloves which will repel liquid and long-sleeved shirts or coveralls is the best way to avoid exposure to the skin.)

4. Propane vapors are nontoxic, but they can reduce the oxygen content in an enclosed space. Oxygen starvation (asphyxia) often develops slowly, and the victim is often unaware that anything is wrong.

5. If a propane cylinder is heavily involved in a fire, it may rupture violently and without warning. Stay well clear of any fire involving a propane cylinder. A ruptured cylinder can take off like a rocket and cause major impact damage.

6. Study and understand the personal safety information contained in the hazard warning label (at right) or other warning labels on cylinders (and fuel dispensers).

7. Study and understand the safety information contained in the Safety Data Sheet for propane. Ask your supervisor for a copy.

JUST IN CASE: FIRST AID FOR FREEZE BURNS

Propane liquid vaporizes quickly and can cause extreme frostbite if it touches your skin. These procedures are recommended for severe freeze burn:

1. Remove any clothing on the burned area or which may inhibit flow of blood to the burned area. Rings, watches and all forms of jewelry must be removed immediately.
2. Immediately arrange for transportation to the nearest burn center or hospital emergency room. If burn centers are nearby, they are much preferred because of their special ability to deal with burns.
3. If possible, place the part of the body exposed to propane in a water bath of warm (105°F-115°F) water. Do not use hot water. Do not rub. Do not use hot water bottles or heat lamps.
4. Gently wrap the injured person with blankets if warm water is not available.
5. Offer hot coffee, warm water or hot tea as a stimulant.
6. Do not allow smoking or drinking of alcohol because these actions decrease blood flow in the burned tissue by constricting blood vessels.
7. Cover the burned area with dry sterile dressing or clean fabric before transportation to the hospital.

STORING PROPANE CYLINDERS PROPERLY

1. Gloves should be available at the cylinder storage site and used during cylinder handling.
2. Store propane cylinders in an authorized, secured, well-marked and ventilated area isolated from combustible materials.
3. Every time you handle a cylinder, always visually inspect top to bottom for leaks, dents, gouges, corrosion and damage or inoperative valves.
4. Do not drop, throw, roll, drag or otherwise abuse cylinders.
5. Cylinders in storage or not in use should have their service valves tightly closed in the off position.
6. Do not store cylinders near sources of heat, open flames or other sources of ignition, smoking areas, pits or low areas that would allow escaping propane vapors to collect.
7. Propane cylinders stored horizontally should be rotated so that the pressure relief valve is in the 12 o'clock position and always in contact with the vapor space (top) of the cylinder.
8. Empty cylinders should not be left lying around the workplace. Always return them immediately to a designated storage area.
9. Cylinders with leaks or that are defective in any way should be tagged, clearly indicating the problem.
10. Leaking or defective cylinders should be separated from serviceable cylinders and stored in designated, well- ventilated areas outdoors, away from any possible ignition sources and access by unauthorized personnel.
11. Utilize properly trained personnel to repair a propane cylinder. This is a job for propane professionals.

THE PROPANE CYLINDER AND ITS PARTS

A propane cylinder is constructed of either steel or aluminum. Cylinders are built to rigid specifications, established by the U.S. Department of Transportation (DOT). While durable, cylinders can be damaged if mishandled or abused. The purpose of the bottom foot ring is to keep the cylinder on firm footing when in a vertical position. The top head ring is designed to protect the fitting and valves from impact and damage.

A forklift cylinder may have some or all of the following valves and gauging devices:

1. **Filler Valve** - This valve is used for filling only and should be covered with a plastic cap, which is usually yellow in color.

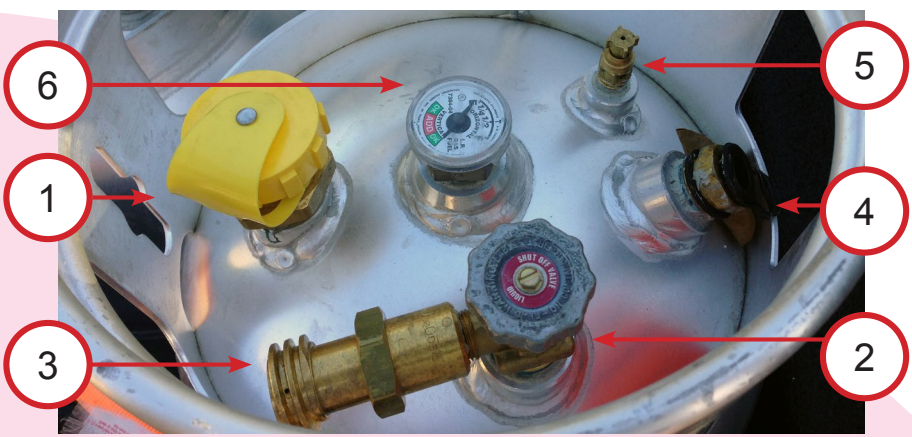
2. **Liquid Service Valve** - The cylinder may be filled through this valve, but the primary function is to provide a source of, and shutoff for, liquid propane to your lift truck engine.

