

## Room Description:

Room \_\_\_\_\_ contains equipment which performs helium liquefaction, and therefore contains both liquid and gaseous helium. Atmospheric pressure gas is piped into the room from experiments. The gas is compressed to up to 200 psi, and is stored in one of 4 363 litre Winchester tanks. From the storage tanks the gas is compressed and liquefied, and then stored in a 150 litre dispensing dewar. Researchers will bring dewars into the room to be filled with liquid helium from the dispensing dewar.

The room is equipped to house a maximum of 1200 litres of pressurized helium gas, and 150 litres of liquid helium.

### **INSERT DIAGRAM OF ROOM LAYOUT/FLOOR PLAN**

## Significant hazards:

- Asphyxiation hazard:
  - o When helium gas is released to atmosphere it displaces oxygen. If enough oxygen is displaced, people in the room could be affected by hypoxia.
  - o Because liquid helium expands by a factor of 700 when evaporating, a small spill of liquid can quickly lead to a large quantity of helium gas.
- Burn hazard: Helium liquid is stored at -270C, and will burn exposed skin on contact. Minimize the amount of exposed skin when working with liquid helium.
- Burn hazard: The 'boil off' gas that is created any time liquid helium is transferred is extremely cold. It will burn exposed skin, and can cause significant internal injuries if inhaled. Ensure that the helium recovery lines are correctly connected prior to initiating a transfer.

## Notable hazards:

- Hearing damage.
  - o The release of compressed gasses to atmosphere causes rapid pressure changes in the room and is very noisy. This can result in hearing damage or loss. Hearing protection must be work when there is a risk of a high pressure release of gas.
- Burns from equipment
  - o The stainless steel transfer tubes used in Room \_\_\_\_\_ for dispensing helium become extremely cold during use. Wear cryogenic compatible gloves when handling transfer equipment.

## Safety features in the helium recycling room:

1. The volume of Room \_\_\_\_\_ is approximately 40,000 litres, while the tanks contain no more than 20,000 litres of gas at atmospheric pressure. Even in the unlikely event that all four tanks

rupture simultaneously, the top half of the room would fill with helium, leaving a 6-foot safe area between the floor and the ceiling.

2. The room is well ventilated with 10 air changes per hour
3. An O<sub>2</sub> sensor with an alarm is mounted at the 7' level, which will warn users if enough helium is released to affect the concentration of O<sub>2</sub>.
4. Insulating gloves, safety eyewear, and ear protection are stored in the room.
5. The door to Room \_\_\_\_\_:
  - a. Has hazard signs posted on it warning of the risks in the room.
  - b. Shall be kept closed and locked when personnel are not using the room. This is to prevent unauthorized persons from entering the room.
  - c. Shall be secured in an OPEN position whenever personnel are in the room, to ensure that personnel are able to leave quickly in an emergency.

### Working safely in Room \_\_\_\_\_.

1. Wear appropriate PPE during the process:
  - a. Face shield
  - b. Insulated gloves specifically designed for working with cryogenics
  - c. Long pants with close toed shoes.
2. Do not enter Room \_\_\_\_\_ if the Oxygen sensor is in alarm condition.
  - a. Call the PI (Dr \_\_\_\_\_) or a qualified technician from the group or from departmental shops.
3. Exit Room \_\_\_\_\_ immediately if a large gas release or liquid spill occurs. Allow 20 minutes for the spill to dissipate or evaporate before re-entering Room \_\_\_\_\_.
  - a. Do not re-enter the room if the O<sub>2</sub> sensor is still in alarm condition.
  - b. Do not attempt to assist co-workers who have collapsed while in the room.
    - i. it is extremely unlikely that this would happen, but if it does it indicates that O<sub>2</sub> levels are dangerously low. Staying in the room will put you at risk of collapse as well.
  - c. Leave the room and return only when you are sure O<sub>2</sub> levels have recovered to safe levels.
4. Small spills of liquid helium or releases of helium gas will occur during the transfer process.
  - a. Pay attention to where gas or liquid can be emitted, and ensure that you and your co-worker(s) are not situated in the path of a stream of helium liquid or gas.
  - b. Gas from helium boil off is very cold. Avoid touching or breathing it. The cold gas stream coming from the transfer lines should be routed to the reclamation system...even so, be careful around it.
  - c. Use cryogenic gloves to handle the transfer tube during the transfer operation.
5. Prior to working with cryogenics, plan what you will do if a spill occurs, and how you will avoid being injured or incapacitated by a spill.

