



Compressed Gas Use and Storage Program

Purpose

Fayetteville State University has developed this program to cover general procedures for the safe handling and storage of all compressed gas cylinders and provide recommended safe practices for the handling, storage, and transport of cylinders.

Applicability

This shall apply to all students, faculty, staff, and contractors on the FSU campus that use, handle, store, or transport compressed gas cylinders.

Scope

This standard shall apply to the management of compressed gases found on university property or under the control of university operations in leased space. This standard shall not apply to compressed gases that have been deemed waste and are being handled under the University's hazardous waste management program.

Definitions

Asphyxiant gas: A gas, usually inert, that may cause suffocation by displacing the oxygen in the air necessary to sustain life or is labeled by the DOT as Division 2.2.

Authorized person: An employee who has received proper training and PPE to safely work with compressed gases.

Compressed Gas: Any gas or mixture of gases in a container having a pressure exceeding 40 PSI at 70°F; or regardless of the pressure at 70°F, having a pressure exceeding 104 psi at 130°F; or any liquid having an absolute vapor pressure exceeding 40 psi at 100°F. Compressed gases can be toxic, flammable, oxidizing, corrosive or inert. In the event of a leak, inert gases can quickly displace air in a large area creating an oxygen-deficient atmosphere, toxic gases can create poison atmospheres and flammable or reactive gases can result in fire and exploding cylinders.

Corrosive gas: A gas that causes visible destruction of, or irreversible alternations in, living tissue by chemical action at the point of contact or is labeled by the DOT as Division 2.3 and Division 8 (Corrosive).

Cryogenic Fluid: A refrigerated liquefied gas having a boiling point colder than -90 °C (130 °F) at 14.7 psi, or which the DOT requires the Division 2.2 label for non-flammable, non-poisonous compressed gas-including compressed gas, liquefied gas, pressurized cryogenic gas, compressed gas in solution, asphyxiant gas and oxidizing gas.

Cylinder: Generally, a compressed gas container having a maximum water capacity of 1,000 pounds of approximately equivalent to 120 gallons.

Flammable gas: A gas that, at ambient temperature and pressure, forms a flammable mixture with air at a concentration of 13 percent by volume or less; or, a gas that, at ambient temperature and pressure, forms a range of flammable mixtures with air greater than 12 percent by volume, regardless of the lower limit; or, one for which the DOT requires their red flammable gas label or is labeled as Division 2.1.

Flammable (Explosive) Limits / Flammable (Explosive) Range – The terms flammable and explosive are used interchangeably since unconfined vapors mixed in air will burn while confined vapors will produce an explosion. The minimum vapor concentration in air that, when ignited, will propagate a flame is the lower flammable limit (LFL or LEL). The maximum vapor concentration in air that when ignited will propagate a flame is the upper flammable or explosive limit (UFL or UEL).

Ignition source: Anything that provides heat, sparks, or flame sufficient to cause combustion or explosion.

Inert gas: Gases that do not readily react with other chemicals.

Oxidizer gas: A gas that is non-flammable but can support and vigorously accelerate combustion in the presence of an ignition source and a fuel or is labeled by the DOT as Division 2.2 and Division 5.1 (Oxidizer).

Pressure Regulator: A device used to prevent the pressure from rising above a predetermined maximum, thereby, preventing rupture of a normally charged cylinder when subjected to a standard fire test.

Restrictive Flow Orifice: A safety device placed in the outlet of a cylinder valve that is intended to limit the release rate of a hazardous gas in the event of unplanned opening of the valve, or failure of the system.

Toxic gas: A gas that has median lethal concentration in air of 2,000 parts per million or less by volume of gas; or gas which the DOT requires the white poison label or is labeled as Division 2.3 “ Gas poisonous by inhalation” because it is known to be so toxic to humans as to pose a hazard to health during transportation; or a gas that has an NFPA health Hazard Rating of 3 (Toxic) or 4 (highly Toxic).

Valve Protection Cap: A rigid removable cover provided for container valve protection during handling, transportation, and storage.

