Compressed Gas Cylinder Safety Program

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Revision History

Revision Number	Revision Date	Revised By	Description of Change
00	7/29/2019	Juliette Jones	Initial creation and implementation.
01	9/10/2020	Selvin McLean	Document review against federal register for updates. No new items posted.
02	4/8/2022	Selvin McLean	Document update; update to links, references and definitions.
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Introduction

Florida Institute of Technology (Florida Tech) is committed to providing a safe and healthful environment for all employees, students, and visitors.

Florida Tech Environmental Health and Safety (EHS) has developed this program to cover procedures for and provide recommended safe practices for the handling, storage and transport of compressed gas cylinders. This program applies to all Florida Tech faculty and staff that use, handle, store or transport compressed gas cylinders.

This Plan has been developed in accordance with the regulations set forth in the Occupational Safety and Health Administration's (OSHA), 29 CFR 1910 Subpart H.

Responsibilities

Environmental Health and Safety (EHS)

- Developing the written Compressed Gas Cylinder Safety Program and revising the program as necessary.
- Assist departments/supervisors with initial and refresher training and written instructions for the care, use and storage of compressed gas cylinders.
- Conduct periodic inspections and evaluations to determine the continued effectiveness of the program.

Department Leads/Employee Supervisors

- Understanding and complying with the requirements of the Compressed Gas Cylinder Safety Program.
- Provide training for employees.
- Enforce the care, use and storage procedures of compressed gas cylinders as outlined in this program.
- Maintain current inventory of gas cylinders and contents.

Employees

- Completing training as necessary.
- Comply with the procedures outline within the Florida Tech's Compressed Gas Cylinder Safety Program.
- Use, handle, and store compressed gas cylinders in accordance with the instructions and training received.

Definitions

Compressed Gas: Any gas or mixture of gases in a container having a pressure exceeding 40 psi at 70°F (21.1°C), or a pressure exceeding 104 psi at 130°F (54.4°C) regardless of the pressure at 70°F (21.1°C), or a liquid having a vapor pressure exceeding 40 psi at 100 °F (37.8 °C) as determined by ASTM D-323-72.

Compress Gas Standards: https://www.osha.gov/compressed-gas-equipment/standards

Corrosive Gas: A gas that can cause visible destruction of, or irreversible alterations in, living tissue (e.g., skin, eyes, or respiratory system) by chemical action.

Cryogenic Liquids: Gases condensed to liquid form at extremely low temperatures. The term "cryogenics" applies to all temperatures less than –238°F (–150°C).

Cylinder: A compressed gas container having a maximum water capacity of 1,000 lbs. (453.6 kg) or approximately 120 gallons (454.2 L).

Flammable gas: A gas that can be ignited in air.

Handling: Moving, connecting or disconnecting a compressed or liquefied gas container under normal conditions of use.

Hazardous gas: A gas that is included in one or more of the following hazard categories: corrosive, flammable, health hazard, oxidizer, pyrophoric, reactive, or toxic.

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

Oxidizing gas: A gas that initiates or promotes combustion in materials, either by catching fire itself or by causing a fire through the release of oxygen or other gases.

Pressure Regulator: A pressure and/or temperature activated 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.

Toxic gas: A gas that is poisonous or capable of causing injury or death, especially by chemical means.

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

Program Components

Personal Protective Equipment (PPE)

The general requirements for the use of personal protective equipment (PPE) while handling or using compressed gases include but are not limited to the following.

1. Eye protection – required any time compressed gases are handled or used.
2. Foot protection – required when moving or handling compressed gas cylinders.
3. Hand and body protection – to protect against cold exposure, corrosives and pinch points.
4. Respiratory protection – may be required depending on the type of gas being used and the procedures being used with the gas.

Inspection

When a gas cylinder is delivered or as necessary thereafter (consult manufacturer's recommendations), it shall be inspected by the user for the following:

1. A stamped hydrostatic test date within the last five years,
2. A labeled identification of its contents,
3. Presence of a valve protection cap; and,
4. Signs of damage or leakage.