3. **Connecting Coupling** - This is a fitting, sometimes referred to as the “quick connect,” which attaches to the liquid service valve. It closes in both directions when disconnected and allows you to connect and disconnect the propane cylinder from your lift truck safely, without tools and with minimum leakage.

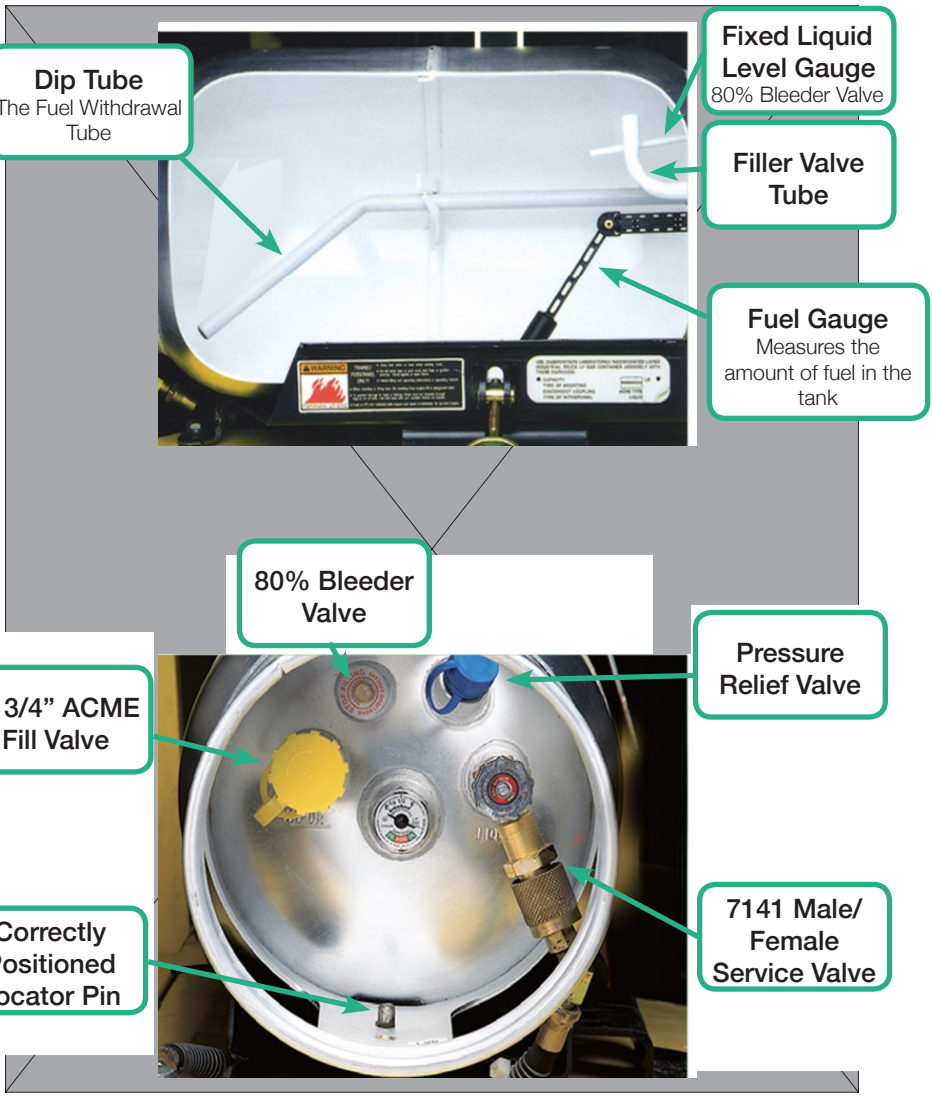
4. **Pressure Relief Valve** - This valve provides overpressure protection to the cylinder. It should be kept clean and unrestricted, and always in the 12 o’clock position when the cylinder is mounted horizontally on your truck. The valve should have a dust cap to prevent dirt and debris from clogging the valve.

5. **Fixed Liquid Level Gauge (80% Bleeder Valve)** - This small valve is used only when filling and can be closed or tightened by hand. It is also called an outage gauge.

6. **Fuel Gauge**



SAFETY FEATURES OF A CORRECTLY INSTALLED PROPANE CYLINDER



When the cylinder is positioned correctly, should the relief valve open, the propane would expel away from the driver. This propane release would be vapor, which reduces the amount of propane released.

HANDLING PROPANE CYLINDERS PROPERLY

1. **Never smoke** when carrying, connecting, disconnecting or working around the cylinder storage area.

2. **Use gloves and safety goggles** when handling propane cylinders to protect from possible effects of escaping liquid propane and to prevent injury to your fingers from pinches and sharp edges.

3. Each time you handle a cylinder, visually inspect top to bottom for:

   • Dents, scrapes and gouges.