Roles & Responsibilities

EHS Officer / Professional is responsible for the following:

- Ensures that a written program is in place
- Inspects and monitors work areas to ensure compliance with this program
- Coordinates training for applicable employees on compressed gas use and storage
- Revise these guidelines as needed

Manager/Supervisor is responsible for the following:

- Ensures that employees complete required training prior use and storage of compressed gases
- Ensures employees using compressed gases are provided appropriate equipment and personal protective equipment to complete job safely

- Provide proper storage for compressed gases

Authorized Employees are responsible for the following:

- Complying with this program
- Follow all storage and use requirements
- Report deficiencies in storage and use to supervisors
- Immediately report releases to supervisors
- Ensure containers are properly labeled and disposed

Contractors are responsible for the following:

- All contractors hired to use compressed gases at FSU shall have their own written compressed gas use and storage program that fulfills all regulatory requirements or follow the guidance in this program

Implementation

Inspection Procedures

- Compressed gas cylinders should be inspected as necessary to ensure they are fit for use (See Attachment 1). Compressed gas cylinders should be visually inspected at the time of delivery and as necessary thereafter, depending on the manufacturer's recommendations.
- Inspections of cylinders should be conducted in accordance with the following applicable standards:
 1. 49 CFR 171-179 – Department of Transportation Hazardous Materials Regulations
 2. Compressed Gas Association (CGA) Pamphlet C-6-1968 – Standards for Visual Inspection of Steel Compressed Gas Cylinders
- If a cylinder is found to be unfit for use, it must be taken out of service and returned to the manufacturer for repair or disposal.

Labeling

- All compressed gases received, used or stored must be labeled according to the Department of Transportation and Occupational Safety and Health Administration.
 1. Each cylinder must be marked by label or tag with the name of its contents. Such identification shall be stenciled or stamped on the cylinder or placed on a label.
 2. Do not accept cylinders without the appropriate labels.
 3. Never rely on the color of the cylinder for identification. Cylinder colors may vary depending on the supplier.
 4. Labels on caps have little value because caps are interchangeable.
 5. All gas lines leading from a compressed gas supply shall be clearly labeled to identify the gas.
 6. Storage areas shall be prominently posted with the hazard class or the name of the gases stored.

General Precautions

- There are two types of hazards associated with the use, storage and handling of compressed gas cylinders: the chemical hazards associated with the cylinder contents (corrosive, toxic, flammable, etc.) and the physical hazard represented by the presence of a high-pressure vessel.
- Compressed gas cylinders shall only be handled by those familiar with the hazards and who understand how to safely handle, transport, and storage compressed gas cylinders. Safety Data Sheets (SDS) must

be obtained and maintained for all compressed gases. Before using any compressed gas, be familiar with the respective Safety Data Sheet (SDS) for the gas being used.

- When using compressed gas cylinders, the following precautions shall be followed at all times:
 1. Only properly trained employees shall handle and/or use compressed gas cylinders.
 2. Cylinders shall not be used as rollers, supports, or for any purpose other than to contain and use the contents as received.
 3. Employees and other personnel shall keep all open flames and heat sources away from medical oxygen tanks, oxygen machines or concentrators, and oxygen tubing.
 4. Repair or alternation of compressed gas cylinders is prohibited.
 5. Cylinders shall not be placed where they might become part of an electrical circuit. When compressed gas containers are used in conjunction with electric welding, they shall not be grounded or used for grounding.
 6. Compressed gas containers shall not be exposed to temperature extremes.
 7. If compressed gas containers have been exposed to fire, contact the supplier immediately.
 8. All tubing shall be periodically checked for integrity. If tubing is damaged, cracked, or missing, it shall be removed from service until properly repaired or replaced.
 9. When a container or valve is noticeably corroded, dented, cut, damaged, or involved in an accident, notify the supplier.
 10. Gases are not to be transferred from one vessel to another (except dry ice and cryogenic materials). Do not try to refill a compressed gas cylinder.
 11. Disposable gas cylinders, including lecture bottles, shall not be refilled. It is against US DOT regulations to refill or reuse a disposable gas cylinder.

