

 <b>CSN Procedure</b>	<b>Facilities Management</b>
<b>Category: Environmental Health and Safety</b>	<b>Effective Date: 08/01/2023</b>
<b>Compressed Gas Safety</b> 	

## I. PURPOSE

The purpose of this procedure is to establish standards for the safe and effective handling, usage, storage, and disposal of compressed gases at the College of Southern Nevada in adherence to applicable health and safety standards.

## II. SCOPE

At the College of Southern Nevada (CSN), ensuring the safe use and storage of compressed gases and cryogenic liquids is a top priority. This policy mandates special precautions to minimize the risk of injury from the hazards associated with these substances in all areas of CSN campuses. While this procedure is intended to clarify specific requirements for the safe handling and storage of compressed gases, it does not replace any existing federal, state, or local applicable codes. Additional safety and regulatory provisions apply to Liquefied Petroleum Gas (LPG), Welding, and other types of Hot Work operations.

## III. PROCEDURE

### A. Responsibilities

1. Environmental Health & Safety (EHS)
  - a. Ensure administration of this procedure and conduct periodic reviews and updates.
  - b. Ensure compliance with environmental and safety regulations through the implementation of this procedure.
  - c. Periodically inspect compressed gas storage cylinder areas to ensure compliance with this procedure.
  - d. Provide specific guidance regarding safety issues associated with storage and disposal of gas cylinders.
  - e. Coordinate disposal of non-rented cylinders.
2. Managers and Supervisors
  - a. Ensure development, communication, implementation, and evaluation of proper work procedures and completion of required training in accordance with the programs identified herein.
3. Employees
  - a. Comply with the program methods described in this procedure and any subsequently developed program(s) and procedure(s).
  - b. Complete assigned safety training courses.

### B. Training

Before employees are permitted to handle, use, or store compressed gases, they must undergo training. The CAPE Learning Management System provides specific training on compressed gas handling and storage to eligible employees annually. New personnel who are responsible for handling compressed gases must complete this training before participating in any related operations.

### C. Procedures

Improper handling, misuse, or abuse of compressed gas cylinders can lead to severe accidents

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involving bodily injury and property damage. Employees responsible for the handling, usage, or storage of pressurized gas cylinders will receive adequate training and work only under the guidance of competent supervision. Adhering to the following stipulations will aid in managing the hazards associated with compressed gas cylinders:

1. Identification
  - a. Vendor labels affixed to cylinders must always be maintained and visible.
  - b. Labels on the cylinder shall identify the contents of the cylinder and any associated hazards, which may involve the use of Globally Harmonized System (GHS) hazard pictograms or Department of Transportation (DOT) diamond-shaped labels.
  - c. If the DOT label on the cylinder does not contain a pictogram for the cylinder's contents, the corresponding GHS hazard pictogram must be displayed as well.
2. Markings
  - a. Compressed gas cylinders must have the following clearly visible markings:
    - i. Owner's name (e.g., Airgas, Praxair, etc.)
    - ii. Registration number
    - iii. Clear identification of the gas
    - iv. Weight when empty
    - v. Date of tests undertaken
    - vi. Permissible maximum charging pressure
  - b. Every cylinder for compressed gases will be durably and clearly marked with cubic capacity.
3. Fittings
  - a. A protective cap shall be provided for each cylinder to safeguard the valve.
  - b. The protective cap will have a vent to prevent gas pressure from accumulating inside the cap.
  - c. Fittings on cylinders used for oxygen and other oxidizing gases must be free of oil and grease.
  - d. Connection screws for flammable gases will have a left-hand thread, while screws for other gases will have a right-hand thread.
4. Handling Cylinders
  - a. Use only cylinders that have been approved by the Interstate Commerce Commission (ICC) for compressed gases.
  - b. Do not remove or alter the numbers or markings stamped on the cylinders.
  - c. Use cylinder dollies to transport bottles as cylinders are difficult to carry by hand due to their shape, smooth surface, and weight.
    - i. If a cylinder dolly is unavailable, cylinders may be moved if secured to a forklift or other equivalent material handling equipment. When transporting cylinders in a vehicle, they must be secured to the vehicle.
  - d. Safeguard cylinders from cuts or abrasions.
  - e. Avoid dropping cylinders or allowing them to strike other cylinders. If the valve is knocked off, the escaping gas velocity can transform the cylinder into a high-speed projectile.
  - f. Do not use cylinders for rollers, supports, or any other purpose except for containing gas.
  - g. Do not tamper with safety devices in valves or on cylinders.
  - h. If unsure about the proper handling of a compressed gas cylinder or its contents, consult the supplier of the gas or a CSN EH&S staff member.
  - i. When transporting cylinders, load them to minimize movement and secure them to prevent violent contact or upsetting.
  - j. Always treat cylinders as full and handle them with appropriate care. Accidents can occur when containers under partial pressure are believed to be empty.
  - k. Do not lift cylinders with protective caps or slide/drag them.
  - l. Secure the valve cap on all stored full or empty cylinders.
  - m. Designate empty cylinders by tagging or labeling them as "EMPTY" and keep them separate from full cylinders.
  - n. Close the valve on empty cylinders and replace the valve protection cap.
  - o. Do not dispose of compressed gas cylinders in regular trash. Return all empty or defective cylinders to the supplier.

