PURPOSE

*Describe relevant background information.*

A cryogenic liquid is defined as a liquid with a normal boiling point below -240°F (-150°C, 123°K). The most commonly used industrial gases that are transported, handled, and stored in the liquid state at cryogenic temperatures are argon, helium, hydrogen, nitrogen, and oxygen. There are a number of general precautions and safe practices that must be observed because of the extremely low temperatures and high rates of conversion into gas of all the cryogenic liquids. There are also specific precautions that must be followed where a particular liquid may react with contaminants or may present other hazards associated with that particular product such as asphyxiation or flammability.

As always, end users should have and be thoroughly familiar with the SDS for their specific product. All operators must be familiar with the instructions provided with the equipment to be used with the cryogenic liquid.

Scope

*Identify the intended audience and/or activities where the SOP may be relevant.*

This SOP is intended for lab personnel involved in the usage of cryogens on UF campus.

[Add or remove additional information as needed]

Responsibilities

*Identify the personnel that have a primary role in the SOP and describe how their responsibilities relate to this SOP.*

* [Identify personnel & responsibilities here]

Hazard Identification & Control Measures

*Include information on how to handle a particularly hazardous substance or experimentation using a certain piece of equipment. Instructions might include recommended hazard control measures, PPE, chemical transportation, and storage. Describe transport, receiving, and storage requirements. Include secondary containment, transport devices (carts, carriers, etc.), segregation requirements, any special temperature or atmospheric requirements, and container compatibility requirements.*

**A. Potential Hazards**

* **Chemical Hazards (CH):** Cryogenic gases can cause asphyxiation by displacing breathable air and therefore, should only be used and dispensed in well-ventilated areas. Non-insulated metal pipes containing cryogenic fluids must be kept clear of combustible materials to minimize the fire potential caused by oxygen enrichment of condensed air
* **Biological Hazards (BH):** None
* **Physical Hazards (PH):** extreme cold, expansion, cryogen, compressed gas, fire, explosion, contact/absorption
* **Electrical Hazard (EH):** None
* **Other Hazards:** None

A sign with a skull and crossbones in a red diamond

Description automatically generated**A sign with flames in the middle

Description automatically generatedA sign with a black bottle in the middle

Description automatically generatedA sign with a fire symbol

Description automatically generated**

[Add or remove potential hazards as needed]

**B. Engineering Controls / Administrative Controls**

Proper ventilation, appropriate storage dewar

[Add or remove engineering and administrative controls as needed]

**C. Personal Protective Equipment (PPE)**

Full face shield over safety glasses, long sleeve shirt or lab coat, loose fitting thermal insulated or leather gloves (these are not the same as heat gloves!), pants without cuffs that can trap liquid next to your body, and closed toe shoes that cover the entire foot.

Procedure

*Provide the steps required to perform this procedure (who, what, when, where, why, how).*

**Dispensing Liquid**

* 1. Don appropriate PPE
  2. Ensure the transfer line is attached to the appropriate liquid dispensing valve.
  3. Check that the pressure is approximately 22 psi.
  4. Position the Dewar on the floor at the base of the cylinder
  5. Slowly open the liquid valve to begin cooling down the transfer line.
  6. Once the line has cooled, open the liquid valve further to dispense cryogenic liquid. Avoid fully opening the valve since it may freeze in that position causing a spill.
  7. Listen for the change in sound as the Dewar fills – a higher pitch indicates the Dewar is getting full.
  8. Once full, close the valve and remove the transfer line carefully to avoid dropping or hitting a solid object, which can cause the phase separator to break.
  9. 10. Loosely cap the Dewar to prevent over pressurization.

**Submerging Objects**

Boiling and splashing occur when inserting objects into a cryogenic liquid. Always submerge objects slowly to prevent excessive splashing. Vessels submerged in a cryogenic liquid may rupture when removed. Store cryovials in the gas phase of a liquid cryogen container or move submerged cryovials to the gas phase 24 hours prior to removal to prevent explosions.

Never reach into a liquid cryogen container to remove objects.

[Add or remove additional step-by-step procedures as needed]

Special Handling and Storage Requirements

*List applicable precautions for preparation and storage.*

* Store full cryogenic containers in a dry, ventilated area - never store or handle cryogens in cold rooms or confined spaces.
* Do not permit oxygen-enriched air to come in contact with combustible and/or reducing materials.
* Frost around the top of a venting container is indicative that the cold vapors are condensing the moisture in the air. Frost at the bottom or on the sides of the cylinder indicates that the container is faulty and damaged. **CALL THE VENDOR** and ask them to pick up and exchange the container.
* If the container is dented or otherwise physically damaged, it should not be accepted from the vendor.
* Follow all substance-specific storage guidance provided in SDS documentation.

Waste Disposal Procedures

*List the types of waste (solid or liquid), the expected amount of waste generated, and how the waste should be handled when performing the procedure. Also list the hazard determination (flammable, oxidizer, corrosive, reactive, toxic) of the generated waste.*

* **Solid Waste:** N/A
* **Liquid Waste:** N/A

Emergency Response (Spill & Accident Procedures)

*Indicate how spills, personnel exposure/injury, and other accidents should be handled and by whom. List the physical address on campus.*

* Evacuate the space immediately in the event of a cryogen leak or spill or if you are suffering from oxygen depletion symptoms. **ACTIVATE THE BUILDING’S FIRE ALARM SYSTEM IF THE SPILL REPRESENTS A THREAT TO HUMAN LIFE OR MAY CAUSE A FIRE OR EXPLOSION.**
* Do not attempt to clean up a cryogen spill. Immediately leave the area and call EHS for assistance (352-392-1591).
* Call 911 if a colleague lies unconscious. Rescue efforts should only be conducted by trained personnel.

For a small spill:

* In the event of a small spill, evacuation may not be necessary if the area is well ventilated. Stand back and let the spill evaporate.

For contact exposure:

* Call 911 in the event of an emergency.
* Run the affected area under cool or warm water for fifteen minutes until help arrives. Do not use hot or cold water.

**Emergency Contact Numbers:**

* Principal Investigator: [xxx-xxx-xxxx]
* Lab Manager: [xxx-xxx-xxxx]
* Lab Manager: [xxx-xxx-xxxx]
* Poison Control Center: 800-222-1222
* Emergency: 911
* EH&S: 352-392-1591

**Physical Address on Campus:**

[Add your lab’s address here]

References

*List resources that may be useful when performing the procedure, for example, Admin policies, standards, etc.*

[Cryogens » UF | EHS (ufl.edu)](https://www.ehs.ufl.edu/departments/research-safety-services/chemical-and-lab-safety/cryogens/)

Documents and attachments

*List applicable forms that are required to be completed in the SOP. Attach any documents used in support of the SOP, e.g., flowcharts, work instructions, pictures or diagrams, forms, and labels.*

[List applicable forms and attachments here]