Handling Procedures

- Compressed gas cylinders are considered to be handled when an FSU faculty/staff member performs tasks including filling, changing gas service, connecting, maintaining, and moving cylinders.
- Compressed gas cylinders should be handled only by employees familiar with the hazards and who can demonstrate safety precautions working with cylinders. Compressed gas cylinders are heavy and awkward to move. Improper handling can result in injuries. Other hazards such as fire, explosion, chemical burns, poison, and cold burns can occur due to mishandling.
- The following precautions must be taken when handling compressed gas cylinders.
 1. Wear the appropriate PPE.
 2. Move cylinders using a suitable hand truck or cart
 3. Cylinders must always be transported on wheeled cylinder carts with retaining straps or chains.
 4. Do not drag a cylinder over a few feet necessary to position the cylinder. Rolling short distances is permitted only along the bottom rim.
 5. Compressed gas cylinders must be transported with protective caps in place. Do not lift the cylinder by the protective cap.
 6. Avoid dropping the cylinder; do not tamper with pressure-relief devices or remove any labeling or shipping hazard labels.
 7. Do not allow grease or oil to come in contact with oxygen cylinder valves, regulator, gauges, or fittings. Oxygen cylinders and apparatus must be handled with clean hands and tools.
 8. Open cylinder valves slowly, directed away from your face.
 9. Do not attempt to refill compressed gas cylinders unless fully trained to do so.
 10. Never drop, bang, or strike cylinders against each other or other objects.
 11. Regulators shall be removed, and valve protection caps put in place before the cylinder is moved.
 12. Do not subject cylinders to rough handling or abuse.

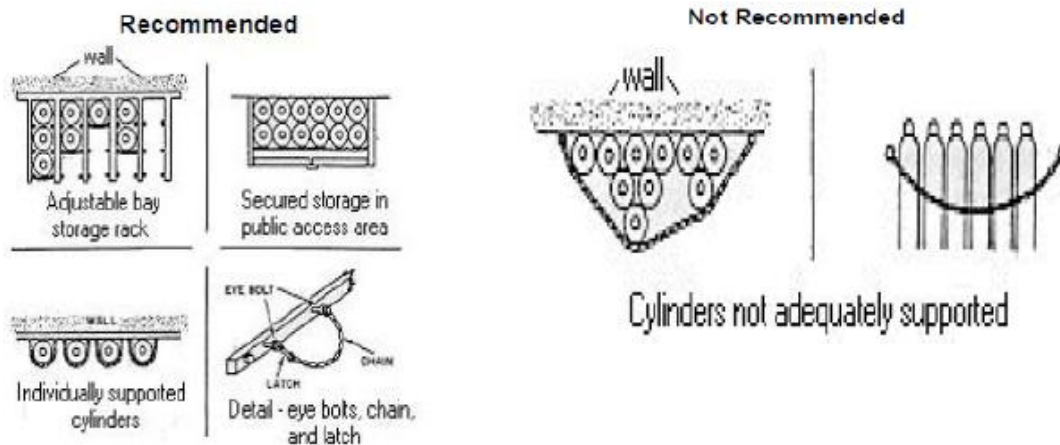
13. Only one cylinder shall be handled at a time unless a two-cylinder cart is used, and each cylinder is rechained by its own chain.
14. Cylinders shall only be transported in freight/cargo elevators when they are available. Passenger elevators shall only be used when freight/cargo elevators are not present in the building.

Storage Procedures

- Compressed gas cylinders must be properly stored to prevent injury in the case of a container breach.
- The following precautions must be taken during the storage of compressed gas cylinders.
 1. Signage is required at compressed gas cylinder storage locations including:



2. Cylinders must be stored in a cool, dry, well ventilated area.
3. Cylinders must be stored upright, with caps in place, and secured by chains, straps, or in racks to prevent falling/tipping.
 - a Cylinders must be secured in one or more of the following methods.
 - i By a noncombustible, two-point restraint system (chain) that secures that cylinder. Nesting of cylinders is not an approved method that can be used to secure cylinders. Individual cylinders can use a bracket or saddle for support means.
 - ii By a noncombustible rack, framework, cabinet, approved strapping device, security to a cylinder cart or other substantial means that prevents the cylinder from falling.
 - iii Straps must surround the cylinder approximately 1/2 to 1/3 of the height of the cylinder measured from the floor.



4. Segregate cylinders in storage by contents (See Attachment 2).

5. Do not expose cylinders to corrosive materials such as corrosive gas or other combustible materials.
6. Segregate full and empty cylinders; use the first in, first out inventory control method.
7. Store cylinders away from heavily trafficked areas and emergency exits.
8. Visually inspect stored cylinders on a routine basis to identify problems before an emergency occurs.
9. All cylinder storage areas, outside or inside, must be protected from extreme heat and cold and from access by unauthorized personnel. Prevent indoor or outdoor temperatures from exceeding 125°F.
10. Cylinders should be labeled full or empty when in storage.
11. Greasy and oily materials must never be stored around oxygen cylinders and fittings must never be greased or oiled.

