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LOCAL DETAILS			
Division	Nuffield Division of Clinical Laboratory Sciences	**Department**	Radcliffe Department of Medicine
Area of application (building & rooms)	Room 4A10B, Level 4 Academic Block, John Radcliffe Hospital		

REASSESSMENT HISTORY (to record annual re-assessments without changes to content & version number)			
Date	**Name of assessor**	**Date**	**Name of assessor**
02.12.2017	Amanda Anderson		
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REVIEW HISTORY (to record changes to contents)			
Date	**Details of review**	**Version number**	**Name of reviewer**
05.12.2020	Update of personnel following staff changes	1.1	Amanda Anderson
01.12.2021	Documenting of contingency plans using North lifts	1.2	Amanda Anderson
08.12.2022	Updated training requirements to include mandatory annual refreshers	1.3	Amanda Anderson
24.11.2023	Section added outlining arrangements to be followed where no lift override is possible. No other changes to SOP on this date.	1.4	Amanda Anderson

Date	Details of review	Version number	Name of reviewer
24.09.2024	Updates to contingency plan for North lifts as the main access route to level 0 and back, and main patient lifts (Lifts A) as the contingency (Section 2.2.8 and Annex 1), minor changes to 2.2.4 and 2.2.5; new Section 2.2.7	2.0	Stephanie Jones
15.04.2025	Removal of section on standalone cell banks no longer in use, added reference to new Competency form, reformatting throughout	3.0	Stephanie Jones

YOU ARE INSTRUCTED TO READ THE FOLLOWING THOROUGHLY BEFORE PROCEEDING TO UNDERTAKE THE METHODS DESCRIBED.

UNDER NO CIRCUMSTANCES ARE THESE INSTRUCTIONS TO BE AMENDED OR ALTERED IN ANY WAY OTHER THAN BY THE AUTHOR, APPROVER OR AN APPROPRIATE ALTERNATIVE.

1. Introduction

This Standard Operating Procedure (SOP) document is issued by the Nuffield Division of Clinical Laboratory Sciences, Radcliffe Department of Medicine. Health and safety inspectors seek to secure compliance with the law and may refer to this document as illustrating good practice. All staff using the NDCLS Cryostorage Facility should adopt the measures set out within this document to ensure that their health, safety and welfare are not knowingly compromised. This document relates to all users, who have a common responsibility to use the facilities correctly and report any failing in the facility, or its associated equipment, to the Cryostorage Facility Manager or, in their absence, the ORB Governance Manager.

1.1. General Information regarding Handling of Liquid Nitrogen (LN2)

Liquid Nitrogen (LN2) poses three major potentially fatal, hazards:

1) Asphyxiation by reducing available breathable oxygen. Nitrogen gas is odourless, colourless and tasteless. When LN2 evaporates it reduces the oxygen concentration in the air and may act as an asphyxiant in confined spaces. A person can become unconscious without any warning symptoms. If the oxygen content is reduced by only a few percent from normal, there can be a substantial risk to life. Even reduced levels of oxygen, which are not immediately life threatening, can affect behaviour and judgement thereby inhibiting decision making (1).
2) Severe burns if the appropriate personal protective equipment (PPE) is not worn. LN2 has a boiling temperature of －196° C, at atmospheric pressure. Direct contact can freeze the skin causing frostbite and cold burns. Brief exposure to cold gas alone, whilst not affecting skin, can damage delicate tissue such as eyes, and can cause breathing difficulties in people with lung conditions e.g. asthma.
3) Physical trauma due to sudden pressure release if the appropriate controls are not in place. LN2 has a liquid to gas expansion rate of 1:694 at 20oC. This means that, as it vaporizes, the volume it occupies will expand close to 700 times. If LN2 gets into a vial, this expansion rate is what can cause vials to explode when removed from LN2 storage. LN2 can get into a vial if the vial is defective or past its expiration date, if the vial is over- or under-tightened, if there is water on the vial threads, or if the wrong types of vials are used.

There are additional hazards associated with using LN2 storage containers in this room, specifically

1) Risk of injury from incorrect manual handling and/or working at height since a full tower can be heavy and a Kik-stool may be required to reach and remove it from the storage vessel.

