

# SAFE USE OF LIQUID NITROGEN

General – any person handling liquid nitrogen	Be trained and competent     Wear PPE as follows:			
must:	Eyes:	Goggles, face visor eg BS EN 166 Grade 3		
	Hands:	Non-absorbent, insulated gloves with sleeves <b>covering</b> the end of the glove eg BS EN 511		
	Feet:	Enclosed shoes, preferably with reinforced toe caps. Trousers should be worn <b>outside</b> the shoe		
	Body:	Overalls or lab coat, without pockets where liquid could collect		
Handling Dewars	Carry o	ut a Manual Handling Assessment – use trolleys / cradles		
	Beware of items that could trap liquid close to the skin eg rings, bracelets			
	Keep dewar upright unless pouring from a specifically designed dewar			
	Never 'walk', roll or drag a dewar			
	Avoid jolting / impacts against the dewar			
	_	ngs to remove objects, handle both carefully		
	Offig us	se in well ventilated areas		
Removing Liquid	Always	use a ljícjuid4&ithchratwa9cle4.ibæ áittec94vith talraw		
Nitrogen from		re relief device that stops the internal		
Dewar	pressur	re exceeding the dewar'sö a 'sö a 'sr Ä ar		

## Moving Liquid Nitrogen Dewars

### **GENERAL**

Never walk, roll or drag a dewar

Avoid jolting / impacts against the dewar

## **MOVING DEWARS UP STAIRS**

If the use of stairs is unavoidable, restrict access to the stairs eg display '**No Entry**' signs top and bottom and use two people to move the dewar

### **MOVING IN A LIFT**

If the use of a lift is unavoidable adopt the following:

Check the lift has an emergency alarm / telephone

Only fill the dewar to 90% capacity

Vent liquid withdrawal devices to less than half relief-valve pressure

Use two trained / competent persons to move the dewar:

- One to put the dewar in the lift and send to the correct floor (use call override if possible, if unavailable place a 'No Entry' sign around the dewar neck)
- o The second to wait at the floor the dewar is travelling to

### **NEVER:**

- 1. Accompany a dewar in a lift
- 2. Move a dewar that is venting gas, leaking, damaged etc
- 3. Move an overfilled dewar
- 4. Vent dewars in lifts

## Storing Liquid Nitrogen Dewars

#### **FULL / PART FULL DEWARS**

Ensure the area is well-ventilated, dry and sheltered from rain

Always store with protective caps fitted

### **EMPTY DEWARS**

Check the dewar is completely empty before storing

Only empty in a secure, well-ventilated area. Allow liquid to evaporate naturally. Never poor down the sink / drain

Ensure the storage area is dry

Always store with the protective cap in place

# Calculating Ventilation Requirements

### **NORMAL OPERATION**

Ventilation should be sufficient to ensure oxygen does not fall below 19.5% during the following normal conditions:

Normal evaporation of all liquid nitrogen containers in the room

Losses when filling the largest dewar in warm conditions

### **SPILLAGE**

Total spill of the largest dewar must not cause oxygen to fall below 18%

# **Effect of Spillage on Oxygen Concentration**

## Resulting % Oxygen Concentration = 100 x Vo / Vr

Where:

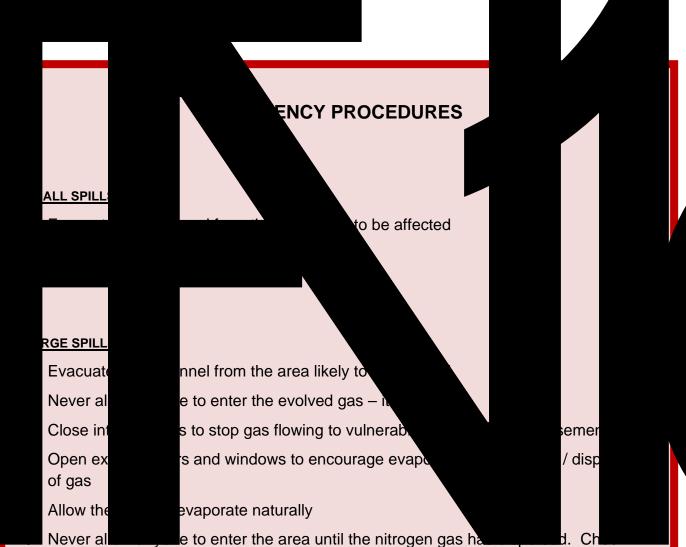
Vo = the volume of air, m

= the room volume, m<sup>3</sup>

**Vd** = dewar capacity

Fg = gas factor -

Transporting	REGULATORY REQUIREMENTS			
Liquid Nitrogen Dewars	Liquid nitrogen dewars moved by road must comply and be labelled in accordance with the Carriage of Dangerous Goods (Classification, Packaging and Labeling) and the use of Transportable Pressure Receptacles Regs.			
	Recipients of dewars must hold a Gas Safety Data Sheet.			
	GENERAL TRANSPORT RECOMMENDATIONS			
	Dewar must be in a separate compartment from the driver / passengers			
	Drivers must be trained in the use of liquid nitrogen dewars			
	Always check the dewar for damage etc before transporting			
	Fit a protective cap. Do not secure unless integral to the cap design			
	Ensure the dewar is appropriately labelled			
	Secure the dewar during transport to prevent spill / damage			
NEVER:	Secure the dewar during transport to prevent spill / damage  TRANSPORT DEWARS IN CARS			
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## FIRST AID ACTION

## **INHALATION**

- 1. Remove person to well-ventilated area. Rescuers may require BA equipment
- 2. Call University Security on 333/2795 to summon an ambulance
- 3. Keep the person warm and rested until help arrives

## **SKIN CONTACT**

- 1. Call University Security on 333/2795 to summon an ambulance
- 2. Whilst waiting:
  - Loosen any restrictive clothing
  - Place the affected part under tepid water, until the skin changes from pale yellow through blue to pink or red
  - Protect frozen parts with loose, dry, sterile dressing
  - o Keep the patient warm and rested

## **NEVER**

- Pull clothing away from burned / frozen skin
- 2. Apply a direct heat source eg heater
- 3. Allow smoking or alcohol consumption
- 4. Give analgesics eg paracetamol, aspirin