

<b>Title:</b>	<b><i>SCIENCE SAFE WORK PRACTICE #14:</i></b> <b>TRANSPORTATION OF CRYOGENIC AND COMPRESSED GASES</b>
SWP document #:	FSSC-SSWP-014-v1.1
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*This Safe Work Practice is approved and maintained by the Faculty of Science Safety Committee. Please contact Leanne Lucas, Safety Advisor–Science Activities, with any questions or concerns ([leanne.lucas@smu.ca](mailto:leanne.lucas@smu.ca))*

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## **1. PURPOSE**

Guidance for the transportation of cryogenic and compressed gases between floors within the Science building.

## **2. SCOPE**

- 2.1** It is the responsibility of the Departmental Chairs, Professors, and Departmental Technicians to ensure that the procedures in this SWP are followed.
- 2.2** This SWP will apply to the transportation of cryogenic (liquid nitrogen, dry ice) and compressed gas cylinders using the elevator or the stairs in the Science building.

## **3. HAZARDS**

- 3.1** The hazards associated with cryogenics like liquid nitrogen include frostbite, asphyxiation, and sudden release of pressure from sealed packages. Spilled liquid nitrogen vaporizes quickly. In confined spaces, nitrogen can displace oxygen which poses an asphyxiation hazard. Elevators still pose a risk because of their small space. Please see the procedure below for transporting materials in the elevator.
- 3.2** Dry ice sublimates at a slower rate than cryogenic liquids, but shares the same hazards mentioned above.
- 3.3** Compressed gases may not include a risk of frostbite, but still retain the risk of asphyxiation and issues with pressure, including the possibility of becoming a projectile if the cylinder valve is broken. Some compressed gases are toxic or flammable.
- 3.4** These hazards can be mitigated by taking the appropriate precautions.

**3.5** Consult Safety Data Sheets (SDSs) for more information on spill procedures and first aid measures.

## **4. SAFETY EQUIPMENT AND SUPPLIES**

### **4.1 Personal Protective Equipment (PPE)**

#### 4.1.1 Planning

4.1.1.1 Think about what could go wrong before you begin your work, and how you would mitigate these problems before you begin. What would happen if something were to spill? If you dropped a small dewar, where would the liquid go? Think of a different way to transfer the material if you would be splashed.

4.1.1.2 Ensure that someone can communicate with the vendor in advance and be available to help accept the delivery.

#### 4.1.2 Eye Protection

4.1.2.1 Use safety glasses with side shields or goggles when transporting liquid nitrogen volumes of 4 L or less.

#### 4.1.3 Gloves

4.1.3.1 A single latex or nitrile glove may be worn to hold the dewar handle if it is suspected to be dirty. An ungloved hand must be available for opening door handles to prevent contamination of common building surfaces.

#### 4.1.4 Protective Clothing

4.1.4.1 Ensure skin is not exposed. Wear long pants. No sandals or open toed shoes. Beware that fabric shoes can absorb liquid nitrogen if spilled.

#### 4.1.5 Containers for Transportation and Transportation Aids

4.1.5.1 Use appropriate containers for transporting the materials. Liquid nitrogen volumes of 4 L or less can be transported in a dewar with a vented lid. If using consumer grade insulated vessels (e.g. Coffee thermos), do not use a cap or lid, do not store liquid nitrogen in the thermos, and ensure containers are tilt-proof.

4.1.5.2 Dry ice can be transported using an insulating container like Styrofoam with a lid.

4.1.5.3 Compressed gases can be transported with the protective valve cap in place and attached to a compressed gas cart.

4.1.5.4 A cart can be used to help transport boxes or smaller dewars.

#### 4.1.6 Warning Sign

4.1.6.1 An elevator warning sign and tension rod will be available for pickup from the Departmental Technician or at the designated storage location. This sign is to be used when transporting liquid nitrogen, dry ice, or compressed gases using the Science building elevator. The sign can be viewed in Appendix 1.

## 5. PROCEDURE

### 5.1 Waste Disposal

- 5.1.1 Liquid Nitrogen. Do not dump out dewars of excess liquid nitrogen in enclosed spaces. Leave them to evaporate in covered dewars to prevent the creation of liquid oxygen.
- 5.1.2 Dry Ice. Leave excess dry ice in Styrofoam containers to evaporate slowly in a well-ventilated area.
- 5.1.3 Compressed Gases. Ensure empty tanks are marked if the tank does not have a built-in gauge.