## 5. Storing Cylinders

- a. Ensure that full and empty cylinders are stored in an upright position in a secure, safe, and well-ventilated area designated and maintained for that purpose.
- b. Keep compressed gas cylinders secured against accidental dislodgement and against access by unauthorized personnel.
- c. Keep compressed gas cylinders secured to prevent falling caused by contact, vibration or seismic activity.
  - i. Securing methods may include racks, cages, or straps/chains securely fastened to a fixed object such as a wall or counter, with the strap or chain positioned above the midpoint but below the shoulder of the cylinder.
- d. Do not store cylinders near elevators, gangways, stairwells, or other areas where they may be knocked over or damaged.
- e. Compressed gas cylinders' valves must be protected from physical damage by means of protective caps, collars, or similar devices when the cylinders are not in active use.
- f. Do not store flammable substances or volatile liquids in the same area as cylinders.
- g. Store oxygen and other oxidizing gas cylinders at least 20 feet away from cylinders containing flammable gases or other highly combustible materials. If storing closer, separate cylinders by a fire-resistant partition at least 5 feet high with a rating of at least one hour.
- h. Keep combustible waste, vegetation, and similar materials away from the compressed gas cylinders.
- i. Do not place compressed gas cylinders in areas where they could be damaged by falling objects.
- j. Store cylinders on a level, fireproof floor, and avoid storing them in direct sunlight or areas where the temperature can exceed 125° F. Additionally, do not store them near sources of heat or highly flammable substances like gasoline.
- k. To prevent bottom corrosion, protect compressed gas cylinders from direct contact with soil or unimproved surfaces. The surface of the area on which the containers are placed should be graded to prevent the accumulation of water.
- l. Plan cylinder storage to use them in the order received from the supplier.
- m. Ensure that all entrances or areas where gas cylinders are stored have prominent hazard warning signs posted.
- n. All empty cylinders should be marked as "EMPTY" and have the valve closed and the protective cap replaced before storage.
- o. Do not lift cylinders with their protective caps or drag them during storage.
- p. Compressed gas cylinders cannot be disposed of as regular trash and should be returned to the supplier.

## 6. Using Cylinders

- a. Always use cylinders, especially acetylene cylinders, in an upright position and secure them to prevent accidental tipping.
- b. Keep the metal cap in place to protect the cylinder valve when the cylinder is not in use unless the valve is protected by a recess in the head. A blow to an unprotected valve could cause gas under high pressure to escape.
- c. Ensure that the threads on a regulator or union match those on the cylinder valve outlet. Do not force connections that do not fit.
- d. Open cylinder valves slowly. If a cylinder does not have a hand-wheel valve, use a spindle key or a special wrench or tool provided or approved by the gas supplier.
- e. Always use a pressure-reducing regulator attached to the cylinder valve outlet, except where the cylinders are attached to a manifold, in which case the regulator will be attached to the manifold header.
- f. Before connecting to a cylinder valve outlet, "crack" the valve for an instant to clear the opening of particles and dirt. Always point the valve and opening away from the body and not toward anyone else.
- g. Use regulators and pressure gauges only with gases for which they were designed and intended.
- h. Do not allow sparks, molten metal, electric currents, excessive heat, or flames to come into contact with the cylinder or attachments.
- i. Do not bring cylinders into tanks, unventilated rooms, or confined spaces.
- j. Do not refill cylinders except with the consent of the supplier and only in accordance with