If the test date, identification, markings or cap are not in order, if the cap is rusted or inoperable, or if the cylinder is damaged it shall be rejected and immediately returned to supplier.

Labeling

All compressed gases received, used or stored must be labeled with the name of its contents. Do not accept cylinders without the appropriate labels.

Never rely on the color of the cylinder for identification. Cylinder colors may vary depending on the supplier, and labels on caps have little value because caps are interchangeable. All gas lines leading from a compressed gas supply shall be clearly labeled to identify the gas.

When a cylinder becomes empty, it must be marked EMPTY and stored apart from full cylinders while waiting to be removed with valve closed and valve cap in place.

Storage areas shall be prominently posted with the hazard class (i.e., flammable, oxidizer, corrosive, toxic) or the name of the gases stored. The area must be locked and secured from unauthorized access.

General Rules

Compressed gas cylinders pose chemical hazards associated with the cylinder's contents (corrosive, toxic, flammable, etc.) and physical hazards due to the presence of a high-pressure vessel. 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 and the possible hazards the contents pose.

The following are general rules for usage of compressed gas cylinders.

1. Compressed gas cylinders must only be used by trained employees.
2. Do not use cylinder as rollers, supports, or for any purpose other than to contain and use the contents within.
3. Keep all open flames and heat sources away from oxygen tanks and tubing.
4. Do not repair or alter gas cylinders.
5. Do not place cylinders near electrical hazards or in places where they may complete a circuit. Do not ground cylinders used for welding.
6. Do not expose cylinders to high temperatures or flame. If compressed gas cylinders have been exposed to fire, contact the supplier immediately.
7. Inspect gas tubing regularly. If tubing is damaged, cracked, or missing, it shall be removed from service until properly repaired or replaced.
8. When a container or valve is noticeably corroded, dented, cut, damaged, or involved in an accident, notify the supplier immediately.
9. Do not transfer gases from one container to another (except dry ice and cryogenic materials). Do not try to refill a compressed gas cylinder. Never mix gases in a cylinder.

Handling

Handling includes but is not limited to tasks such as usage of gas, connection to tubing, and transporting cylinders. When handling compressed gas cylinders, one must:

1. Wear the required PPE when handling cylinders.
2. Move cylinders only using a suitable hand truck or cart. Do not try to lift, carry, or drag cylinders.
3. Rolling short distances is permitted only along the bottom rim and only for position into a storage/usage position or for moving onto a hand truck/cart for cylinders.
4. Cylinders must always be upright (with valve up) and be securely fastened to prevent them from falling or being knocked over. Suitable racks, straps, chains, or stands are required to support cylinders.
5. An upright position shall include conditions where the cylinder is inclined as much as 45 degrees from the vertical.
6. Never drop, bang, or strike cylinders against each other or other objects.
7. All tanks should have their regulators removed and their valve protection caps on when in storage and during transportation. Do not lift or move the cylinder by the cap.
8. Do not subject cylinders to rough handling or abuse.
9. Only one cylinder shall be handled at a time unless a two-cylinder cart is available for use and each cylinder is restrained by its own chain/strap.
10. 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.

Caps and Regulators

Use the valve protection caps when cylinders are not in use. Tighten the cap only hand tight: do not overtighten or force.

Do not access the gas in a cylinder without a regulator. Regulators are gas specific and are generally not interchangeable. Make sure that the regulator and valve fittings are compatible, and always check the threads of regulators and valves for grease and oil before attaching. Do not use if oil, grease, or damage is present. Remove and store in protective covering when not in use.

Tubing and Connections

Tubing used in gas connections must be burst resistant to twice the maximum pressure on a second stage regulator. Always use tubing compatible with the gas in use. Leak test piping when using hazardous gases.

