Pressure Vessels (Air Compressors) and LPG Tanks

1. **Identification of Workplace Hazard**

Any container, tank or vessel that contains pressurized material is a potential hazard to employees due to the force of sudden release of pressure as well as the possible flammability hazard of fuel gases and oxygen. Cal/OSHA standards contain specific safety requirements for such materials including, in certain cases, permitting. Employees must be particularly diligent in following proper operating procedures and safety practices when handling and working with compressed gases and pressurized storage systems.

2. **Management and Trainer Information**

The following information summarizes information from Cal/OSHA standards on pressurized material safety.

**Compressed gases used in welding and cutting**

Gas welding and cutting operations are governed by a number of Cal/OSHA standards which include requirements for:

- Establishing safe operating procedures for welding operations:
  1. Inspecting welding equipment at the beginning of every work shift including hoses and torches.
  2. Using friction lighter, never matches, to light torches.
  3. Closing the cylinder valve and purging lines before removing regulators from the cylinder.
  4. Ensuring that combustibles and flammables are removed from welding areas or, if moving them is not possible, ensuring that they are well shielded from heat and sparks.

**Oxygen and Acetylene Gas Cylinder Storage and Handling**

The cylinder storage and handling standard sets forth requirements for safely handling and storing gas cylinders, including:

- Cylinders must be stored in safe, accessible and well ventilated areas where they are protected from external heat sources.
- Inside building cylinders must be stored at least 20 feet from highly combustible materials such as oil or excelsior.
- Storage spaces should be assigned for the cylinders and the storage location must protect cylinders from physical damage.
- Valve caps must be in place on cylinders unless they are in use.
- Regulators may remain on cylinders only if cylinders are securely fastened to a cart when being moved.
- Gas cylinders in portable service must be securely fastened to a truck or cart. Stationary cylinders also must be securely fastened to racks or other rigid structures.
All gas cylinders in storage for future use, must be stored in an upright position and fastened to a fixed object in a manner to prevent their rolling, falling, or tipping.

Oxygen and acetylene must be stored separately. Oxygen cylinders must be separated from fuel gas cylinders by at least 20 feet or by a non-combustible barrier at least 5 feet high and having a fire resistance of at least one-half hour.

Air Compressor and Pressure Vessels

The Air Compressor/Pressure Vessel Standard requires that all compressor air tanks with volumes greater than 1.5 cubic feet or any tank that contains pressures in excess of 150 pounds per square inch (psi) be permitted before use. The permit must be posted in a conspicuous place on or near the tank. It requires further that all such pressurized tanks requiring a permit to operate shall be inspected by a qualified inspector internally and externally at least once every three years for portable tanks and once every five years for all other tanks and re-permitted in this same frequency. Permits are issued by Cal/OSHA’s Pressure Vessel Unit.

Use of Compressed Air

Cal/OSHA standards for use of compressed air are designed to protect employees from flying particles. The requirements include:

1. The use of compressed air shall be so controlled, and proper personal protective equipment (PPE) or safeguards used to protect against the possibility of eye or body injury to the operator or other workers. This includes a pressure control nozzle that regulates air pressure to 30 psi for air blowing operations except as stated below.

2. Compressed air or gases in excess of 10 pounds per square inch may not be used to blow dirt, chips or dust from clothing while it is being worn.

Liquified Petroleum Gas (LPG) Tank Requirements

Equipment and Permit Requirements for LPG Tanks

LPG tanks must be permitted by Cal/OSHA before use. The permit must be posted in a conspicuous place on or near each tank or at least in a weatherproof container secured to the unit. Tanks requiring a permit to operate must be inspected by a qualified inspector at least once every five years. In addition to permit and inspection requirements, Cal/OSHA has established various criteria for operating procedures, delivery piping systems, illumination of work areas, and other requirements for liquified petroleum gas (LPG) systems.

Electrical and Lighting Requirements

1. Seals must be in place on electrical conduits running from the LPG tanks (designated as Class 1, Division II locations by Cal/OSHA) into unclassified areas away from the tanks.

2. All areas where LPG transfer is undertaken must be appropriately illuminated if filling of tanks is to be carried out at night.
LPG System Hose Specifications

Hoses used for transfer of LPG gas must be made of or lined with materials that are resistant to the effects of LPG gas, such as stainless steel. The hoses must be designed for a bursting pressure of 1,250 psi. Hose connections must be designed to the same bursting pressure and must be maintained in good condition. Hoses of 1/2 inch diameter or less must be marked every five feet with the letters "LPG". Hoses over 1/2 inch diameter must be marked every five feet with the words "LPG - Gas" followed by the manufacturer's name or trademark. Responsible personnel should periodically check all LPG system hoses and connections to ensure they meet the above specifications and that the hoses and connections are free of corrosion, cracks or other problems. Deficient hoses should be replaced at once.

Tank Location and Protection Requirements

LPG tanks must be located at least 10 feet from any important building, sidewalk, public highway or road. The tank must be installed on firm masonry or concrete foundations. When used, metallic structural supports must be encased in concrete when the distance between the lower surface of the tank and the foundation exceeds 18 inches.

In addition, the tank must be protected from impact from vehicles by means of crash posts. These posts must be at least 3 feet aboveground with a minimum of 2 feet below ground, be at least 4 inches in diameter and filled with concrete. Posts must be no more than 5 feet apart on center and must be at least 3 feet from the tank.

A fire extinguisher having a rating of at least 16 ABC must be available and ready for use.

Safe Operating Procedures

At least one qualified attendant properly trained, must remain at the controls at all times while transfer of the LPG is undertaken. This attendant must be provided with a set of written instructions for the transfer operation and must have satisfactorily completed the transfer at least three full cycles during training. The training of the attendant and the minimum experience requirements must be documented. The written operating instructions must be conspicuously posted (usually on the tank) and must include at a minimum the following rules:

1. Suitable gloves must be worn during transfer of pressurized materials.
2. Tanks and cylinders not in compliance with OSHA requirements must not be filled.
3. The vehicle/forklift engine must be shut off during filling.
4. All other sources of ignition on the vehicle/forklift must be shut off.
5. The vehicle/forklift hand or emergency brake must be set.
6. The filling connection must be made before the manual shut-off valve(s) is/are opened.
7. If filling by volume, the stop-filling valve must be opened not more than two turns.
8. The attendant must stand by the filling control during transfer.
9. Tanks and cylinders must not be overfilled. The filling connection valve must be closed immediately when liquid appears.
(10) When the transfer is complete, the pump is stopped and the stop-filling valve is closed.

(11) The filling connection must be backed off not more than one turn. Do not disconnect until bleeding through vent hole in the connection stops.

(12) Close manual shut-off valve(s).

(13) Replace cap on filling connection of filled tank or cylinder or replace vehicle fuel connection hose securely into the cylinder.

(14) Recheck stop-filling valve to make sure it is securely closed.

3. Employee Safe Work Practices

Employees should be required to comply with the following safe work practices when working with pressurized systems:

**Compressed Gases**

(1) Never use a gas welding or cutting system unless you have been authorized or trained in its safe use.

(2) Inspect welding and cutting equipment at the beginning of every work shift, including hoses and torches.

(3) Make sure that gas bottles are securely fastened to a stationary object or to their carts.

(4) Use only a friction lighter to light torches.

(5) Close cylinder valves and purge lines before removing regulators from the cylinder.

(6) Remove or protect any combustible materials from areas where welding or cutting is performed.

(7) Protect cylinders from physical damage from falling and being struck by securely chaining them in a protected area.

(8) Make sure caps are on unused cylinders and that valves are securely closed.

(9) Keep oxygen and fuel gases well separated by distance or by a wall.

**Compressed Air**

(1) Make sure that proper pressure reduction jets are in place on all air hose nozzles used for blowing objects (30 psi) and blowing off personnel (10 psi).

(2) Wear appropriate eye and face protection when blowing with compressed air.

**LPG Tanks**

(1) Do not smoke or use any potential ignition source near an LPG tank.

(2) Inspect all hoses and connections to determine that they are free of cracks, corrosion or other defects.
(3) Use care in operating vehicles, including forklifts, around LPG tanks.

(4) When transferring LPG fuel from the supply tank, follow the operating procedures posted on or near the tank. Do not attempt to transfer LPG if you have not been trained in these procedures and authorized by the employer to do so.

4. Items Subject to Periodic Scheduled Inspections

The employer's periodic scheduled inspections should consider the following items during workplace inspections as described in Step 5.

Compressed Gases

(1) Are all employees involved in gas welding, cutting and compressed cylinder handling trained in safety procedures?

(2) Are all gas bottles observed securely fastened to a storage rack, cart or other stationary object?

(3) Are all gas bottles not in use securely valved off and caps in place if not connected to regulators?

(4) Are oxygen and full gas cylinders adequately separated by distance or a fire resistant barrier?

(5) Are combustible materials a safe distance away from gas welding or cutting or oxygen bottles?

(6) Are hoses, connection, valves and regulators, and torches in good condition?

Compressed Air

(1) Are appropriate pressure reduction nozzles on air hoses used for blowing and cleaning?

(2) Are the air compressor tank or other pressure vessel permits posted and current, if required?

LPG Tanks

(1) Is the LPG tank's permit posted and current?

(2) Is the LPG tank installation in good condition? Consider footings, crash posts, lighting and electrical connections.

(3) Are operating procedures posted on or near the tank and are they legible?

(4) Is there at least one 16 ABC fire extinguisher available and ready for use?

(5) Are operators trained in safe operating procedures?

(6) Do operators follow safe operating procedures?