Usage Procedures

- The following precautions must be used to prevent injuries caused by the improper use of compressed gases and cylinders.
 1. Know and understand the hazards associated with the gases and equipment being used.
 2. Use only regulators approved for the gases and cylinders in use.
 3. Never mix gases in a cylinder.
 4. Do not allow cylinders to become part of an electrical circuit.
 5. Use non-sparking tools (brass) when working with flammable/explosive materials.
 6. Prevent sparks and flames from contacting cylinders.
 7. Do not discharge the contents from any gas cylinder directly towards people.
 8. Open cylinder valves slowly and carefully after the cylinder has been connected.
 9. Never use compressed gases in a confined space.
 10. Never work alone when using a compressed gas.
 11. Never use compressed gas to dust off equipment or clothing.

Tubing and Piping Connections

- Hazardous gases must be dispensed using systems that are properly designed and compatible with the gas in use. Tubing and piping must be burst resistant with a burst pressure twice the maximum pressure on the second stage regulator.
- The following should be followed regarding tubing and piping for compressed gas use.
 1. Hard piping is the preferred method of piping for compressed gas use. Piping should be copper or stainless steel. Cast iron is not acceptable for use with compressed gases. Flexible tubing can be used in approved applications.
 - a When flexible must be used, select tubing compatible with the gas in use. Flexible tubing is not for use with highly toxic gases. Flexible tubing can only be used within “line of sight”. Do not run flexible tubing through walls, ceiling spaces, doorways or other non-visible pathways.
 - b Always clamp flexible tubing connections. Use a clamp approved for the maximum allowable pressure that the connection is subject to. Never use wire, which may cut the tubing.
 - c Flexible tubing deteriorates with age or exposure to chemicals or UV light. Inspect tubing regularly and replace when wearing is noticed.
 - d Do not use Teflon tape on pipe threads where the seal is made at the threads. Compressed gas connections have metal to metal seals or gaskets seals.
 - e Leak-check tubing or piping connections when using hazardous gas.
 - f Secure and support tubing or piping to keep it in place and to prevent injuries from whipping if the connection fails under pressure.

Regulators and Valves

- Regulators reduce high pressure gas on a cylinder to a lower usable level. Regulators provide additional safety measures by preventing fire/explosions and exposure to chemicals or cold burns.
- Ensure the appropriate regulator is selected for the compressed gas in use. It must be compatible and operate at the appropriate pressures.
- Most compressed gas cylinders will be equipped with a valve to release gas from the cylinder. The cylinder valve is the most vulnerable part of the compressed gas cylinder. Leaks can also occur at the valve, cylinder stem and the hose connection.
- Check valves are mechanical valves that permit gases and liquids to flow in only one direction, preventing reverse flow. Common types of valves include, check, ball, disk, butterfly, gas, diaphragm, needle and solenoid and can be constructed of plastic, stainless steel, or other material. Ensure the proper check valve is selected for the compressed gas in use and the operations taking place.
 1. If a valve becomes noisy or hard to turn, the cylinder should be taken out of service, capped and repaired before putting back into use.
- A flash arrestor prevents ignition sources from reaching regulator and cylinder for flammables.
- Excess flow valves restrict flow in the event of a gas line break.

Oxygen-Fuel Welding Gas Storage

- Cylinders shall be kept away from radiators and other sources of heat.
- Inside of buildings, cylinders shall be stored in a well-protected, well-ventilated, dry location, at least 20 feet from highly combustible materials such as oil.
- Cylinders shall be stored in assigned places away from elevators, stairs, or gangways.
- Assigned storage spaces shall be located where cylinders will not be knocked over or damaged by passing or falling objects, or subject to tampering by unauthorized persons.
- Cylinders shall not be kept in unventilated enclosures such as lockers and cupboards.
- Empty cylinders shall have their valves closed.
- Valve protection caps, where cylinder is designed to accept a cap, shall always be in place, hand-tight, except when cylinders are in use or connected for use.
- Fuel-gas cylinder storage inside a building, except those in actual use or attached ready for use, shall be limited to a total gas capacity of 2,000 cubic feet or 300 pounds of liquefied petroleum gas.
- For storage in excess of 2,000 cubic feet total gas capacity or 300 pounds of liquefied petroleum gas, a separate room or compartment shall be provided, or cylinders shall be kept outside or in a special building.
- Acetylene cylinders shall be stored valve end up.
- Oxygen and acetylene may be stored together if it is reasonably anticipated that the gas will be used in the next 24 hours.

