

Liquid Nitrogen and Liquid Helium Code of Practice for Handling

HAS-PRC-0024

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1. Purpose and Scope

To describe how to handle cryogenics at Diamond

The procedure applies to: All persons working with either liquid nitrogen or liquid helium on Diamond premises.

2. Definitions

None.

3. Responsibilities

For general responsibilities which apply, see Safety, Health and Environmental Policy Arrangements (HAS-POL-0001-ARR).

Managers / Group Leaders

Managers/Group leaders are responsible for ensuring staff and persons under their control are appropriately supervised, informed, instructed and trained for safe use of cryogenics.

Responsible for:

- Ensuring that tasks under their control or in their areas involving cryogenics are suitably and sufficiently risk assessed including COSHH assessment.
- Ensuring that controls are in place and suitably maintained to control risks.

4. Procedure

Policy

It is Diamond policy to ensure all persons who handle liquid nitrogen or liquid helium are trained on handling cryogenics and the associated equipment, as well as ensuring all such activities are suitably and sufficiently risk assessed.

Training

All personnel handling cryogenics and associated equipment should have appropriate training.

Hazards

The main hazards associated with these cryogenic liquids are;

- Asphyxiation
- Cold burns or frostbite
- Pressurisation
- Oxygen rich liquid air formation.

Asphyxiation

Liquid N₂ and liquid He can be rapidly converted into gas at 700 times the liquid volume. They may then kill by asphyxiation. When the oxygen concentration in the air is sufficiently low, a person can become unconscious without sensing any warning symptoms, such as dizziness.

Cold Burns

Cryogenic liquids can cause severe frostbite and cold burns. Safety eyewear and gloves must be worn when handling liquid gases. Never touch an uninsulated pipe or vessel. The cold metal may stick fast and tear the flesh when you attempt to withdraw from it.

Pressurisation

Liquid N₂ and liquid He boil off very quickly. Do not put liquid gases in closed vessels that cannot withstand the pressure. All fit for purpose closed vessels and pipelines have relief valves that relieve excess pressure. They should not be tampered with or their operation hindered in any way.

Oxygen Rich Liquid Air Formation

Uninsulated surfaces cooled by liquid N₂ or liquid He can be cold enough to cause atmospheric air to condense on them. Oxygen condenses at a higher temperature than nitrogen or helium, and as a result condensed liquid air has a higher oxygen content (~40%) than normal atmospheric air (~21%). This can significantly increase the risk of fire if combustible materials are present.

Vessels

Only fill liquid He vessels with liquid He – they are designed to allow for the low latent heat of vaporisation and low density of liquid He and will be damaged if filled with liquid N₂. All vessels should be labelled to show what they contain. Plugs should be fitted except when filling or decanting.

Transport

Only use 'Onion' (25 litre) dewars (with neck plug) on a trolley or pressurised transport vessels when moving liquid N₂ or liquid He.

Signage

The presence of liquid N₂ or liquid He must be indicated by a sign. All areas where an Oxygen depleted atmosphere may form must have "asphyxiation" warning signage and appropriate access control.

Use of Lifts

No one shall accompany the dewar. Two person operation is required for the use of lifts. One person puts the dewar in the lift ensuring it is empty of personnel and the other person shall be on the receiving floor.

Gloves

Non-absorbent leather gloves (or similar) (BS EN 511) must be worn when handling anything that is, or has been recently, in contact with cryogenic liquids. The gloves should be loose fitting with a cuff.

Note: Other clothing (including footwear) should not allow liquid to be held next to the skin.

Eye Protection

As a minimum safety glasses (BS EN 166) shall be worn when handling cryogenic liquids. The risk assessment will determine if goggles or a face visor are more appropriate protection.

First Aid

For skin/eye contact immediately flush with warm (tepid) water for 15 minutes, then obtain medical assistance. For asphyxiation, move to fresh air and obtain medical assistance.

Oxygen Deficiency Alarms

All rooms with piped liquid N₂ must be equipped with oxygen monitoring. Any room where volumes in excess of 25 litres of liquid N₂ or liquid He are held shall be risk assessed for oxygen monitoring. Repeater alarms shall be fitted outside the room, with instructions on the meaning of the alarm and actions to be taken clearly posted.

5. Referenced Documents

Document Title	Reference	Location
None		

6. Records

Record	Responsible Person / Group	Statutory	Retention Time
Risk assessment	Line/Area manager	Y	Permanent
COSHH risk assessment	Line/Area manager	Y	Permanent

7. Final Approvers

Position	Approval Type
Senior Safety Advisor	Subject Matter Expert
Head of Mechanical Facilities	Management
Experimental Hall Manager	Management
Science Director - Physical	Management
Head of SHE Group	SHE Management System

8. Document History

Issue	Date	Comment
1	02 02 2006	New document
2	01 02 2010	Minor Revision
3	29 11 2010	Amend paras 11 & 15. Reapproved by DSPPC
4	26 06 2013	New format
5	06 09 2017	Reformatted

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