















CHEMICAL HAZARD GUIDELINE

		<h2>CRYOGENS</h2> <p><i>Examples: Dry Ice, Liquid Nitrogen, Liquid Helium, Liquid Hydrogen, Liquid Oxygen (O₂)</i></p>	<p>May show</p>  or 
Hazard	Potential Hazards	<ul style="list-style-type: none"> • Potential explosion due to pressure buildup (mostly for liquid He and H₂, which can solidify air). • Oxygen (O₂) deficiency (through displacement of O₂ by cryogenics other than liquid O₂). For cryogen leaks, See Emergencies. If large amounts (>2L) are dispensed, contact EHRM to assess ventilation and the possible need for O₂ monitor. • Oxygen enrichment around liquid oxygen may cause or intensify fire. • Liquified gases may condense oxygen from the air, causing O₂ to build up as a contaminant. If oxygen-incompatible materials are present, violent reactions could occur. • Tissue damage (frostbite) • Refer to chemical specific Safety Data Sheet (SDS) for hazard information. 	
	Hazard Controls		<p>Purchasing</p> <ul style="list-style-type: none"> • Ensure containers are equipped with pressure relief devices. <p>Storage and Transportation</p> <ul style="list-style-type: none"> • Never store cryogenic liquids or dry ice in a walk-in cold room! • Store liquid O₂ away from open flames and post “No Open Flames” nearby. • Store liquid hydrogen, helium, and nitrogen away from flammable materials and ignition sources (These gases may become contaminated with liquid O₂.) • Store and transport cryogenic materials <i>ONLY in Dewars or cryogenic liquid cylinders designed specifically for that cryogen. Inspect</i> storage containers daily to ensure that no air or ice plugs exist in the openings. • Cryogenics may be transported in elevators only in containers certified to leak at ≤ 1 L (or 1 kg of solid) per day.   <p>Work Practice Procedures</p> <ul style="list-style-type: none"> • Use liquid hydrogen, oxygen, helium, and nitrogen away from flammable materials & sparks • For liquid helium and hydrogen storage systems, check the pressure relief and inspect for leaks regularly because of the risk of solidified air. • Do not put your head inside a liquid nitrogen freezer, dry ice chest, or other enclosed space containing a cryogen. • Do not use hollow rods, or tubes as dipsticks. (When a warm tube is inserted into a cryogen, liquid will spout <u>from the top of the tube.</u>) • Check the liquid level regularly. Is the liquid evaporating more rapidly than normal, the Dewar/liquid cylinder may be losing its vacuum.   <p>Engineering Controls</p> <ul style="list-style-type: none"> • Each part of a cryogenic system must have a pressure relief system (may require maintenance) • Use and store cryogenics in well-ventilated areas such as most labs (not a closet or cold room) • EHRM evaluation is required for use of cryogenics in a manner that could displace oxygen and/or “high-risk” uses (including examples of “large quantities”). • Monitors may be appropriate depending on cryogen use and location. <p>Personal Protective Equipment</p>  EYE PROTECTION  FACE SHIELD  CHEMICAL GLOVES  LAB COAT  LONG PANTS  INSULATED GLOVES  CLOSED TOED SHOES ARE REQUIRED
		<p>Note: Always refer to glove manufacturer for chemical specific glove type.</p>	

Other	Waste	Return cylinders to vendor. If vendor cannot be determined, contact EHRS. Do not dump cryogenics into sinks as the thermal shock may cause damage to the sink or plumbing.
	Emergencies	In the event of an emergency – Call campus safety at (215) 214-1234 & EHRS at (215) 707-2520. Direct contact – Flush contaminated area with copious amounts of water (eyewash or safety shower) and then seek medical attention. Inhalation – Remove to fresh air and then seek medical attention. Spill/ Release – Close cylinder valve, if possible. If unable to contain, evacuate lab. Contact EHRS for additional assistance or guidance.
	Training	Sign signature on Laboratory-Specific Training Checklist to indicate review.
	Questions	Contact Environmental Health and Radiation Safety (EHRS) at (215) 707-2520

OXYGEN MONITORS

Supplements the Chemical Hazard Guideline-Cryogenics

Lab or Area	PI or Manager Name	Date:	
		Signature:	
Lab or Area	Location	Building(s):	Lab/Area(s):
Specific Hazard Controls	Cryogen Details	Specific cryogen present	
		Maximum volume on hand (in tanks and Equipment)	
		Container type (freezer, high pressure cylinder, low pressure cylinder, etc.)	
		Is cryogen or gas being supplied from a tank outside the building?	Yes <input type="checkbox"/> No <input type="checkbox"/>
	Location	Specific location of monitor	
	Alarm Response Procedures	<u>Current Alarm Status</u>	<u>Procedure</u>
		Alarm sounds for the first time	Leave the area. Do not enter the room if the oxygen level shown on the monitor/display is below 19.5% or if the alarm is sounding. For areas with a source of oxygen, do not enter the room if the O ₂ level is above 23.5%.
If alarm continues for > 15 minutes, check oxygen levels		Safety Contact should check the oxygen levels with a handheld meter (if available). If no meter is available, contact EHRS at 215-707-2520	
	If alarm continues and oxygen levels are determined to be safe.	Contact maintenance provider* to calibrate the sensors.	

	If monitor indicates a fault condition (or in rooms without a source of O ₂ , if concentration displayed is over 20.9%)	Contact the Maintenance Provider* to check the monitor and recalibrate the sensors.
	For frequent alarms (more than once a day)	Contact EHRS at 215-707-2520 to assess ventilation and appropriate placement of sensors.
	* Any lab/area not supported to Facilities Management needs to have written procedures for regular maintenances/calibration of O ₂ monitors & sensors.	
Details Specific to the Lab or Area	<i>Provide details specific to the space, monitor, etc. Note if the alarm needs to be reset to stop the sound even after concentration has returned to above 19.5%.</i>	

RESPONDING TO OXYGEN ALARMS

(Post this sign next to each alarm monitor/display and outside of the monitored room.)

Safety Contact Name	
Safety Contact Phone Number	
PI or Manager Name	
Maintenance Provider Name	
Maintenance Provider Phone Number	

You may enter the room if the oxygen level shown on the monitor/display is between 19.5% and 20.9%. For areas with a source of oxygen, you may enter if the oxygen level is between 19.5% and 23.5%.

Do not enter the room if the oxygen level shown on the monitor/display is below 19.5%, or if the alarm is sounding. For areas with a source of oxygen, do not enter the room if the oxygen level is above 23.5%. If the alarm is sounding or the lights are flashing, close all door and leave the room immediately.



For “latching alarms” (where audible alarm continues when concentration returns to a safe level), push the reset button on the monitor display box to acknowledge the audible alarm. If the alarm horn and light continue, push the reset button again.

If the problem continues for > 15 minutes, contact safety contact listed above to check oxygen levels with a handheld meter (if available). If no handheld meter is available, contact EHRS at 215-707-2520.

Once the oxygen level has been determined to be safe, contact your maintenance provider to calibrate the sensor

If the oxygen monitor indicates a fault condition, or (only in areas with a source of oxygen) if the oxygen concentration displayed is above 20.9% (normal air) contact your maintenance provider** to check the monitor and/or recalibrate the sensor.

For frequent alarms (more than once a day), contact EHRS 215-707-2520 to assess ventilations and appropriate placement of sensors.

** Any lab/area not supported to Facilities Management needs to have written procedures for regular maintenances/calibration of O₂ monitors & sensors.