Other Considerations for Compressed Gas Cylinders

- Restrictive Flow Orifices (RFOs): Used in conjunction with high purity, highly hazardous or pyrophoric compressed gas applications to limit the potential danger of an uncontrolled flow from a compressed gas cylinder. An RFO can cut the flow rate by a factor of 100 to add an extra level of safety in the event of an uncontrolled release.

- Rupture Disc: A non-reclosing pressure relief device that protects a pressure vessel, such as a compressed gas cylinder from over pressurization or potentially damaging vacuum conditions. A rupture disc is designed to provide a leak-bursts preventing damage to the equipment from overpressure.
- Compressed gas users must be informed and knowledgeable of the types of gases being used, the hazards associated with those gases, and the necessary safety components required for their use at all times.

Disposal of Cylinders

- When disposing or returning gas cylinders that following shall apply:
 1. Close and tighten valves and replace valve caps on cylinders when they are empty.
 2. Contact the supplier/vendor to obtain guidelines for the shipment of cylinders to be returned.
 3. Cylinders of corrosive or unstable gases shall be returned to the vendor when the expiration date or the maximum recommended retention period has been reached.

Compressed Gas Types

Asphyxiant Gases

- Do not store asphyxiant gases in areas without ventilation. This includes environmental chambers that do not have a fresh air supply or exhaust system.
- An oxygen detection device must be present when the calculated oxygen concentration is less than 18% if the full contents of the cylinder were released
- Any gas that has the potential to displace oxygen in enough quantities can cause asphyxiation. Only persons trained and qualified in the use of a self-contained breathing apparatus (SCBA) with adequate back-up shall respond to an inert gas leak or enter an area where an asphyxiant gas could be present. Shut off the source of the gas leak if there is no risk to personnel and ventilate the area. If a person has symptoms of asphyxiation, move the victim to fresh air and obtain proper medical attention.

Corrosive gases:

Some common examples of corrosive gases include ammonia, hydrogen chloride, chlorine, and methylamine.

- Keep exposure to gas as low as possible. Use in a fume hood or other vented enclosure when possible. Avoid contact with skin and eyes.
- An emergency shower and eyewash must be installed within 10 seconds where corrosive materials, including corrosive gases are used.

Cryogenic liquids:

Cryogenic liquids and their boil-off vapors rapidly freeze human tissue and cause embrittlement of many common materials which may crack or fracture under stress. All cryogenic liquids produce large volumes of gas when they vaporize (at ratios of 600:1 to 1440:1, gas: liquids) and may create oxygen-deficient conditions.

Examples of common cryogenic liquids include liquid nitrogen, oxygen, hydrogen, and helium. The following information applies to the use and handling of cryogenics:

- Wear face shield and chemical safety goggles when dispensing from cylinder or dewar.
- Wear appropriate insulated gloves to protect from the extreme cold when handling cryogenic containers. Gloves need to be loose fitting so that they can be readily removed in the event liquid is splashed into them. Never allow an unprotected part of the body to touch uninsulated pipes or containers of cryogenic material.

- Keep liquid oxygen containers, piping, and equipment clean and free of grease, oil, and organic materials.
- Do not store cylinders or dewars in environmental chambers that do not have fresh air ventilation. A leak or venting from the container could cause an oxygen deficient atmosphere.
- First aid treatment for cold-contact burns
 1. Remove any clothing not frozen to the skin that may restrict circulation to the frozen area. Do not rub frozen parts, as tissue damage may result. Obtain medical assistance as soon as possible.
 2. Place the affected part of the body in a 100 - 105°F warm water bath (not to exceed 44°C or 112°F).
 3. Do not use dry heat.

Flammable gases:

Some common examples of flammable gases include acetylene, hydrogen, methane, propane, and isobutane.

