

Principal Investigator: \_\_\_\_\_

Date Approved: \_\_\_\_\_

## Dry Ice, Liquid Nitrogen, and Other Cryogenics

**Cryogenics** are liquefied gases which boil below  $-180^{\circ}\text{C}$ . The most common cryogenics used in research laboratories are dry ice and liquid nitrogen. Liquid helium is used in operations which require even colder temperatures.

Tissues exposed to cryogenics can freeze, causing severe frostbite. Cryogenics can also embrittle plastic or rubber components of equipment, and crack glass through thermal shock. Cryogenics expand dramatically upon evaporation (1:845 for dry ice; 1:694 for liquid nitrogen). This can displace oxygen in the event of their rapid vaporization in a poorly-ventilated space and cause asphyxiation. Vaporization of cryogenics within a sealed vessel can cause an explosion.



Personal Protective Equipment & Personnel Monitoring		
 <b>Lab Coat</b>	 <b>Gloves</b>	  <b>Eye Protection</b> <b>Face Shield</b>
Traditional lab coat. For operations where a significant splash hazard is present, an apron may be required.	Wear insulated, impermeable, elbow-length gloves.	ANSI Z87.1-compliant safety glasses or safety goggles <b>AND</b> a face shield when dispensing cryogenics from a cylinder.

## Labeling & Storage

Cryogenics should be handled and stored in well-ventilated rooms. Cryogen cylinders are typically equipped with a handling ring which can protect the valves and regulators in the event of a fall. Whenever possible, store cryogen cylinders such that the venting valve is pointed away from paths of egress or regular foot traffic (e.g. towards a wall). Do not store dry ice, liquid nitrogen, or any other cryogen inside of a tightly-sealed container (e.g. refrigerator, freezer, or gasketed cooler) as the pressure resulting from evaporation can cause an explosion.

## Engineering Controls, Equipment, & Materials

### Oxygen Sensor

Oxygen sensors may be necessary in rooms where large quantities of cryogenics are stored or handled. Never enter a room if an oxygen sensor is in alarm.

## Cautions & Considerations

### *Equipment*

Regulators should be checked for cracks or defects before dispensing. Ensure that a liquid phase separator is used when dispensing liquid nitrogen to prevent splashes. Fully close regulators when dispensing is finished to prevent unintended venting of the liquid nitrogen that could damage regulators and/or valves.

## First Aid & Emergencies

### *Release*

In the event of an uncontrolled release, assume that oxygen may be displaced. Notify others in the area of the release and evacuate the room until an adequate supply of oxygen can be confirmed.

### *Skin or Eye Contact*

If any tissues appear to have been frozen, seek medical attention immediately. Apply a dry, sterile bandage. Do not rub the affected area.

### *Inhalation*

If you suspect that a person has lost consciousness due to oxygen deprivation, call 911 and **do not** enter the room. Move affected individual(s) into fresh air only if safe to do so. If symptoms persist, seek medical attention.