2) Rapid unconsciousness will also pose a risk of falling, possibly from height.

To minimise risk, all users must ensure that at least one other person is aware of them using the room and is able to provide assistance. During weekends, evenings and early mornings, when numbers of staff within the department are reduced, it is essential that at least two members of staff are present in or immediately near the LN2 facility whilst work takes place.

1.2. Specific information regarding the NDCLS Cryostorage Facility (room 4A10B)

1.2.1. Emergency contact numbers

The nearest telephones are located inside Room 4A10B, in Lab 4A10A (Adjacent to Cryostorage Facility), in room 4A13 (opposite Cryostorage Facility) or further along corridor just beyond entrance to Skills lab.

- Hospital Switchboard 0
- Cryostorage Facility Manager NDCLS DSO 07393858877
- John Radcliffe Hospital Estates 01865 (2)20600
- John Radcliffe Hospital Security 01865 (8)57727 or 01865 (2)21106

1.2.2. Additional responsibilities

- Cryostorage Facility Manager: ensuring at least annual review of this document
- ORB Governance Manager for ensuring monthly checks on safety equipment and PPE
- NDCLS Facilities Manager for ensuring that yearly maintenance checks (according to Level 1 service contract) of storage vessels, liquid nitrogen cylinders, oxygen sensor equipment and extraction fan (at time of writing, by Lab Mode Ltd, Elstree 01908 768000, office@labmode.co.uk) are carried out

1.3. References for this SOP document

1.3.1. HSE Information Sheet 'The risks posed by exposure to inerting gases in the open air' Offshore Information Sheet 4/2008 http://www.hse.gov.uk/offshore/assets/docs/is4-2008.pdf

1.3.2. Oxygen Monitoring System manuals https://www.quantumcryogenics.com/downloads, go to Cryopanels or Oxygen Monitoring Maintenance Guide

1.4. Related documents for this SOP

1.4.1. NDCLS Risk assessment document NDCLS-RA-001 Safe use of Cryogenic liquids

1.4.2. NDCLS Competency document NDCLS-Comp-001 Access to LN2 repository competency assessment

1.4.3. University policy statement S4/03 Liquid Nitrogen

1.4.4. University policy statement S3/11 Work at height

1.4.5. University policy statement S8/10 Eye protection

1.4.6. University policy statement S3/02 Personal protective equipment

1.4.7. University policy statement S7/99 Manual handling operations regulations 1992

1.4.8. University policy office memo M23/08 Explosion risk – sample retrieval from cryogenic storage

2. Procedures

2.1. Emergency procedures

Emergencies include but are not limited to:

- any escape of liquid nitrogen that cannot be controlled including explosion of a storage vessel
- spillage of more than 2L liquid nitrogen generating significant volume of nitrogen gas
- debilitating physical injury occurring whilst in the room (such as becoming trapped by any of the equipment or accidental self-injury)
- exposure of personnel to liquid nitrogen resulting in significant burns
- failure of the extraction system
- fire alarm sounding
- discovery of an unconscious person

Audible alarms and/or flashing lights will signify many of these conditions apart from personal physical injury. If alarms are sounding and/or lights are flashing DO NOT ENTER THE ROOM.

2.2. In an emergency situation:

2.2.1. Leave the Cryostorage Facility room by pressing the exit button or through the open door. Instruct anyone else in the room to leave. Switch on the fan then close the door.

2.2.2. Prevent other people from entering the room.

2.2.3. **If the blue beacon is ringing**, get assistance from Ajay Pandey or Stephanie Jones. If

they are not available, evacuate the area (lab and offices in the academic block) and use the NDCLS SOS WhatsApp group to escalate immediately. If no response, contact ORB Governance Manager David Maldonado-Perez (01865) (2)20557

2.2.4. Inform another member of staff to assist if necessary.

2.2.5. In most cases leave the door open, however in the case of a LN2 spill/leak, summon help from a first aider if required for example if there is a cryogenic burn.

2.2.6. All accidents/ incidents/near misses must be reported in line with University procedures in order to improve future safety of the Cryostorage Facility.

