

STANDARD OPERATING PROCEDURE: *Filling Small Dewars from 160 L Tank in OCW Closet*

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 <http://adminopsnet.usc.edu/department/environmental-health-safety>. 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 160 L LN2 tank:

1. Face shield.
2. Insulated cryogenic gloves.

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Both the face shield and insulated gloves are available inside the closet containing the LN2 tank.

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. Do not fill dewars larger than 10 L from the closet. See Allan Kershaw if you have a larger dewar that needs to be filled. Only use dewars with an orifice greater than 1.5" diameter to avoid restricting the flow of the nitrogen gas boil off.
2. Put on all necessary PPE (see section 3.0).
3. Record dewar size, group name, and your name on the record sheet.
4. Place dewar on stand beneath tank spout.
5. Slowly open valve to dispense LN2. Minimize the amount of LN2 spill by regulating the flow.
If dewar is warm, take extra caution and LN2 will splash vigorously.
6. Close valve when receiving dewar is no more than 80% full.
7. If tank empties while filling, close valve and move receiving dewar and stand to another tank.
Do not move to another tank unless the first tank is completely empty. Check this by opening tank valve to see if LN2 comes out.
Notify Allan Kershaw if both tanks are empty.
8. Return the face shield and insulated cryogenic gloves to their hook inside the closet.
9. Make sure the closet door is closed and locked when you leave.

6.0 EMERGENCY

For general emergencies, follow the steps below. Refer to EH&S' "Emergency Notification" Fact Sheet (http://adminopsnet.usc.edu/sites/default/files/all_departments/EHS/ehs%20fact%20sheet-emergency%20notification-1.pdf) 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.

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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.

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 no larger than 10L with liquid nitrogen. The most up to date version of the SOP can be located at:

<http://nmrnet.usc.edu/>



Name	Signature	Date

To be allowed to withdraw 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.

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8.0 SOP REVIEW/REVISION

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September 26, 2016

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Date revised:

By: *(Name of preparer/reviewer for internal SOPs;*
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