- Flammable gases such as propane, hydrogen, and acetylene always have a red Flammable Gas label. Do not use the color of the cylinder as an indicator of hazard type.
- Users should be knowledgeable of the flammable range of flammable gases. For example, Hydrogen Lower Flammable Limit (LFL) = 4%; Upper Flammable Limit (UFL) = 75%.
- Users must know the auto-ignition temperature for flammable gases in use and ensure temperatures do not reach this point.
- Flammable gases must be segregated from oxidizing gases.
- Flammable gases must be stored in well-ventilated areas away from flammable liquids, combustible materials, oxidizers, open flames, sparks or other sources of heat or ignition.
- A portable fire extinguisher (carbon dioxide or dry chemical powder type) must be available for fire emergencies where flammable gas is stored.
- “Flow” experiments with flammable gases are not to be left unattended; an explosimeter or combustible gas alarm must be used.
- Spark-proof tools shall be used when working with flammable gas cylinders.
- All lines and equipment associated with flammable gas systems must be bonded and grounded and acetylene shall not be utilized in lines or hoses at a pressure exceeding 15 psi.

Inert gases:

- Inert gases such as Nitrogen is a gas that makes up 78% of the atmosphere, is a dry, colorless and odorless gas; it is nonflammable and noncorrosive. Inert gases can displace oxygen in an enclosed space.
- Inert gases can be vented in occupied spaces if adequate ventilation is supplied to the area. This includes hallways and loading docks.

Oxidizing gases:

Some common examples of oxidizing gases include oxygen or nitrous oxide.

- Oxidizing gases such as compressed oxygen or nitrous oxide, while not combustible, will cause many materials to burn violently.
- Oxygen is not compressed air.
- All equipment used for oxidizing gases must be cleaned with oxygen compatible materials free from oils, greases, and other contaminants. Do not handle the cylinder with oily hands or gloves.
- Keep oxygen cylinders away from all heat sources, including radiators, heat ducts, stoves, fireplaces, matches, and lighters.
- Do not permit open flames, sparks, or burning material in the area where oxygen is being used.
- Never use oxygen as a substitute as “compressed air” to run pneumatic tools, in oil heating burners, to start internal combustion engines, to blow out pipelines, or to create pressure for ventilation.

- Oxygen cylinder valves should be opened all the way during use.
- Do not smoke when oxygen or fuel gases are present.

Pyrophoric gases:

Some common examples of pyrophoric gases include arsine, silane, and phosgene.

- Must be stored in a suitable exhausted location or ventilated cylinder storage cabinet.
- If a pyrophoric cylinder is found leaking, the area must be evacuated, and emergency services utilized

Toxic gases:

- Toxic gases shall not be stored or used outside of laboratories.
- Large cylinders of toxic gases must be stored in gas cabinets, exhausted enclosures, or gas rooms.
- A gas detection system with visible and audible alarms to detect the presence of leaks must be installed for all toxic gases that exceeds the maximum allowable quantities.
- Toxic gas use is approved only in well ventilated applications.
- Respirator use may be necessary when toxic gases are used in a process.

Emergency Procedures

Emergencies involving compressed gas cylinders may arise due to fire threatening the cylinder; toxic gas leaks; inert gas leaks resulting in low oxygen within a room; or unplanned chemical or other reaction.

- Most leaks occur at the valve and valve stem fittings, typically due to dirt/debris in the fitting. For small leaks, tighten fittings to attempt to rectify the problem. If leaks do not stop, remove the cylinder from service and properly repair.

If a cylinder is involved in an emergency, such as a fire, evacuate the area; do not attempt to move the cylinders during an emergency; and notify emergency responders of the cylinder location and contents.

Information & Training

All applicable students and employees will be trained in the proper use and storage of compressed gases. Training shall include:

- Cylinder identification
- Cylinder inspection
- Cylinder handling, storage, and use
- Cylinder transportation

Recordkeeping

The **EHS Officer / Professional** will:

- Provide Compressed Gas Use and Storage training and be responsible for maintaining training records. Records will include names of the individuals trained, type of training, date of training, and name of the trainer.

Annual Review























The Compressed Gas Use and Storage Program will be reviewed by the **EHS Officer / Professional**. The annual review will include current training and any documents associated with this program. When new tasks, procedures, and/or positions are added or modified/revised which affect compressed gases, the Compressed Gas Use and Storage Program will be updated immediately to reflect these changes.



