

# SOP **Cryogenics**

Purdue University                      Physics Department                      PRIME Lab  
Applicable rooms:                      All PRIME Lab areas

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## INTRODUCTION

Cryogenic liquids have boiling points of less than  $-90^{\circ}\text{C}$  ( $-130^{\circ}\text{F}$ ) at 14.7 PSIA (1 bar). All cryogenic liquids are gases at normal temperatures and pressures. When cooled and placed under pressure in specially designed systems or storage containers, the gases condense to a liquid state and maintain very cold temperatures.

## HAZARDS

- Fire (if flammable gas)
- Pressure rupture
- Embrittlement of materials
- Condense oxygen out of air to produce liquid oxygen, a hazardous oxidizer
- Can cause severe low temperature burns to skin and eyes
- May produce an oxygen deficient atmosphere if large volumes of gas are released in a short time
- Some cryogenics have additional hazards, for example liquid oxygen is also an oxidizer

## PROCEDURES

- 1 Read and understand the MSDS or SDS for any chemicals to be used before starting work.
- 2 Equipment should be kept clean, especially when working with liquid or gaseous oxygen
- 3 Containers and systems containing cryogenics should have pressure relief mechanisms. Containers and systems should be capable of withstanding extreme cold without becoming brittle. Glass containers should be taped solidly around the outside or encased in plastic mesh
- 4 Funnels should not be used for pouring cryogenics unless specifically designed for that purpose. Large mobile Dewars or LN2 refrigerators (or the trolleys carrying these) used for transporting cryogenics within a building or between buildings should be equipped with a braking mechanism.
- 7 Wheeled trolleys may not be used if the vessel must pass over elevator thresholds or other slots/crevasses wider than 25% of the wheel width
- 8 Appropriate PPE and engineering controls must be used

# SOP

## Cryogenics

### MINIMUM PPE REQUIREMENTS

- 1 No rings or other jewelry may be worn
- 2 Skin cover to throat/wrists/ankles including required lab coat
- 3 Closed shoes that can be quickly removed
- 4 Hand protection
  - Volume  $\leq$  500 ml Dewar - none
  - Volume  $>$  500 ml Dewar - cryogloves
  - Dispensing cryogen from pressurized Dewar - cryogloves while operating valves or touching components or piping cooled to low temperatures
- 5 Eye protection
  - Volume  $<$  100 mL Safety glasses with side shields
  - Volume  $>$  100 mL  $\leq$  1 L Splash goggles or safety glasses with side shields and face shield
  - Dispensing cryogen from pressurized Dewar - Splash goggles or safety glasses with side shields and face shield
- 6 Any additional requirements of hazard certification in room where work is done

### STORAGE

- 1 Flammable and Oxidizing cryogenics should be stored in separate locations
- 2 Do not store dewars in areas with limited ventilation such as cold rooms

### DISPOSAL

- 1 Because of the rapid evaporation rate, there generally is not a disposal issue unless the cryogen is hazardous or flammable

### EMERGENCY PROCEDURES

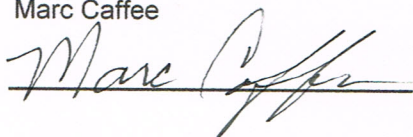
- 1 Know the maximum amount that can be spilled or released in the area without creating an oxygen deficient atmosphere. If a spill occurs that exceeds this amount, immediately leave the area, shut doors, and call 911. If the amount spilled or released is such that it could impact nearby areas, initiate building evacuation procedures.
- 2 If eye or skin contact with frostbite occurs, remove restrictive clothing, flush the affected area with tepid (NOT HOT) water and seek medical attention. Do not rub the affected area or use dry heat to warm.
- 3 Skin or eye contact should continue to be treated as specified in the MSDS or SDS
- 4 For any eye injury or significant other injuries Purdue EMS should be called immediately.
- 5 All injuries must be treated as specified in section 6.7 of the CHP

### APPROVAL

PI

Marc Caffee

Signature:



Date:

6/10/19