Safe Method of Use 18 – Cryogenic Liquids

There are two major hazards associated with cryogenic liquids such as liquid nitrogen and helium – burns and asphyxiation.

A. BURNS

Cryogenic liquids are, by definition, extremely cold. Contact between cryogenic liquids and exposed skin can produce a painful burn. A splash of cryogenic liquid to the eye can cause loss of vision.

Personal Protective Equipment

- Face shield
- Loose fitting Thermal Mittens or Gloves (that can be easily shaken off)
- Closed Shoes or boots
- If pouring cryogenic fluids ensure pants material is not tucked into boot

Emergency Treatment for Burns

- Attempt to raise the burnt area to room temperature reasonably quickly.
- Do not use warm water.
- Do not remove clothing around burn as it may lift frost bitten skin

B. ASPHYXIATION.

Cryogenic liquids will expand many times their origin volume when they convert to gas at room temperature.

If vented into a closed space, cryogenic liquids such as helium, argon and nitrogen will displace oxygen when they become gaseous and have the potential to create oxygen deficient environments in a closed room.

Because of the nature of the gases involved, the victim will have no warning that they are in or entering an oxygen-deficient environment.

For this reason, container of cryogenic liquid ***must never*** be stored in small enclosed rooms.

Refer to SMOU 21 - Safe Storage of Liquid Nitrogen for further guidance as to room size.

Liquid nitrogen and argon ***must never*** be stored or used in basement area or pits. Where gas can accumulate and develop an oxygen deficient atmosphere.

Other Hazards Associated With Cryogenic Liquids

1. Pressure buildup.

Boiling of liquefied gases within a closed system increases pressure. Users must make certain that cryogenic liquids are never contained in a closed system. Cold fingers and similar devices have exploded when either an ice dam is formed within the apparatus or when users create a closed system by shutting off all valves. Users should also tape exposed glass parts to minimize the hazard of flying glass shards in the event of an explosion.

2. Oxygen enrichment.

Liquid nitrogen and liquid helium may fractionally distill air, causing liquid oxygen to collect in the cryogenic container.
Liquid oxygen increases the combustibility of many materials, creating potentially explosive conditions. Make sure to provide adequate venting when working with cryogenic liquids in a closed system or enclosed space.

3. Embrittlement.

Do not dispose of cryogenic liquids down the drain! Ordinary materials such as metal or polyvinylchoride (PVC) piping in laboratory sinks may not be able to withstand cryogenic temperatures.
Allow cryogenic liquids to evaporate in a fume hood or other well-ventilated area. Materials exposed to cryogenic temperatures for long periods or materials that have undergone periodic warming and freezing must be examined regularly for cracks and warping.

4. Cryotube Explosions.

Cryotubes used to contain samples stored under liquid nitrogen may explode without warning when warmed. Tube explosions are caused by liquid nitrogen entering the tube through minute cracks and then expanding rapidly as the tube thaws. Cryotubes may be thawed behind

shields or in fume hoods where the glass sash can provide shielding. When thawing cryotubes in the open, take the following protective steps:

- Wear a face shield, or at least safety goggles, whenever handling cryogenic liquids.
- Wear heavy gloves.