## Safety Inspection and Testing Requirements

- The monthly safety inspection for Room \_\_\_\_\_ shall include a check of the oxygen sensor in Room \_\_\_\_\_ to confirm that the controller is reading correctly, and to confirm that the sensor has been checked within the previous 12 months.
- The sensor and controller shall be tested annually, with controller calibration or sensor replacement performed as recommended by the manufacturer (most sensors have a 2 year working life).

## References

UBC Risk Management Cryogenics Safety: <https://riskmanagement.sites.olt.ubc.ca/files/2021/04/CHEM-GDL-003-Cryogenic-Liquids-Safety.pdf>

## Emergency Rescue and Evacuation Procedures

### Emergency Contact Information

<b>Dr</b>	<b>Principle Investigator</b>	
<b>Tony Mittertreiner</b>	<b>Manager, Technical Services</b>	<b>604-817-6363</b>
<b>Mechanical Engineering Shop</b>		<b>604-822-9467</b>
<b>Trouble Calls</b>	<b>Building Operations</b>	<b>604-822-2173</b>

If someone is injured or incapacitated, call 911 immediately, then call Campus Security at 604-822-2222. Advise the operator whether a hazard still exists (that is, if helium is still leaking or present in the room).

### First Aid

<b>For:</b>	<b>Treatment:</b>
- Skin frostbitten by exposure to helium liquid, cold transfer tube contact, or contact with cold gas	- Treat as burns. Minor burns treated on site, 2 <sup>nd</sup> or 3 <sup>rd</sup> degree burns should be treated by medical staff
- Inhalation of cold gas or liquid	- Transfer injured person to hospital immediately.
- Loss of consciousness or disorientation due to hypoxic atmosphere.	- Treat as for asphyxiation.

### Emergency Procedures

<b>Emergency Condition</b>	<b>Action</b>
- Unplanned release of helium gas or liquid	<ul style="list-style-type: none"> <li>- Exit Room _____ to the hallway or Room _____ immediately.</li> <li>- Re-enter only if O2 alarm is not active, and if leak is known to be contained or of limited quantity.</li> <li>- Do not re-enter Room _____ until you are certain that the O2 levels are not compromised.                             <ul style="list-style-type: none"> <li>o Cold helium gas will collect at the ceiling, and will cause a dense fog to form. No fog at the top of the room indicates that <b>a liquid spill</b> has evaporated and the resulting gas has dissipated.</li> </ul> </li> <li>- A life threatening helium leak will take no more than 1 minute to clear itself (based on the total amounts stored in Room _____).</li> </ul>
- Unplanned release of helium gas or liquid which leads to an injury.	<ul style="list-style-type: none"> <li>- Items from (1) above with the addition:                             <ul style="list-style-type: none"> <li>o Do not attempt to assist an injured person in Room _____ until you are certain that O2 levels are adequate.</li> </ul> </li> </ul>
- O2 sensor indicates low oxygen (alarm sounds and strobe light flashes).	<ul style="list-style-type: none"> <li>- Items from (1) above with the addition:                             <ul style="list-style-type: none"> <li>a. If the O2 alarm sounds for more than 1 minute, it is likely to be broken and in need of repair.</li> </ul> </li> </ul>

## Student/Staff Helium Recycling Safety Certificate

\_\_\_\_\_  
(Name of Room \_\_\_\_ user)

The user listed above has been trained to safely work in the helium recycling Room \_\_\_\_\_.

They have demonstrated that they understand and will adhere to the requirements laid out in the safety plan:

- Use of appropriate PPE
- What to do in case of emergency
- Proper technique during helium transfers
- Understanding of the risks of cyrogens

Completed and signed certificates shall be stored in the student's/staff member's red safety folder.

Certified by:

\_\_\_\_\_  
Dr. \_\_\_\_\_ (Principle Investigator)

\_\_\_\_\_  
Date (yyyy-mm-dd)



**Warning!**

Compressed Helium.

Asphyxiation risk!

**Warning!**

Liquid Helium.

Risk of severe frostbite!