### 5.2 Transportation Procedure using the Elevator

- 5.2.1 Below 2 kg of dry ice may be transported on the elevator with passengers. Please ensure that you inform someone else when you are travelling with dry ice in the elevator. Check in before and after transport, so they can act quickly in case you become trapped in the elevator.
- 5.2.2 For transportation of liquid nitrogen, compressed gas cylinders, and more than 2 kg of dry ice:
- 5.2.3 Typical consumer gases are not included in this procedure (e.g. 1 lb propane canisters, CO<sub>2</sub> for home carbonation of drinks, or gases used by HVAC/ plumbers, etc.).
- 5.2.4 Transportation must be done by two people. Receipt of dewars or gas cylinders will be completed by designated people or alternates chosen within each department.
- 5.2.5 Always make sure to move large liquid nitrogen dewars by the handle and not using the protective ring around the top of the cylinder.
- 5.2.6 Move gas cylinders using a compressed gas cart, ensure the valve protection cap is in place before moving. At the final location, secure gas cylinders to a wall or bench.
- 5.2.7 Pick up the warning sign, as shown in Appendix 1, and tension rod from the Departmental Technician or designated storage location.
- 5.2.8 Returning empty containers:
  - 5.2.8.1 One person places the empty liquid nitrogen dewar or compressed gas cylinder in the elevator with the warning sign.
  - 5.2.8.2 The elevator is sent to the first floor containing only the empty dewar or compressed gas cylinder.
  - 5.2.8.3 The person on the first floor removes the empty container and caution sign.
- 5.2.9 Receiving full containers:
  - 5.2.9.1 The person on the first floor loads the full liquid nitrogen or compressed gas cylinder into the elevator with the warning sign.
  - 5.2.9.2 The elevator is sent to the appropriate floor with the full liquid nitrogen dewar or compressed gas cylinder.

5.2.9.3 The person on the appropriate floor removes the full dewar or compressed gas cylinder and warning sign.

5.2.10 The warning sign and tension rod are returned to the Departmental Technician or designated storage location.

5.2.11 Note: When transporting cryogenics using the elevator after hours or when there is not a second person available on site, please use the stairs to meet the elevator and remove the material.

### 5.3 Transportation Procedure using the Stairs

5.3.1 Only for transportation of dry ice or small (4 L or less) of liquid nitrogen. Do not transport gas cylinders using the stairs. Typical consumer gases are not included in this procedure (e.g. 1 lb propane cannisters, CO<sub>2</sub> for home carbonation of drinks, or gases used by HVAC/ plumbers, etc.).

5.3.2 Ensure liquid nitrogen is transported in a dewar with an appropriate vented lid (if available) covering the top and dry ice is transported using a Styrofoam container with a lid. Please wear the correct PPE including eye protection and protective clothing.

## 6. REFERENCES

- 6.1 Chemical Laboratory Safety Manual, Dalhousie University, 29 pages, 2018.
- 6.2 Appendix U: Elevator Transport of Cryogenic and Hazardous Materials, Carnegie Mellon University, 2 pages.
- 6.3 Safe Work Practice (“SWP”) Protocol Working Safely with Liquid Nitrogen, UBC Chemistry Department, 6 pages, 2015.
- 6.4 Report to the Life Sciences Centre (LSC): Evaluation of Recommendations for the transport of dry ice (CO<sub>2</sub>) and liquid nitrogen (N<sub>2</sub>) in LSC elevators, David Kodama and Karen Bartlett, UBC School of Environmental Health, 14 pages, 2010.
- 6.5 SOP Transport of Liquid Nitrogen and Dry Ice in Elevators, Universitat Bern Department of BioMedical Research, 1 page, 2017.

## 7. REVISION HISTORY

Date	Version	Summary of changes
2024-02-09	v1.0	New document approval.
2024-05-13	v1.1	Reflect common dewar size of 4L. Added exemption for typical consumer gases.

## 8. APPENDIX 1: ELEVATOR CAUTION SIGN

# CAUTION

Cryogenics or  
Compressed Gas  
Cylinders in Transport

# DO NOT ENTER ELEVATOR



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