

Policy Number: 2021-05
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Applicability: Compressed Gas Life Safety Sensor/Alarm Policy

Purpose

This policy establishes requirements for laboratories/areas that have life safety sensors and alarms for compressed gases that could pose a significant hazard to the occupants.

Employees who use compressed gases must understand the health and safety hazards of the compressed gas cylinders. The gas contents in a cylinder can present physical and/or health hazards to users. Gases may be classified as flammable, toxic, corrosive, pyrophoric, oxidative, an asphyxiant, and/or may present a combination of these dangers. Because gas cylinder contents are under high pressure, any uncontrolled release can create a hazardous situation in the area in a very short period of time.

Therefore, an assessment shall be performed by Environmental Health and Safety (EH&S) where gas cylinders are used and stored for evaluation of whether an oxygen and/or other gas sensor(s) are warranted. The assessment must be documented by EH&S and kept with either the Principal Investigator or Supervisor of the area, and with the Project Manager/Coordinator for construction and/or renovation projects.

The scope of this document is not intended to cover the use of oxygen sensors for confined spaces, hot work (welding, grinding, abrading), or emergency response.

Additional information is available by contacting Environmental Health and Safety (EH&S) at 84251.

Personnel Affected

The policy affects all those using compressed gases in quantities to potentially create a hazardous environment to the occupant. All personnel must meet all other University requirements established by EH&S including the training video Compressed Gas Safety found on the EH&S website under online training. All training must be completed BEFORE an employee is allowed to handle compressed gases. A copy of the results for the online compressed gas quiz will be sent to the researcher as well as EH&S as a record of training.

Definitions

Asphyxiant Gas: A gas or mixture of gases that displaces oxygen in the ambient atmosphere and can thus cause oxygen deprivation in those who are exposed, leading to unconsciousness and/or death.

Breathing Zone: The breathing zone is the 6 to 9-inch area surrounding a worker's nose and mouth where the majority of air is drawn into the lungs.

Competent User: A user who has successfully completed compressed gas cylinder training and received site-specific training for the hazards from their area supervisor.

Compressed Gas: Any material or mixture having in a container either an absolute pressure exceeding 40 pounds per square inch at 70°F (21.1°C), or an absolute pressure exceeding 104 pounds per square inch at 130°F (54.4°C), or both, 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.

Continuous Gas Monitoring: The process and technology used to detect atmospheric conditions at all times.

Cryogenic Liquid: A cryogenic liquid is any liquid with a boiling point less than -238°F (-150°C). The most common cryogenic liquids include oxygen, nitrogen, helium, and argon.

Monitored Area: Any area where oxygen sensors are installed.

Permanent Installation: An installation that is connected to a permanent power supply, tied into the building automation system, and cannot be removed or relocated without permission from EH&S.

Point of Egress: Standard doorway into and out of the area.

Standard Temperature and Pressure (STP): The temperature of 0°C and pressure of 1 atmosphere, usually taken as the conditions when stating properties of gases.

Temporary Work: Work that will last for less than six (6) months, is regularly mobile, or at the discretion of EH&S.

Responsibilities:

Principal Investigators/Supervisors of the area are responsible for the maintenance and continual good working order of all gas sensors in the area of the laboratory as well as surrounding areas (hallways, etc.) that have gas sensors installed for a particular research project.

If gas sensors are not functioning properly, it is the responsibility of the Principal Investigator or Supervisor to get it repaired and/or replaced as soon as possible due to life safety concerns. Interim measures, such as personal oxygen monitors must be used until the permanent sensor can be restored, if operations of the gases in the area cannot be halted.

All gas sensors must be calibrated annually or per manufacturer recommendations. The Principal Investigator or Supervisor is responsible for ensuring this annual calibration by a competent (trained) individual or vendor and to be able to produce those records when requested.

All laboratory personnel must be properly trained by the Principal Investigator or Supervisor to evacuate the affected space in the event of a gas sensor alarm or cylinder failure. Evacuation procedures specific to the laboratory must be documented by the Principal Investigator or Supervisor.

It is the responsibility of all Principal Investigators and Supervisors, Trainers, and Managers to ensure that all employees who work with compressed gases are properly trained in their knowledge, duties, and the standard operating procedures surrounding compressed gases.

It is the responsibility of those approved and deemed competent by their supervisors to transport, store, and use gas cylinders utilizing the standard operating procedures established for their location.

Procedures

- A. Continuous gas sensors shall be installed to monitor areas where gases can accumulate and displace oxygen and/or pose a hazard. Sensors shall be installed to indicate levels at each point of use and may be required by EH&S, Planning or an outside consultant in each storage area/room, depending on the design of the system.
- B. Sensors shall be:
 - 1. New. Used or secondhand devices are not allowed.
 - 2. Listed or approved devices.
 - 3. Permanently mounted.
 - 4. Installed at a height of between 4-6 feet above the floor or as indicated by the manufacturer's instructions.
 - 5. Free of obstructions with a clearance area of 2-3 feet.
 - 6. Directly connected to a building's electrical system and Principal Investigator or Supervisor's internal lab alarm system or to the building's shared toxic gas management system (TGMS).
 - 7. Gas sensors in public halls or corridors are to be connected to the building fire alarm, which is tied to the Keltron system.
 - 8. Protected from accidental disconnection or damage.
 - 9. Located within manufacturer's specified detection range for each point of use and storage location.
 - 10. Located close to each point of use and at the discretion of EH&S, Planning or an outside consultant.
- C. Display panel shall be:
 - 1. Located immediately outside of monitored area, preferably in the nearest hallway or public space for easy visibility for first responders.
 - 2. Mounted 4-5 feet above floor.
- D. Alarm shall:
 - 1. Have set points at the manufacturer's recommendation and reviewed by EH&S, Planning or an outside consultant.
 - 2. Be located immediately outside the monitored area.
 - 3. Have an annunciator and strobe.
- E. Areas that contain multiple gases may require multiple gas-specific sensors.

F. Signage shall be required adjacent to each horn/strobe.

Hydrogen Gas

Hydrogen gas is very flammable and must be monitored. In gas mixtures anything greater than 5%, hydrogen is considered flammable and requires a gas cabinet or proper ventilation to prevent gas build up. Environmental Health and Safety requires personnel using hydrogen gas to review the training video “Hydrogen Gas Use in Lehigh Laboratories” found on the Lehigh University Environmental Health and Safety website under “online training.”