Compressed Gas Cylinder Inspection Checklist

#	Inspection Items	Yes	No
1.	Are cylinders stored in upright positions and immobilized by chains or other means to prevent them from being knocked over? [CGA 3.4.4 and 29 CFR 1910.101(b)] Note: Tragic accidents have occurred when a cylinder was knocked over, damaging the cylinder and turning it into a rocket.		
2.	Are cylinders stored away from highly flammable substances such as oil, gasoline, or waste? [CGA 3.3.6]		
3.	Are cylinders stored away from electrical connections, gas flames or other sources of ignition, and substances such as flammable solvents and combustible waste material? [CGA 3.5.1]		
4.	Are flammable gases separated from oxidizing gases in storage areas? [CGA 3.3.3] Note: Acetylene and propane cylinders should be separated from oxygen cylinders when not in use.		
5.	Are oxygen and fuel gas cylinders separated by a minimum of 20 feet when in storage? [CGA 3.5.3] Note: A fire-resistant partition between the cylinders can also be used.		
6.	Are storage rooms for cylinders dry, cool, and well-ventilated? [CGA 3.3.5] Note: The storage rooms should be fire resistant and the storage should not be in subsurface locations. Cylinders should be stored in secure areas at temperatures below 125°F, away from radiators or other sources of heat.		
7.	Are cylinders stored away from incompatibles, excessive heat, continuous dampness, salt or other corrosive chemicals, and any areas that may subject them to damage? [CGA 3.3.7 and 29 CFR 1910.101(b)] Note: Rusting will damage the cylinder and may cause the valve protection cap to stick.		
8.	Is the storage area permanently posted with the names of the gases stored in the cylinders? [CGA 3.3.2 and 29 CFR 1910.101(b)]		
9.	Do all compressed gas cylinders have their contents and precautionary labeling clearly marked on their exteriors? [29 CFR 1910.101(b)]		
10.	Are all compressed gas cylinder valve covers in place when cylinders are not in use? [29 CFR 1910.101(b)]		
11.	Are all compressed gas cylinders stored so they do not interfere with exit paths? [29 CFR 1910.101(b)]		
12.	Are all compressed gas cylinders subjected to periodic hydrostatic testing and interior inspection? [29 CFR 1910.101(a)] Note: This is normally done by the supplier.		
13.	Do all compressed gas cylinders have safety pressure relief valves? [29 CFR 1910.101(c)]		
14.	Are cylinders always maintained at temperatures below 125°F? [CGA 3.1.12] Note: A flame should never come in contact with any part of a compressed gas cylinder.		
15.	Are safety relief devices in the valve or on the cylinder free from any indication of tampering? [CGA 3.1.14]		
16.	Is repair or alteration to the cylinder, valve, or safety relief devices prohibited? [CGA 3.1.15] Note: All alterations and repairs to the cylinder and valve must be made by the compressed gas vendor. Modification of safety relief devices beyond the tank or regulator should only be made by a competent person appointed by management.		

17.	Is painting cylinders without authorization by the owner prohibited? [CGA 3.1.20] Note: Often color codes are used to help designate cylinders. Arbitrary paint is not recommended.		
18.	Are charged or full cylinders labeled and stored away from empty cylinders? [CGA 3.3.4 and 29 CFR 1910.101(b)]		
19.	Is the bottom of the cylinder protected from the ground to prevent rusting? [CGA 3.3.9]		
20.	Are all compressed gas cylinders regularly inspected for corrosion, pitting, cuts, gouges, digs, bulges, neck defects and general distortion? [29 CFR 1910.101(a)]		
21.	Are cylinder valves closed at all times, except when the valve is in use? [CGA 3.1.15] Note: Regulator diaphragms have failed, and unwanted gas was delivered to an area or apparatus, causing safety and health problems.		
22.	Are compressed gas cylinders always moved, even short distances, by a suitable hand truck? [CGA 3.2.6] Note: They must never be dragged across the floor. Serious accidents have occurred when a cylinder with a regulator in place was improperly moved. The cylinder fell, causing the regulator to shear off, and the cylinder rocketed through several brick walls.		
23.	Is using wrenches or other tools for opening and closing valves prohibited? [CGA 3.4.9] Note: Hammering on valve wheels to open them should be strictly prohibited. For valves that are hard to open, contact the supplier for instruction.		
24.	Is suitable pressure regulating devices in use whenever the gas is emitted to systems with pressure-rated limitations lower than the cylinder pressure? [CGA 3.4.5]		
25.	Are all compressed gas cylinder connections such as pressure regulators, manifolds, hoses, gauges, and relief valves checked for integrity and tightness? [29 CFR 1910.101(a)]		
26.	Are all compressed gas cylinders regularly subjected to leak detection using an approved leak detecting liquid? [29 CFR 1910.101(a)] Note: Ordinary soap solution may contain oils that are unsafe when used with oxygen cylinders. Leak detection liquids are available from commercial welding supply houses.		
27.	Is an approved leak-detection liquid used to detect flammable gas leaks? [CGA 3.5.2] Note: A flame should never be used.		
28.	Are procedures established for when a compressed gas cylinder leak cannot be remedied by simply tightening the valve? [CGA 3.1.6] The procedures should include the following: <ul style="list-style-type: none"> a. Attach tag to the cylinder stating it is unserviceable. b. Remove cylinder to a well ventilated out of doors location. c. If the gas is flammable or toxic, place an appropriate sign at the cylinder warning of these hazards. d. Notify the gas supplier and follow his/her instructions as to the return of the cylinder. 		
29.	Are students/employees prohibited from using compressed gases (air) to clean clothing or work surfaces? [29 CFR 1910.101(b)]		
30.	Are compressed gases only handled by experienced and properly trained people? [CGA 3.4.1]		

