



Title of SOP: <b>General Use SOP for Cryogenic Liquids</b>		
SOP Originator: Chuck Cooper	Date Created: 4/24/2013	Effective Date: 4/24/2013
Name:	Name	Last edited Date:
EHS Reviewer: Lindsay Henderson	Date Reviewed: 4/19/2017	Document #: 4

**PURPOSE:**

This standard operating procedure (SOP) is intended to provide general guidance on how to safely work with cryogenic liquids and dry ice. This general use SOP only addresses safety issues specific to cryogenic hazards of chemicals. In some instances, several general use SOPs may be applicable for a specific chemical (i.e., for liquid hydrogen, both this general use SOP and the general use SOP for flammable liquids would apply). If you have questions concerning the applicability of any item listed in this procedure contact the Principal Investigator/Laboratory Supervisor of your laboratory or Environmental Health and Safety (5-4312).

**SCOPE:**

Cryogenic liquids are materials with extremely low boiling points (i.e. less than – 150 °F). Common examples of cryogenic liquids are liquid nitrogen, helium, and argon. Dry ice is the common term for frozen carbon dioxide. One special property of both cryogenic liquids and dry ice is that they undergo substantial volume expansion when converted to a gas phase, which can potentially lead to an oxygen deficient atmosphere where ventilation is limited. Few cryogenic liquids can also pose additional hazards including toxicity and flammability (i.e. liquid carbon monoxide).

**APPLICABILITY:**

**Control of Hazards – General:**

- Only work with cryogenic liquids in well-ventilated areas to avoid localized oxygen depletion or build up of flammable or toxic gas.
- Handle objects that are in contact with cryogenic liquids with tongs or proper gloves.
- Transfers or pouring of cryogenic liquids should be done carefully to avoid splashing.
- Containers and systems containing cryogenic liquids should have pressure relief mechanisms.
- Cryogenic liquid cylinders and other containers (such as Dewar flasks) should be filled no more than 80% of capacity to protect against thermal expansion.
- Cryogenic liquid/dry ice baths should be open to the atmosphere to avoid pressure build up.
- Keep liquid oxygen away from organic materials and ignition sources.
- Transfer of liquid hydrogen in an air atmosphere can condense oxygen in the liquid hydrogen, creating an explosion risk.

- Cryotube thawing - In addition to wearing proper safety equipment, when thawing cryotubes, place the cryotube in a heavy-walled container (e.g., a desiccator) or behind a safety shield to protect yourself in the event that the tube shatters.
- Shield or wrap fiber tape around glass dewars to minimize flying glass and fragments should an explosion occur. Note: Plastic mesh will not stop small glass fragments.

## **PROCEDURE:**

### **Engineering/Ventilation Controls:**

If the process does not permit the handling of cryogenic liquids in well-ventilated areas (i.e., lab ventilation having a minimum of 6 air changes per hour).

### **Personal Protective Equipment:**

At minimum, safety glasses, long pants, and closed toed shoes are to be worn when entering laboratories having hazardous chemicals. Additionally when handling cryogenic liquids, heavy gloves (e.g., cryogenic gloves) are appropriate.

### **Special Handling Procedures and Storage Requirements:**

Cryogenic liquid dewars are to be stored in well-ventilated areas. Storage in unventilated closets, environmental rooms, and stairwells is prohibited.

Large dewars must be tethered/ anchored to a wall.

Store flammable cryogenic liquids and liquid oxygen away from combustible materials and sources of ignition.

Additionally, follow all substance-specific storage guidance provided in MSDS documentation.

### **Spill and Accident Procedures:**

Do not attempt to clean up any spill of cryogenic liquid. If a large spill or dewar leak occurs, immediately exit the area and call 911, then 5-4404.

Laboratory personnel who work with hazardous chemicals are to be provided the opportunity to receive medical attention/consultation when:

- A spill, leak, explosion or other occurrence results in a hazardous exposure (potential overexposure).
- Symptoms or signs of exposure to a hazardous chemical develop.

### **Waste Disposal:**

Coordinate w/ vendor for return of dewar(s).

### **Minimum Training Requirements:**

Laboratory-specific training

### **Approval Required:**

Consult with PI regarding need for prior approval.

**Decontamination Procedures:**

**Personnel:** If skin or eye(s) comes in contact with a cryogenic liquid, run the area of skin under cool or warm water for fifteen minutes (do not use hot or cold water). **DO NOT RUB OR MASSAGE AFFECTED AREAS**— this can cause further tissue damage. Refer to MSDS for any specific instructions. Where medical attention is required, ensure to bring along MSDS(s) of chemical(s) to aid medical staff in proper diagnosis and treatment.

**Designated Areas:**

For cryogens that are also considered particularly hazardous substances, a designated area shall be established per the other applicable SOP(s).

**ATTACHMENTS:**