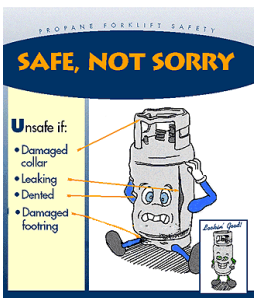
   • Damage to the valves.

   • Debris in the relief valve.

   • Damage to or loss of the relief valve cap.

   • Leakage at valves or threaded connections.

   • Damage or loss of gaskets and O-rings in filling and service connections.



   If any defects are found, tag the cylinder, remove it from service and place it in the area reserved for unserviceable cylinders.

4. Propane cylinders can be damaged by rough handling and should not be dropped, thrown, rolled or dragged.

5. Protect your back and use proper lifting techniques when lifting propane cylinders. Cylinders are heavy.

6. When transporting cylinders, secure them in the transporting cart or vehicle by racks, chains or web strapping.

DISCONNECTING REMOVABLE PROPANE CYLINDERS FROM LIFT TRUCKS

1. **Always use gloves and goggles** to protect from possible injury from escaping liquid propane.
2. **Turn off** the engine ignition switch.
3. **Close service valve** on the cylinder.
4. **Loosen the quick connector coupling**. Be aware that there may be a momentary hiss as a small amount of gas is released. Do not disconnect the coupling until the fuel in the line is consumed and the engine stops running. When the engine stops, loosen the quick connector coupling.
5. **Unlatch** the cylinder tie-down bracket.
6. **Remove the empty cylinder** and carry it to the proper storage location. Be careful when lifting because cylinders are heavy.
7. **Never drop, throw, roll** or otherwise abuse propane cylinders, whether full or empty.
8. **If you discover any problem** with the propane cylinder during your shift, be sure the cylinder is removed from service and tagged, and your supervisor is notified.

CONNECTING REMOVABLE PROPANE CYLINDERS TO LIFT TRUCKS

1. Always use gloves and goggles to protect yourself from possible injury due to escaping liquid propane.
2. Remove a full cylinder from the storage area. Visually inspect the cylinder top to bottom for defects such as leaks, dents, gouges, excessive corrosion and valve damage. Do not use a defective cylinder.
3. Look into the male quick connector to make sure that both the flat gasket and O-ring are in place. If either is missing, replace the missing gasket or O-ring before using the cylinder.
4. Perform this safety check only if you are outdoors and with the valve opening pointed away from any person or source of ignition.

   Valve Safety Check: Quickly open and close the liquid service valve. If there is a burst of gas from the male quick connector, do not use the cylinder. A cylinder which fails this check has an inoperative or leaking internal flow check valve. Be sure to tag it as “defective quick connector” and place it in the proper area for leaking, defective or unserviceable cylinders.
5. Position the cylinder on the bracket alignment pin.
6. Latch the cylinder mounting straps.
7. Inspect the fuel hose to make certain it is free from cuts, abrasions, blistering and soft spots and has not been exposed to excessive heat from the exhaust manifold. Do not operate a lift truck with a defective engine fuel hose.
8. Make sure service valve is turned to the “OFF” position.
9. Fasten the quick connector coupling to the cylinder. Tighten the coupling with quick turns, but do not overtighten or use tools. Be aware that there may be a hiss of gas during the tightening process; however, continue to tighten the connection until snug.
10. Slowly open the liquid service valve a quarter turn, listening and looking for any leaks.
11. If no leaks are noted, open the valve completely.
12. Start engine and resume your work.

What to Do if You Detect a Leak

1. Shut down the lift truck engine and all nearby sources of ignition.

2. If safe to do so, close the cylinder valve.

3. Warn nearby personnel and evacuate the immediate area.

4. Ventilate the area and allow the propane vapors to dissipate.

5. Do not return to the leak site if you can either see leaking gas fumes or smell the propane.

6. If you suspect a leak but are uncertain, use a water-soap solution for leak detection. Never use a match or open flame.

SOME OTHER DOS AND DON'TS

DO

1. Do keep the service valve closed on propane cylinders at all times except when the lift truck is in use.
2. Do keep the service valve closed when the lift truck is parked overnight or stored indoors for an extended period of time.
3. Do keep used cylinders in the proper storage area and not scattered around the facility.
4. Do call the fire department at the first indication of a propane fire.

DON'T

1. Don't park or store a propane lift truck in a trailer or other enclosed area unless the liquid valve is closed and the engine is operated until it stops from fuel starvation. This procedure evacuates all fuel from the fuel lines.
2. Don't smoke or use matches or other open flames around forklift truck cylinder storage areas or while handling forklift truck propane cylinders.
3. Don't use a cylinder with the service valve hand wheel missing.
4. Don't extinguish a propane-fed fire unless you can shut off the source of the gas.
5. Don't use a leaking or defective propane cylinder.
6. Don't park your propane-powered lift truck overnight or for extended periods of time in the air flow of a heating unit or near an infrared heater.
7. Don't tamper with or try to repair a leaking or damaged propane valve or cylinder. Cylinders needing repair should be returned to a qualified facility.

NOTES: