Section 37.0
COMPRESSED GAS AND COMPRESSED AIR EQUIPMENT

A. Purpose

The purpose of this procedure is to establish guidelines for the safe use and handling of compressed gas cylinders and equipment by **JAGUAR ENERGY SERVICES, LLC** personnel.

Familiarity with the appropriate care, use, handling, and storage of compressed gas cylinders and equipment is essential to maintain a safe work environment.

This will also help **JAGUAR ENERGY SERVICES, LLC** comply with OSHA 1910.166-168.

B. Scope

This procedure applies to all work locations both **JAGUAR ENERGY SERVICES, LLC** and clients.

C. Responsibilities

1. The Safety Coordinator or his/her designee is responsible for ensuring that employees have completed the training required by this procedure.
   - (a) Additional responsibilities include:
     - (i) The implementation of this Policy.
     - (ii) Take corrective actions on all violations or suspected violations of this procedure.
     - (iii) Documentation of completion by each employee.

2. The Supervisor is responsible for providing assistance in the implementation of this policy.

3. **JAGUAR ENERGY SERVICES, LLC** personnel are responsible for implementing the training that they received on compressed gas and compressed air equipment.

D. Procedure

1. Compressed Gas Hazards

Compressed gases expose workers to both chemical and physical hazards.

(a) Gases contained within compressed gas cylinders can be toxic, flammable, oxidizing, corrosive, inert, or some combination thereof.

(b) Chemicals in pressurized gaseous form can quickly contaminate a large area in the event of a leak in the cylinder or hoses.

(c) In addition to chemical hazards, the amount of energy resulting from compressing gas makes a compressed gas cylinder potentially explosive**.**

2. General Requirements

(a) The contents of the gas cylinders should be clearly identified. Color coding is not a reliable means of identification.

- (i) Do not deface or remove any markings, tags or stencil marks used by the vendor for identification.
- (ii) Cylinders that do not bear a legibly written, stamped, or stenciled identification of the contents should not be used.
- (iii) Unmarked cylinders must be segregated and returned to the vendor as soon as possible.
- (iv) Cylinder caps should be kept on the cylinder except when the cylinder is in use.
- (v) Cylinder caps should be screwed all the way down on the cylinder neck and should fit securely.
- (vi) The cylinder cap is for valve protection only.

(b) If a cylinder containing poison gas is leaking, immediately leave the area and close any doors.

- (i) Notify appropriate emergency personnel.
- (ii) The supplier should be contacted for disposal of the cylinder once the emergency situation is stabilized.

(c) If a cylinder containing flammable or oxidizing gas is leaking, follow the same steps as number three above.

(i) If possible, turn off all sources of ignition in the area before leaving.

(d) If a cylinder containing an inert gas is leaking, leave the area and notify appropriate emergency personnel.

(i) The cylinder should be placed in a well-ventilated location, preferably an outdoor cylinder storage area, and the vendor contacted for removal.

(e) Do not transfer compressed gases from one commercial cylinder to another.

3. Moving and Transporting Cylinders

(a) Always use a suitable hand truck or similar device.

(i) The cylinder must be firmly secured for transporting and unloading.

(ii) Do not roll or drag a cylinder to move it or allow cylinders to strike each other or any other surface.

(b) Cylinder caps must be secured when moving cylinders.

(i) Do not lift or move a cylinder by the cap.

(c) Ropes or slings should be not be used to suspend cylinders unless the vendor has made provisions for such lifting and attachment points are provided on the cylinder.

4. Storing Cylinders

(a) All cylinder storage areas must be prominently marked with the hazard class or the name of the gases to be stored.

(i) For example: *Flammable Gas Storage Area* or *No Smoking* signs should be posted and observed.

(b) Always secure gas cylinders upright (valve end up) to a wall, cylinder hand truck, cylinder rack, or post, unless the cylinder is specifically designed to be stored otherwise.

(c) Where gases of different types are stored at the same location, cylinders (empty or full) should be grouped by the type of gas, for example, flammable, oxidizer or corrosive.

(i) Inert gases can be stored with any other type of gas.

(d) Full cylinders should be stored separately from empty cylinders.

(e) Cylinders should be used by the "first in, first out" guideline.

(f) Cylinders should be stored in a well-ventilated area away from sparks, flames, or any source of heat or ignition.

(g) Cylinders may be stored outside on a slab, however, cylinders should be stored so that they are protected from the direct rays of the sun.

(i) Do not expose cylinders to temperatures above 125 ^{O}F (51.2. ^{O}C).

(h) Cylinders should not be exposed to continuous dampness, stored salt, or other corrosive chemicals or fumes.

(i) Corrosion can damage cylinders and cause valve protection caps to stick.

(j) Cylinders containing corrosive chemicals should be periodically checked to ensure that the valve has not corroded.

(k) Avoid prolonged storage of cylinders in corridors.

(l) Never store cylinders in elevator lobbies, stair towers or any other locations that could obstruct the safe exit pathway of the building occupants.

5. General Use Precautions

(a) Do not use compressed gas cylinders for any purpose other than the transportation and supply of gas.

(b) Do not attempt to remove a stuck cap by using a lever in the cap ports.

(i) The lever may accidentally open the valve when the cap turns.

(c) Do not place cylinders where they might become part of an electric circuit or allow them to come into contact with an electrically energized system.

(d) Use soapy water or leak detection equipment to search for leaks in a gas transport system.

6. Using Compressed Gases

(a) Before using a compressed gas, read all associated information such as labels and data sheets.

(b) Do not permit oil or grease to come in contact with cylinder cap threads, cylinders or their valves, especially cylinders containing oxidizing gases.

(c) Open cylinder valves slowly.

(i) Point the valve opening away from yourself and others.

(ii) Never use a wrench or hammer to open or close a hand wheel type cylinder valve.

(iii) If the valve is frozen and cannot be operated by hand, return the cylinder to the vendor.

(d) Never completely empty a rented gas cylinder; discontinue use of the cylinder when it has at least 25 psi remaining.

(i) Mark the cylinder so that others know that it is nearly empty, for example, write *MT* on a piece of tape and stick it on the cylinder.

(ii) Close the valve and secure the cylinder valve protective cap and outlet cap or plug, if used.

7. Special Precautions For Using Flammable Gases

In addition to the above Using Compressed Gases guidelines, the following measures should be taken when handling flammable gases.

(a) Cylinders containing flammable gases (empty or full) should be separated from cylinders containing oxidizing gases by a minimum distance of 20 feet (6.1 meters) or by a barrier at least 5 feet (1.5 meters) high that has a fire-resistance rating of at least one-half hour, for example, a concrete block wall.

(b) Do not store flammable or oxidizing gases near highly flammable solvents, combustible materials, or unprotected electrical connections, gas flames, or any other source of ignition.

(c) It is preferable to store flammable gases in a ventilated, fire resistant enclosure such as an approved gas cabinet.

(i) If this is not possible, flammable gas cylinders should be stored in a well-ventilated space.

(d) The quantity of flammable gases in a work area should be kept to a minimum.

(i) A maximum of three full-size cylinders of flammable gas are permitted in a work area.

(e) It is preferable to use flow restrictors or surge protectors on flammable gas cylinders so that there cannot be a sudden large flow of gas if a rupture or other unexpected release happens in the system.

8. Special Precautions For Using Poison Gases

In addition to the above Using Compressed Gases guidelines, the following measures should be taken when handling poison gases.

(a) Poison gases must be stored in a ventilated enclosure such as an approved gas cabinet or fume hood.

(b) Gas detection systems may be required in work areas utilizing poison gases.

(i) Contact the Safety Director or the client representative if you are unsure.

(c) Keep the quantity of poison gas in a work area to a minimum.

(d) Flow restrictors are required on most poison gas cylinders.

(e) Ensure that pressure-relief devices vent directly to an exhaust system or a safe location.

9. Special Precautions For Using Oxygen and Oxidizing Gases

In addition to the above Using Compressed Gases guidelines, the following measures should be taken when handling oxidizing gases:

(a) Do not permit oil or grease to come in contact with cylinders or their valves, especially cylinders containing oxidizing gases.

(i) Explosions may occur when a pressurized oxidizer such as oxygen comes into contact with grease or oil.

(ii) Regulators and tubing used with oxidizing gases must be specially cleaned to remove oil and other reducing agents.

(b) Cylinders containing oxygen or oxidizing gases (empty or full) should be separated from cylinders containing flammable gases by a minimum distance of 20 feet (6.1 meters) or by a barrier at least 5 feet (1.5 meters) high, that has a fire-resistance rating of at least one-half hour, for example, a concrete block wall.

(c) Do not store oxidizing gases near highly flammable solvents, combustible materials, or unprotected electrical connections, gas flames, or any other source of ignition.

10. Compressed Air Equipment

(a) In the workplace, compressed air is second only to electricity as a source of power and energy.

(b) Compressed air is used in automotive repair shops to lift vehicles, operate a variety of power tools such as impact wrenches, blow dirt and debris, and inflate tires.

(c) In customer plants, compressed air can be piped throughout a facility to feed a variety of machinery and power tools.

(d) Because the use of compressed air is so widespread, the various hazards associated with its use have the potential to affect a large number of workers.

(e) Following compressed air equipment safety rules and guidelines can prevent needless injury.

11. Blowing Dirt and Debris

(a) The practice of using compressed air to blow dirt and debris can lead to worker injury and also cause housekeeping problems.

(i) This practice can pose a serious hazard to workers, especially when employees blow their hair or face area and the air gun is accidentally moved in line with the ear or eye.

(ii) It only takes about 10% of the air pressure normally available for a worker to seriously injure an eardrum or eye, and these body parts are particularly vulnerable to foreign matter being blown into them by compressed air.

(iii) The most serious (and potentially fatal) risk is an air bubble being forced under the skin and making its way into the bloodstream.

(b) Although it may be very quick to blow metal chips off a drill press table with an air gun, the chips end up on the floor.

(i) Brushing chips into a container is a better idea, improves housekeeping, reduces clean-up time and eliminates the risk of a chip being blow into an eye.

(c) A drill press can also be very quickly cleared of shavings by blowing the machine with an air gun, but the operator has little control over where the dust settles.

(i) Filling a work area with fine particles of dust does not improve working conditions, and will eventually create a serious fire/explosion hazard if the dust is allowed to accumulate on walls and ceilings.

(ii) Vacuuming up the debris with an appropriate vacuum or dust collection system is safer and takes less time in the long run.

12. Dirty Air

A compressed air line feed must be installed correctly and periodically cleaned.

(a) Compressed air that contains dirt, oil and other debris can cause machine malfunctions which, in turn, can result in personal injuries, product damage, machine or tool damage, and down time.

13. Explosions

Explosions can be caused when pressures become higher than the equipment was designed to withstand.

(a) Explosions can lead to dangerous equipment failures and serious personal injuries.
    (i) Damage to tools from abuse, such as dropping them on the floor, may weaken the tool enough to cause it to explode.

(b) Most installations include four components between the air line and the tool or machine.
    (i) The filter is intended to remove dirt and particles from the air.
        (i) Filters must be kept clean.
        (ii) During humid weather, water can accumulate and must be drained, perhaps daily.
    (ii) The lubricator is intended to add oil to the compressed air to lubricate any moving parts within the machine or tool.
        (i) Oil must be added to the lubricator in order to prevent damage.
    (iii) The regulator is intended to control the pressure to the tool or machine.
        (i) Regulators are adjustable and must be properly set.
        (ii) Failure to properly install or adjust the air pressure regulator can cause an explosion due to excessive pressure.
    (iv) The pressure gauge is intended to provide a visual reading of the pressure level being sent to the tool or machine

14. Excessive Oil

When compressed air operated equipment requires lubricated air, excessive oil mist may be present in the air the worker breathes.

(a) The oil from the air lubricator is usually exhausted into the atmosphere at the machine or tool.

(b) Recent studies and air sampling have shown that these oil levels can exceed acceptable limits.
    (i) However, there will usually be some evidence of this problem as the oil will accumulate on walls, machines and fixtures, and floors will become slippery.

15. Noise-Induced Hearing Loss.

Compressed air operated equipment often generates sufficient noise levels to warrant the wearing of personal protective equipment, such as ear plugs or muffs.

(a) Mufflers are effective in reducing noise levels from machines but are not practical on most tools. (x-ref Hearing Conservation)

16. Lockout/Tagout

Lockout/tagout can be more difficult with air components than with electrical or hydraulic components.

(a) Some air cylinders are powered in one direction with air pressure and in the opposite direction with spring pressure.

(b) Others may be air powered in both directions.

(c) When machine jams occur, releasing all stored energy may not be possible until the jam is cleared.

(d) Once a jam is cleared, sudden and unexpected machine movements can be hazardous to those workers clearing the jam.

(e) Provisions should be made to dissipate or bleed stored air, and the source of the air should be locked in the off position when this takes place. (x-ref Lockout Tagout)

17. Specific Requirements For Compressed Air Equipment

(a) If a cylinder or valve is corroded, or has other damage that might impair the integrity of the cylinder, the vendor should be contacted and the cylinder taken out of service.

(b) All gas lines leading from a gas cylinder should be labeled clearly to identify the gas carried.

(c) Never tamper with or attempt to repair or alter cylinders, valves or any safety relief devices.

(i) Return cylinders to the vendor for all repairs.

(d) Use pressure regulators that are equipped with pressure relief devices where the cylinder contents are admitted to a system of lower pressure rating than the cylinder.

(e) Before attaching cylinders to a connection, be sure the threads and the connection mate are of a type intended for gas service.

(f) The threads and mating surfaces of regulator and hose connections should be cleaned before the regulator is attached.

(i) Wipe the outlet with a clean, dry, lint-free cloth.

(ii) Particulates can clog the regulator filter (if so equipped) or cause the regulator to malfunction.

(g) Always use the proper regulator for the gas in the cylinder. Always check the regulator before attaching it to a cylinder.
  (i) If the connections do not fit together readily, the wrong regulator is being used.

(h) Attach the regulator securely with the secondary valve closed and preferably with the regulator flow backed off (counterclockwise).

(i) Always use a cylinder wrench or other tightly fitting wrench to tighten the regulator nut and tube connections.
  (i) Use "backup" wrenches to minimize stress on tubing and fittings where appropriate.

(j) Never use teflon tape on cylinder connections or tube-fitting connections.
  (i) Use Teflon tape only on pipe threads where the seal is made at the threads.
  (ii) All other connections have metal to metal face seals or gasket seals.

(k) Before a regulator is removed from a cylinder, close the cylinder valve and release all pressure from the regulator.

18. General Requirements For Compressed Air Equipment

(a) Never use compressed air or gas to blow particles off yourself.

(b) Compressed air must not be used for cleaning purposes except where reduced to less than 30 p.s.i. and then only with effective chip guarding and personal protective equipment (x-ref Personal Protective Equipment).

(c) Never use natural gas or nitrogen as a substitute for compressed air to power pneumatic tools.

(d) Compressed air should never be transported through PVC tubing or piping.

E. Training Requirements

1. **JAGUAR ENERGY SERVICES, LLC** personnel will be trained on the following topics:
  (a) Hazards of compressed gas cylinders.
  (b) Moving and transporting compressed gas cylinders.
  (c) Proper storage of compressed gas cylinders.
  (d) Compressed air equipment safety.
  (e) Contents of this procedure.

F. Training Frequency

1. **JAGUAR ENERGY SERVICES, LLC** personnel will be trained according to the following schedule:
   (a) Initially upon hire.
   (b) As necessary thereafter.