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- DOT (or other applicable) regulations.
- k. Do not attempt to mix gases in a compressed gas cylinder or use it for purposes other than those intended by the supplier.
  - l. Before removing a regulator from a cylinder valve, close the cylinder valve and release the gas from the regulator.
  - m. Close cylinder valves when finished.
  - n. When using acetylene and oxygen and they are placed on the same cart, they are in use if the regulators are attached, and the valves are closed.
7. Leaking Cylinders
- a. Treat leaks as serious occurrences and take appropriate precautions. Some leaks, such as those involving chlorine gases, can be fatal if not handled properly.
  - b. If a cylinder valve is found to be leaking, close the valve by hand tightening. Do not use wrenches or other tools to force the valve shut.
  - c. To stop a leak between the cylinder and regulator, first close the cylinder valve and then wait for the gas to escape before tightening the adjusting nut.
  - d. In the event of a leak, take the cylinder outdoors and away from any source of ignition or occupied areas. Properly tag the cylinder and notify the supplier immediately.
  - e. If a leak occurs at a fuse plug or other safety device, take the cylinder outdoors and away from any ignition source or occupied areas if it is safe to do so. Open the valve slightly and let the gas escape slowly.
  - f. Notify University Police Services (UPD) at 7-911 or 702-895-3669 and the gas supplier immediately in case of a leak.
  - g. Leaking, damaged or corroded compressed gas cylinders shall be removed from service.
8. Disposal
- a. Do not dispose of compressed gas cylinders in regular trash. Return all empty or defective cylinders to the supplier.
  - b. Unwanted pressurized gas cannot be deliberately vented from its cylinder for the purpose of disposing of the gas.
  - c. In instances when the gas supplier cannot be identified, coordinate disposal with the EHS Department.
9. Acetylene
- a. Handle acetylene with caution as it is highly flammable.
  - b. Ensure that acetylene cylinders are stored with the valve end up.
    - i. If acetylene cylinders have been stored on their sides, stand them upright for at least 2 ½ hours before use to prevent acetone from being drawn out.
  - c. Store acetylene in a well-ventilated area to prevent the accumulation of gas concentrations that could become explosive.
  - d. Avoid storing acetylene gas near materials that are highly flammable, unprotected electrical connections, gas flames, or other ignition sources (except for welding gases).
  - e. Acetylene cylinders may be stored with oxygen cylinders on a steel welding cart only if their regulators are attached. Once the regulators are removed, the cylinders must be capped and removed from the cart and separated from the oxygen tanks.
10. Oxygen
- a. Avoid using oil or grease as a lubricant on valves or attachments of oxygen cylinders. Keep oxygen cylinders and fittings away from any contact with oil and grease. Ensure that you do not handle such cylinders with oily gloves, hands, or clothing.
  - b. Never use oxygen in place of compressed air in pneumatic tools, oil preheating burners, to start internal combustion engines, or to clean clothing. Only use oxygen for the purpose it was intended.
  - c. Store oxygen in a safe and secure location, away from any flammable materials.
11. Cryogenic Liquids
- Cryogenic liquids, such as liquid nitrogen and helium, can cause rapid freezing of human tissue and may cause common materials to crack or fracture under stress. These liquids vaporize and generate large volumes of gas, which can lead to an oxygen-deficient atmosphere. To ensure the

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safe handling of cryogenic liquids, the following guidelines should be observed.

- a. When handling cryogenic liquids, use proper personal protective equipment such as insulated gloves, goggles, and a face shield.
- b. Avoid touching uninsulated pipes or containers of cryogenic material with any unprotected body parts. If skin contact with cryogenic liquids occurs, do not rub the skin. Instead, immerse the affected area in a warm water bath and seek medical attention, if needed.
- c. Ensure that cylinders or Dewars containing cryogenic liquids are stored in well-ventilated areas. Leaks or venting from the container could result in an oxygen-deficient atmosphere.

#### 12. Toxic Gases

Substances that have a health hazard rating of 3 or 4 according to NFPA 704 are classified as toxic gases. These substances can cause either acute or chronic health effects. Examples of toxic gases include anhydrous ammonia, arsine, phosphine, hydrogen sulfide, phosgene, and nitrous oxide. Prior to acquiring a toxic gas, it's important to notify EH&S to ensure that proper handling and storage requirements are met to ensure safety.

#### IV. AUTHORITY AND CROSS REFERENCE LINKS

International Fire Code (IFC 2018)

NFPA 55 - Compressed Gases and Cryogenic Fluids Code

29 CFR 1910.101 - Occupational Safety and Health Standards, Compressed gases (general requirements).