Augusta University
Policy Library

Oxygen Deficiency Monitor Policy

Policy Manager: Environmental Health and Safety Division

POLICY STATEMENT
Oxygen deficiency monitors shall be selected, installed, and maintained in accordance with this policy in work spaces with asphyxiation risks posed by storage and use of compressed inert gases and cryogenic liquids.

AFFECTED STAKEHOLDERS
Indicate all entities and persons within the Enterprise that are affected by this policy:

☐ Alumni ☒ Faculty ☐ Graduate Students ☐ Health Professional Students
☒ Staff ☐ Undergraduate Students ☐ Vendors/Contractors ☐ Visitors
☐ Other:

DEFINITIONS

Asphyxiant: a substance that can cause unconsciousness or death by suffocation (asphyxiation). Asphyxiants which have no other health effects are sometimes referred to as simple asphyxiants.

Calibration: to determine, check, or rectify the response of any instrument giving quantitative measurements.

Cryogenic Liquids: gases at normal temperatures and pressures. However, at low temperatures, they are in their liquid state. These liquids are extremely cold and have boiling points less than -150°C (-238°F). Vapors and gases released from cryogenic liquids are very cold.

Inert Gas: a chemically non-reactive gaseous element.

Maintenance: the process of preserving the serviceability of equipment or systems through routine preventive or corrective actions.

Risk Assessment: the formal process of identifying and quantifying potential negative events, including harm to people, property, or the environment.

PROCESS & PROCEDURES
Compressed inert gases and cryogenic liquids are used in laboratories and other locations for various lab applications and work procedures. Nitrogen and helium are the most commonly used compressed gases and cryogenic liquids used primarily for freezing specimens or cooling equipment such as Magnetic Resonance Imagers (MRI) and Nuclear Magnetic Resonance (NMR) systems.

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These gases are classified as simple asphyxiants that displace oxygen thus, creating the potential for an oxygen deficient atmosphere. An oxygen deficient atmosphere is a serious occupational hazard and in extreme cases can be lethal in seconds.

Oxygen deficiency monitors are required in those locations where under conditions of normal use or accident the released gases may exceed the capacity of engineered systems (principally the general ventilation system) to maintain a safe atmosphere.

Risk Assessment
The requirement for an installed oxygen deficiency monitor is established by risk assessment. The risk assessment considers the application of the gas; volume of gas; room size; ventilation exchange rate; spill, leak, and other accident scenarios; and engineered protection systems. Environmental Health and Safety Division (EHS) conducts risk assessments in University work spaces.

Monitoring for other asphyxiants, including liquid carbon dioxide, carbon monoxide, and hydrogen cyanide, is outside the scope of this policy. For example, liquid carbon dioxide is toxic in addition to a simple asphyxiant. Leaked liquid carbon dioxide may create a toxic atmosphere before oxygen depletion is detected. For this reason an oxygen monitor is not effective in liquid carbon dioxide environments.

Selection Criteria
The following selection criteria are established:

- Permanently installed, fixed monitoring systems designed for a 110/120v AC power supply.
- Detection range of 0% - 25% oxygen concentration.
- Digital communication capability.
- Long-life sensor. Most existing oxygen deficiency monitors incorporate an oxygen sensor with a two-year service life. Newer sensor technology is available with a service life up to ten years.
- Underwriter's Laboratories (UL) certification.

Pre-installation Notifications
Departments are required to notify Facilities Operations and Environmental Health and Safety before installing an oxygen deficiency monitor.

Installation
Install oxygen monitors in accordance with the manufacturer's instructions and the following requirements:

- Locate the device in accordance with manufacturer's instructions, at the proper height corresponding to the density of the gas. For liquid nitrogen applications the recommended height is typically 4 – 6 feet from the floor. Helium is lighter than air, and may require higher placement.
- Ensure that system is accessible for viewing the display and performing maintenance.
- Leak test sample lines and fittings.

- Where possible, interlock the monitor to an emergency ventilation fan.
- Do not place sensors near entrances or fresh air vents, as sample concentrations will be diluted by incoming air.

Alarm Monitoring and Signaling
Oxygen monitors shall be networked to a Central Alarm Station (CAS) for alarm signaling (e.g., Johnson Controls Incorporated (JCI) Remote Operations Center (ROC)). In addition to department contacts the CAS shall notify Public Safety of alarms.

Departments may request a variance from this requirement if a risk assessment conducted by Environmental Health and Safety demonstrates that the monitor is not a safety requirement, but installed as a laboratory best practice. Direct variance requests to the AVP, Environmental Health and Safety.

Calibration and Testing
The end user is responsible for obtaining calibration and testing services. Initial and annual calibration and testing are required to verify proper operation of the oxygen monitor. The manufacturer's representative or qualified staff member of Laboratory Equipment Services will perform calibrations and testing.

Maintenance
The end user is responsible for daily operational checks conducted in accordance with the manufacturer's instructions.

Maintenance or repair of oxygen monitors shall be performed by the manufacturer or the supporting in-house maintenance organization. A preventive maintenance schedule shall be established in accordance with the manufacturer's instructions.

The critical component of most oxygen deficiency monitors is an electro-chemical sensor with a 2-year service life. Vendors manufacture replacement sensors on demand to avoid loss of service life in storage. Operating an oxygen monitor to failure may result in an extended out-of-service period while a replacement sensor is obtained. To avoid loss of monitoring capability a predictive component replacement schedule (planned sensor replacement) is required.

For long-life sensors (up to ten years' service life) the predictive maintenance schedule may be extended in accordance with manufacturer's instructions.

Response to Alarms
- Treat all alarms as real.
- Alarms are warning devices, and are not protective. On alarm evacuate the room immediately and close the door.
- Call Public Safety (706) 721-2911.

- Call Environmental Health and Safety (or request that Public Safety do so). Environmental Health and Safety contact numbers are (706) 721-2663 during normal duty hours and (706) 664-8607 after hours.
- Remain outside the room. Do not enter for any reason. Do not attempt a rescue.
- Call the Fire Department if a rescue is necessary. Only trained responders in self-contained breathing apparatus can conduct a rescue in an oxygen deficient atmosphere.
- When the gas release abates, or if a faulty sensor is suspected, EHS can clear the area for re-occupancy using hand-held gas monitors. Do not re-enter the area until cleared by EHS or the Fire Department.

REFERENCES & SUPPORTING DOCUMENTS

- Augusta University Chemical Safety Guide Appendix I, *Cryogenic Liquids Standard Operating Procedure*. http://www.augusta.edu/services/ehs/chemsafe/chemsafeguide9-2016.pdf
- Augusta University Chemical Safety Guide Appendix J, *Liquid Nitrogen Safety*. http://www.augusta.edu/services/ehs/chemsafe/chemsafeguide9-2016.pdf
- Liquid Nitrogen Safety Data Sheet. https://www.airgas.com/msds/001188.pdf
- Liquid Helium Safety Data Sheet. https://www.airgas.com/msds/001184.pdf

RELATED POLICIES

None

APPROVED BY:

Executive Vice President for Academic Affairs and Provost, Augusta University
Date: 3/22/2021

President, Augusta University Date: 3/22/2021