

STANDARD OPERATING PROCEDURE: *Filling Dewars from Large Tanks*

University of Southern California, Chemistry

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1.0 PURPOSE

The purpose of this standard operating procedure (SOP) is to provide general information and guidelines for *safely filling dewars with liquid nitrogen (LN2)*. It is recommended that current literature on the subject be consulted for up-to-date information and best practices.

2.0 EXPOSURE HAZARDS AND FIRST AID

Cryogenic liquids are materials with extremely low boiling points (< -150 °F/ -101 °C), such as LN2. LN2 will undergo substantial volume expansion upon evaporation, which can possibly lead to an oxygen deficient atmosphere that may cause asphyxiation and unconsciousness when there is limited ventilation.

LN2 can rapidly freeze skin tissue and eye fluid, resulting in cold burns, frostbite, and permanent eye damage even with brief exposure.

For medical emergencies, contact the Department of Public Safety (DPS) at 213 740 4321. Attach pertinent Safety Data Sheets (SDS) of liquid nitrogen. SDSs are available through the EH&S portal . Select “MSDS” under “Links” on the right margin.

For eye/skin exposure:

1. Flush affected body area with tepid water for at least **15 minutes**. Do not use cold or hot water.
2. Do not rub or massage the affected area as this can cause further tissue damage.

For anoxia:

1. If a person becomes dizzy or loses consciousness, move them to a well-ventilated area assuming it is safe to access them.
2. If breathing has stopped, have a certified individual apply artificial respiration.
3. Seek immediate medical attention.

3.0 PERSONAL PROTECTIVE EQUIPMENT (PPE)

In addition to general lab PPE (i.e., long pants, close-toed shoes, lab coat, safety glasses), the user must also utilize the following **additional PPE** when using the large LN2 tank:

1. Face shield.
2. Insulated cryogenic gloves.

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The face shield and insulated cryogenic gloves are available for the large tank adjacent to CEMMA in the OCW LN2 storage closet. The face shield and insulated cryogenic gloves are available adjacent to the large tank in SGM in a plastic container.

4.0 ENGINEERING AND VENTILATION CONTROLS

1. Only work with LN2 in well-ventilated areas (minimum of 6 air changes/hour) to avoid oxygen depletion.
2. Containers and systems containing LN2 must have pressure relief mechanisms. **Never seal LN2 in a closed system.**
3. Dewars should never be more than 80% full to protect against thermal expansion and to avoid splashing.
4. When transferring LN2, oxygen in the air surrounding a cryogen containment system can dissolve and create an oxygen-enriched environment. Since the boiling point of nitrogen is lower than oxygen's, liquid oxygen evaporates slower than nitrogen and may build up to levels which can increase the flammability of materials such as clothing near the system. Equipment containing cryogenic fluids must be kept clear of combustible materials in order to minimize the fire hazard potential. Condensed oxygen in a cold trap may combine with organic material in the trap to create an explosive mixture.

5.0 PROCEDURES

1. Dewars 25 L or larger should be filled from the large storage tanks.
Smaller dewars should be filled from the 160 L tank in the OCW closet.
2. Put on all necessary PPE (see section 3.0).
3. Open vent valve on the receiving dewar.
Dewar should be depressurized before fill is started.
Make sure vent is pointed away from the user and any walkways where pedestrians may be passing by.
Do not allow anyone to enter the area of the vent stream.
4. Connect the large storage fill line to the liquid port of the receiving dewar with flare fitting matching the fill line. The fill line and liquid port must be secured in a manner that will not allow the line to come loose during the fill process.
5. Open the liquid valve on the receiving dewar.
6. Open the liquid valve on the large storage tank about 1/4 turn.
If dewar is at room temperature, open about 1/8 turn until the inside is cooled.
A drop in exhaust gas will be observed with the inside of the dewar has been cooled.
7. Allow receiving dewar to fill. Dewar is full when liquid is observed exhausting from vent port.
8. Close storage tank valve.
9. Close dewar liquid valve.
10. Close dewar vent valve.
11. Disconnect storage tank fill line.
If flare nut is frozen to fill line, do not force with wrench.
Get cup full of water and slowly pour over nut until it can be loosened.
12. Place fill line on hook so the end does not touch the ground.
13. Lock gate when finished.

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6.0 EMERGENCY

For general emergencies, follow the steps below. Refer to EH&S' "Emergency Notification" Fact Sheet () for details.

1. Call DPS immediately. UPC 213.740.4321.
2. Call EH&S. Dial 323.442.2200, press "6".
3. Supply name; call back number; nature of the emergency and location.
4. Report the emergency to the supervisor, lab manager, or principal investigator.

6.1 SPILL AND ACCIDENT PROCEDURES

In the event of a large (> 1 liter) spill, follow these guidelines:

- Evacuate personnel from the spill area.
- Notify everyone in the immediate area and the supervisor.
- Deny entry.
- Alert other building occupants. NOTE: Evacuation of the building and its occupants may be necessary depending on the volume of chemical spilled and its relative hazard.
- Notify DPS at 213 740 4321 from a safe location and provide the following information:
 - Name, telephone number, and location;
 - Type of incident, location, and time of occurrence;
 - Name and quantity of material involved, to the extent known;
 - If victims are involved, relay the victim(s)' name(s) and extent of injuries, if any;
 - If exposed to a spill, see 2.0 Exposure Hazards and First Aid.

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7.0 TRAINING AND DOCUMENTATION

The Principal Investigator must ensure that his/her research group is trained in the application of this SOP by Allan Kershaw. Each user will enter his/her name, physical or electronic signature, and date below once he/she has read and understands the content of this SOP.

NOTE: Users are subject to all applicable safety trainings including the General Lab Safety Course, manual laboratory safety training refresher, etc.

I have agreed that I have been properly trained fill dewars 25L or larger with liquid nitrogen. The most up to date version of the SOP can be located at:



Name	Signature	Date

To be allowed access to the liquid Nitrogen you must email a picture of this page with your signature to: sop@chemmac1.usc.edu

Include your full name in the subject of the email.

8.0 SOP REVIEW/REVISION

Date prepared:
September 26,
2016

By: *Richard Brutchey, Allan Kershaw, Corey Schultz, Department of Chemistry*

Date revised:
June 30, 2017

By: *Richard Brutchey, Allan Kershaw, Corey Schultz, Department of Chemistry*

Date revised:

By: *(Name of preparer/reviewer for internal SOPs; department name for external SOPs)*