

# Cyclotron Institute Radiation Effects Facility

## Cryogenic Safety Guidelines

A detailed description of the cryogenic setup and procedure must be submitted in advance of your arrival to our facility. This description and procedure must meet with the approval of the Cyclotron Institute Safety Committee. In addition, you must provide written confirmation that someone in your group has previous experience with handling cryogenic liquids.

While at our facility you must inform the operator on duty before you begin using any cryogenic liquid.

You must also be thoroughly familiar with the information presented below before handling a cryogenic liquid and its associated equipment at this facility.

### Cryogenic Hazards

**Extreme Cold** Cryogenic liquids and their associated cold vapors and gases can produce effects on the skin similar to thermal burns. Even brief exposures to the eye can be damaging. Prolonged exposure of the skin to cryogenic fluid or contact with cold surfaces can cause frostbite. In such cases the skin will appear waxy yellow with no initial pain, but the pain will be intense when the frozen tissue thaws.

**Asphyxiation** When cryogenic liquids form a gas, the gas is very cold and usually denser than air. This cold, dense gas does not disperse very well and can accumulate near the floor. Even if the gas is non-toxic, it displaces air. When there is not enough air or oxygen, asphyxiation and death can occur. Oxygen deficiency is a serious hazard in enclosed or confined spaces. **NOTE: The use of toxic cryogenic fluids is not allowed at this facility!**

**Explosion** Without adequate venting or pressure-relief devices on the containers, enormous pressures can build up. The pressure can cause an explosion. Unusual or accidental conditions such as an external fire, or a leak in the vacuum that provides thermal insulation, may cause a rapid pressure rise. The pressure relief valve may not be able to handle this increased pressure. Therefore, the containers must also have another backup device such as a frangible (bursting) disc.

### Personal Protective Equipment

To reduce the possibility of coming in contact with cryogenic liquid the proper protective equipment must be worn. This includes:

- Full Face Shield with safety glasses.
- Heavy, loose fitting leather or cryogenic gloves (elbow length)
- Long sleeve shirt, or arm protection
- Pants should be cuff-less and not be tucked into shoes or boots.
- Closed toed shoes. No sandals or flip-flops.

## Handling of Cryogenic Fluids and Equipment

- Store and use cryogenics with adequate ventilation. Do not store in a confined space.
- Do not plug, remove, or tamper with any pressure relief device.
- Containers should be handled and stored in an upright position.
- Do not drop, tip, or roll containers on their sides.
- Do not remove or interchange connections.
- Contact the vendor if you experience any difficulty operating the container valve or with the container connections. Discontinue use. Use the proper connection. **DO NOT USE ADAPTERS!**
- Use piping and equipment designed to withstand the low temperatures and high pressures to be encountered. Only transfer lines designed for use with cryogenic liquids should be used.
- On gas withdrawal systems, use a check valve or other protective apparatus in any line or piping from the container to prevent reverse flow.
- To prevent cryogenic liquids or cold gas from being trapped in piping between valves, the piping should be equipped with pressure relief devices.
- Always read the container label prior to use.
- Cryogenic liquids should not be handled in open pail-type containers or in unapproved dewars.
- Transfer of liquid into warm lines or containers must be done slowly to prevent thermal shock and possible buildup of pressure.
- High concentrations of escaping gas should not be allowed to collect in an enclosed area.
- Avoid prolonged breathing of cryogenic liquid vapors.
- Never allow any unprotected part of the body to come in contact with un-insulated pipes or equipment that contains cryogenic product. The extremely cold metal will cause the flesh to stick fast and tear when one attempts to withdraw from it.
- Watch out for frost build-up on vents, containers and lines as it may interfere with function of the safety devices, indicate a thermal insulation problem, or cause mechanical failure.
- Always make sure that you can easily obtain help from another person in case of an accident.

## Emergencies

- If liquid is splashed in the eyes, flush with water for at least 15 minutes. Seek immediate medical attention. Call 911.
- Skin contact may cause frostbite and burns. Soak affected part in tepid water and seek immediate medical attention. Call 911. (Skin contact is a medical emergency. Lack of prompt medical attention may result in amputation).
- If liquid spills on clothing or gets into gloves or shoes that you are wearing, remove the affected garment immediately.
- In case of a massive spill, evacuate the area immediately. Use the nearest pull station to set off an alarm. Notify the operator or the accelerator technician on duty.

**I have read and understand the information presented above and agree to observe and follow the given guidelines, rules and regulations.**

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**Name**

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**Date**

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**Signature**

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**Company**