DANGEROUS GOODS & COMBUSTIBLE LIQUIDS STORAGE COMPATIBILITY CHART														
Class or Subsidiary Risk														
FLAMMABLE GASES		OK TO STORE TOGETHER	OK TO STORE TOGETHER	SEGREGATE At least 3m	SEGREGATE At least 3m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 3m	ISOLATE	SEGREGATE At least 3m	SEGREGATE At least 5m
NON TOXIC NON FLAMMABLE GASES		OK TO STORE TOGETHER	OK TO STORE TOGETHER	OK TO STORE TOGETHER	OK TO STORE TOGETHER	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 3m	ISOLATE	SEGREGATE At least 3m	SEGREGATE At least 5m
TOXIC GAS		SEGREGATE At least 3m	OK TO STORE TOGETHER	MAY NOT BE COMPATIBLE CHECK MSDS AND NOTES	SEGREGATE At least 3m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 3m	ISOLATE	SEGREGATE At least 3m	SEGREGATE At least 5m
OXIDIZING GAS		SEGREGATE At least 3m	OK TO STORE TOGETHER	SEGREGATE At least 3m	OK TO STORE TOGETHER	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 3m	ISOLATE	SEGREGATE At least 3m	SEGREGATE At least 5m
FLAMMABLE LIQUIDS + COMBUSTIBLE LIQUIDS		SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	OK TO STORE TOGETHER	SEGREGATE At least 3m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	ISOLATE	SEGREGATE At least 5m	SEGREGATE At least 3m
FLAMMABLE SOLID		SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 3m	OK TO STORE TOGETHER	SEGREGATE At least 3m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 3m	ISOLATE	SEGREGATE At least 3m	MAY NOT BE COMPATIBLE CHECK MSDS AND NOTES
SPONTANEOUSLY COMBUSTIBLE		SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 3m	OK TO STORE TOGETHER	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	ISOLATE	SEGREGATE At least 3m	SEGREGATE At least 3m
DANGEROUS WHEN WET		SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	OK TO STORE TOGETHER	SEGREGATE At least 5m	SEGREGATE At least 5m	ISOLATE	SEGREGATE At least 3m	SEGREGATE At least 5m
OXIDIZING AGENT		SEGREGATE At least 3m	SEGREGATE At least 3m	SEGREGATE At least 3m	SEGREGATE At least 3m	SEGREGATE At least 5m	KEEP APART	SEGREGATE At least 5m	SEGREGATE At least 5m	SEGREGATE At least 5m	MAY NOT BE COMPATIBLE CHECK MSDS AND NOTES	ISOLATE	SEGREGATE At least 3m	SEGREGATE At least 3m
ORGANIC PEROXIDE		ISOLATE	ISOLATE	ISOLATE	ISOLATE	ISOLATE	ISOLATE	ISOLATE	ISOLATE	ISOLATE	ISOLATE	OK TO STORE TOGETHER	ISOLATE	SEGREGATE At least 3m