Gateway University Research Park
Safety and Health Policy and Procedure Manual
Cryogenic Safety

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I. Introduction

This section is 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 operating procedures may be applicable for a specific chemical. If you have questions concerning the applicability of any item listed in this procedure contact the Principal Investigator/Laboratory Manager of your laboratory or the Gateway EHS Manager. The Gateway Equipment Engineer should be notified when any new cryogenic liquids or vessels are introduced into the University environment.

II. Definition

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. 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. A few cryogenic liquids can also pose additional hazards including toxicity and flammability (i.e. liquid carbon monoxide).

III. General Control of Hazards

- All manufacturer safety precautions for cryogenic containers and systems shall be followed.
- Only work with cryogenic liquids in well-ventilated areas to avoid localized oxygen depletion or the buildup of flammable or toxic gas.
- Handle objects that are in contact with cryogenic liquids with tongs, proper gloves, and eye/face protection.
- Containers and systems containing cryogenic liquids should have pressure relief mechanisms, and be secured.
- Cryogenic liquid cylinders and other containers (such as Dewar flasks) should be filled no more than 80% of capacity to protect against thermal expansion.

IV. Special Liquid Helium Precautions

Liquid helium has the potential to freeze all gases (e.g., H20, N2, and O2). All of these can freeze inside a Dewar or delivery line, forming an “ice” plug. Procedures must be in place to prevent air or other gases from entering the liquid delivery lines or Dewar at all times. Should a blockage be suspected, contact the vendor immediately.

V. Specific Hazard Controls

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A. Engineering/Ventilation Controls

If the process does not permit the handing of cryogenic liquids in well-ventilated areas (i.e., lab ventilation having a minimum of 6 air changes per hour), contact the Environmental Health and Safety Manager to determine the necessity of an oxygen-deficiency monitor (as applicable).

B. Personal Protective Equipment (PPE)

The following PPE shall be utilized when handling cryogenic liquids: heavy gloves (e.g. Cryogenic gloves), safety goggles, face shield, and lab apron (Cryogenic) are appropriate.

C. 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.
- Cryogenic liquid/dry ice baths should be open to the atmosphere to avoid pressure build up.
- Transfer of liquid hydrogen in an air atmosphere can condense oxygen in the liquid hydrogen, creating an explosion risk.
- Store flammable cryogenic liquids and liquid oxygen away from combustible materials and sources of ignition.
- **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.
- Additionally, follow all substance-specific storage guidance provided in the SDS documentation.

D. Spill and Accident Procedures

Do not attempt to clean up any spill of cryogenic liquid. Report any accidents to your PI and Gateway EHS Manager. If a large spill or Dewar leak occurs, immediately exit the area and call Gateway EHS Manager and emergency assistance 911.

E. Waste Disposal

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

F. Decontamination Procedures

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. Seek medical attention. Refer to SDS for any specific instructions. When medical attention is required, ensure to bring along SDS(s) of chemical(s) to aid medical staff in proper diagnosis and treatment.

Report the incident to Gateway's EHS Manager.