General Storage

Improper storage can damage the cylinder which can lead to punctures and leaks, and the valve is especially vulnerable to damage. Punctures can cause the high-pressure cylinders to behave as dangerous projectiles. A damaged valve can also cause leaking gas to displace oxygen in the area or pose an atmospheric hazard such as flammability, reactivity, and/or toxicity.

The following are general rules for storage of cylinders at Florida Tech:

1. Storage areas shall be prominently posted with the hazard class (i.e., flammable, oxidizer, corrosive, toxic) or the name of the gases stored.
2. Always secure gas cylinders upright (valve end up) to a wall, cylinder hand truck, cylinder rack or post, or laboratory bench unless the cylinder is specifically designed to be stored otherwise. An upright position shall include conditions where the cylinder is inclined as much as 45 degrees from the vertical. If being secured to a laboratory bench, cylinder bench clamps can only be attached to a bench that is adequate to support the weight of the cylinder.
3. A chain, bracket, or other restraining device must be used to prevent cylinders from falling. Straps should be secured above the center of gravity roughly halfway to two-thirds of the way up from the bottom.
4. Cylinders should be grouped by hazard type and stored together (i.e., flammable, oxidizer, corrosive).
5. Cylinders should follow the “first in, first out” guideline for use, and full cylinders should be stored separately from empty cylinders.
6. Cylinder storage areas should be free from hazards such as sparks, flammable material, and sources of heat in well ventilated areas. Avoid damp areas, areas where salts, oils, and greases are stored, and keep out of direct sunlight. Cylinders should not be exposed to temperatures above 125°F.
7. Do not obstruct paths of egress such as corridors, lobbies, stairways, or exits. Store tanks away from these areas.
8. Empty cylinders should be returned to the vendor/manufacturer. Do not dispose of in trash.

Specific Storage and Usage

Hazardous gases (flammable, oxidizing, corrosive, toxic, asphyxiants, oxygen) and cryogenic liquids have specific storage requirements.

Flammable Gases

1. A portable fire extinguisher must be available wherever flammable gases are stored.
2. Use in fume hoods and vented enclosures whenever possible.
3. Do not leave "flow" experiments with flammable gas unattended.
4. Use spark proof tools (brass) when working with flammable gasses.
5. Ground and bond all lines and equipment associated with flammable gas systems.
6. Keep acetylene pressure lines/hoses below 15 psi.

Oxidizing Gases

1. Cylinders that contain oxygen or oxidizing gases, whether full or empty, must be stored a minimum from 20 feet from flammable gases or in areas separated by a firewall 5 ft high and with a 0.5-hour fire rating.
2. Keep away from oil, greases, and other flammable contaminants and materials.
3. Oxygen and acetylene for welding torches may only be stored together if they will be used within 24 hours.

Corrosive Gases

1. Use in fume hoods and vented enclosures.
2. Emergency showers and eyewash stations must be available when using corrosive gases.
3. An emergency response procedure must be in place, and everyone working in the area must be trained in it.

Toxic Gases

1. Toxic gas cylinders must not be stored or used outside laboratories. Store cylinders in gas cabinets, exhausted enclosures, or gas rooms.
2. Use in fume hoods and vented enclosures.
3. A gas detection system with visible and audible alarms must be installed to detect leaks.
4. An emergency response procedure must be in place, and everyone working in the area must be trained in it.

Inert Gases and Cryogenic Liquids

1. Inert gases and cryogenic liquids can pose an asphyxiation risk by displacing oxygen in the air. Use only in ventilated areas.
2. Wear loose fitting insulated gloves, aprons, and face shields (in addition to regular PPE) when handling cryogenic liquids.

Emergency Procedures

Whenever it is safe to do so, always shut off gas before leaving the area. In the event of an emergency that threatens life and safety (such as a fire, toxic gas leaks, low oxygen alarms), evacuate the area and call emergency services. Notify emergency services of the location of cylinders and their contents.

Training

All employees who handle compressed gas cylinders should receive Compressed Gas Cylinder safety training initially and any time there are changes to the program. Check the Florida Tech EHS Website for details.