



Compressed Gases Hazard Class Standard Operating Procedure

1. Purpose

This standard operating procedure (SOP) is intended to provide guidance on how to safely work with compressed gases in a University of Arizona (UA) laboratory. Laboratory personnel should review this SOP, as well as the appropriate Safety Data Sheet(s) (SDSs), before using compressed gases. If you have questions concerning the requirements within this SOP, contact the Approval Holder (AH)/Approval Safety Coordinator (ASC), or the Research Laboratory & Safety Services (RLSS).

2. Scope

This hazard class SOP only addresses safety issues specific to the high pressure hazard of a chemical. The gases within the cylinder may pose additional hazards, such as flammability, corrosivity, toxicity, etc. Consult the SDS for each compressed gas and refer to the other hazard class SOPs that may apply to the gas's hazards.

3. Hazard Description

Compressed gases present a physical hazard due to the high pressures within the gas cylinders. Even if a compressed gas does not present a physical or health hazard beyond the high pressure (e.g. compressed nitrogen, etc.), the volume of the gas may fill the room in the case of a leak, creating an oxygen-deficient atmosphere.

Cryogenic materials (e.g. liquid nitrogen) are also included within the scope of this SOP, as cryogenic dewars contain gases under high pressure. Cryogenic materials can cause tissue damage due to extreme cold, and can create an inhalation hazard in poorly ventilated areas due to boil off or spill.

4. General Control of Hazards

The following general control measures should be implemented whenever using or handling compressed gases:

- All compressed gas cylinders must be legibly marked with the chemical name of the contained material (cylinder color does not constitute chemical identity), manufacturer identification and a UA identifier (most commonly a barcode).
- When using a highly flammable or toxic gas, check the delivery system with an inert gas before introducing the hazardous gas.
- Corrosive gases should not be kept for longer than 1 year. The recommended shelf life of all other gases is 2 years.
- Check connections and hoses regularly for leaks using instrumentation, soapy water, etc.



5. Engineering Controls

Cylinders of hazardous gases may require additional engineering controls, such as a ventilated enclosure for use and storage, restricted flow orifices for regulators, and gas detection monitors. See the Use of Hazardous Gases SOP for further information on requirements for toxic, pyrophoric, or corrosive gases.

Cryogenic dewars may need to be secured; the RLSS will provide guidance for securing dewars on a case-by-case basis. The storage of cryogenic materials in a laboratory or storage room may require the installation and use of oxygen monitors. Examples of situations where oxygen monitors may be required include freezer bays and hypoxia chamber rooms.

6. Personal Protective Equipment

At a minimum, all laboratory workers must wear safety glasses, long pants, closed-toed shoes, a laboratory coat and examination gloves when working with hazardous chemicals in a laboratory.

Laboratory personnel working with cryogenic materials should wear cryogenic-resistant gloves rather than examination-type gloves. Chemical resistant gloves should be considered if working with a gas that is hazardous to the skin. Refer to the Personal Protective Equipment Selection Guide on the RLSS website for further information on appropriate chemical-resistant gloves.

If the compressed gas is corrosive, laboratory workers must wear splash goggles instead of safety glasses.

7. Handling and Storage Requirements

Only the gas cylinders necessary for experiments or procedures in the laboratory should be stored within the laboratory itself. All others, including empty cylinders, must be promptly returned to the University Research Instrumentation Center (URIC) Cryogenics & Gas Facility. Compressed gas cylinders must be secured to a wall or other sturdy structure by chains, or by a cylinder stand/clam shell. If a gas cylinder is not secured to a wall (i.e. with an approved stand), it must be secured so as not to be in danger of being knocked over by foot traffic. Compressed gas cylinders must remain upright, whether in storage or use. The valve protection cap must be fully screwed onto the gas cylinder when not in use.

Protect gas cylinders from sunlight and store them in a well-ventilated place. Gas cylinders containing anything other than compressed air must not be stored in cold rooms or other unventilated areas. Ensure proper regulators and piping are being used for the gas in each cylinder.

Segregate compressed gases by type and compatibility. Empty gas cylinders should be segregated from full, or partially full, cylinders. Gas cylinders that are empty must still be stored and secured as if they were full. Flammable gas cylinders must only be used with flame-resistant gas lines and hoses, and be stored at least 20 feet away from oxygen gas cylinders and other oxidizing gases.

Compressed gas cylinders must be transported using hand-trucks or other appropriate means. Cylinders must be secured to the hand-truck by straps or chains. They should be transported in their upright position whenever possible.



8. Waste Disposal

Cylinders should not be refilled by the laboratory; the URIC Cryogenics & Gas Facility or other authorized vendors can transfill cylinders upon request. Lecture bottles of compressed gases are collected by Risk Management Services for disposal. The removal of all other cylinders is performed by the URIC Cryogenics & Gas Facility. Contact Risk Management Services, the URIC Cryogenics & Gas Facility or your local gas vendor (especially for off-campus satellite locations) for the disposal of unwanted or empty compressed gases.

Disconnecting and disposing of hazardous gases may require the use of approved protective equipment (i.e. SCBA gear) and specialized training. For further information, contact the RLSS or the URIC Cryogenics & Gas Facility.

9. Spill and Incident Procedures

Laboratory personnel must keep antidotes for hazardous gases on hand, whenever antidotes exist (e.g. calcium gluconate for HF gas).

Immediately evacuate the area in the event of a spill or leak of a compressed gas that is an irritant, oxidizer, asphyxiant, or has other hazardous properties. Follow the procedures in the University Chemical Hygiene Plan section on major chemical spills. Inform the RLSS of all major chemical spills.

If there is a fire or explosion in the laboratory, leave the area immediately and call 911 from a campus phone, or call 911 from a non-campus phone and mention the incident is on the UA campus.

If a laboratory worker is injured or exposed to a hazardous gas, immediately notify the AH/ASC. If they require immediate medical attention, call 911. Move the laboratory worker to fresh air. If the skin was exposed to corrosive or toxic gas, remove contaminated clothing and immediately flush the contaminated areas with water for at least 15 minutes. For eye exposures, immediately remove contact lenses, if present, and flush the eyes with water for at least 15 minutes. Consult the chemical's SDS for more specific information on appropriate first aid. Inform the RLSS and Risk Management Services of the incident as soon as practicable.

10. Designated Area

Designated areas are not required for this hazard class. However, chemicals may belong to multiple hazard classes, and a compressed gas may require storage and use in a designated area if it belongs to a hazard class that includes particularly hazardous chemicals (e.g. ammonia gas).