2.3. Normal working procedures

2.3.1. Access

- Access to 4A10B is limited to authorised users who have been issued with a proximity fob. A list of authorised users is maintained and fobs are recalled when a staff member leaves. Staff will only be issued with a proximity fob on completion of mandatory training and competency sign-off.
- Out-of-hours access to the adjacent corridor doors is by swipe card only. This is co-ordinated by the NDCLS Facilities Manager.
- Within normal working hours (9am to 5pm) users must ensure that a colleague (buddy) is aware that the Cryostorage Facility room is in use and is available to assist if necessary. There is no requirement to sign in and out of the room.
- Outside normal working hours users must ensure that at least two members of staff are present in or immediately near (within calling distance of) the Cryostorage Facility room whilst work takes place.
- Lone working in the Cryostorage Facility is not permitted under any circumstances.
- Exiting the room is by push-button (white box in diagram below) and is not card controlled.

Figure 1: Exit button

2.3.2.Exterior checks

- Prior to entering, check the control panel situated outside the door (blue LCD, Figure 2) to make sure the oxygen level in the room measured by the two oxygen monitors (black box in Figure 2 right) is not below 20%. Do not enter the room if the oxygen level is below 19. 5%, and report the problem to either the NDCLS Cryostorage Facility Manager or, in their absence, the ORB Governance Manager.

Figure 2: Control panel for O2 levels & Example of O2 sensor in repository

- Check that the blue warning light above the door (see Figure 3) is not flashing and/or that the alarm is not sounding.

Figure 3: Visual and auditory beacon for O2 below 18%

- If all checks are satisfactory enter the room using proximity tag.

2.3.3.Interior room checks

- The oxygen alarm itself is mains powered while the sensors (QFM330) are battery powered. They last at least 2 years and should be replaced at the annual service. However, if the audible low battery alarm is activated, report it immediately to either the NDCLS Cryostorage Facility Manager or, in their absence, the ORB Governance Manager.
- On entering the room, activate the extraction fan by pressing the green override

button to the left of the exit door as you go into the room (Figure 4). The fan will remain active for 30 minutes and then switch off automatically if the oxygen level is above 20%.

Figure 4: Fan override button and fan air entry vent

- Should the Oxygen level drop below 20%, the extraction fan will activate automatically, and speed of extraction will increase should oxygen level fall below 18%. The fan will continue to run for a minimum of 30 minutes.

2.3.4. Personal Protective Equipment

- Personal protective equipment (PPE) is available for users of the Cryostorage Facility. This is stored within the Cryostorage Facility is and checked on a monthly basis by the ORB team to ensure it is fit for purpose. Any defects in PPE should be reported immediately to either the NDCLS Cryostorage Facility Manager or, in their absence, the ORB Governance Manager
- PPE includes: Protective blue apron (see below), Full-face visor (see below), Eye-protection (Safety glasses), Insulated gloves (leather insulated gloves with elasticated cuffs and blue insulated gauntlets such as those in Figure 5). NOTE: blue insulated gloves are for use when handling frozen vapour-phase material only, NOT for handling actual liquid nitrogen

Figure 5: Example of PPE in repository: Cryoapron, cryogloves, face visor

2.3.5. Removing or adding a sample from/to a storage tank

- NOTE: There is a small but significant risk of a cryovial exploding once it is removed from LN2 storage tanks, so all persons handling frozen tubes must wear full-face protection together with a laboratory coat. Anyone in the vicinity must also wear a full-face visor or if there aren't enough of these, then safety specs for the person furthest away from the samples being handled. Users must not lift their visor to read a label on, for example, a cryovial.
- NEVER store boxes of samples in the **bottom two levels** of a tower: these get submerged in Liquid nitrogen rather than staying vapour phase, and are subject to dangerous ingress of LN2 into the vials.
- Ensure that all required protective equipment is being worn and that the stainless-steel bucket (see Figure 6) is present to hold the rack of frozen samples temporarily.
- If additional height is needed for the transfer of samples to/from the large tank or to swap dewars, ensure that the Kik-step (see Figure 5) is present and in good condition (top rubber surface intact).

Figure 6: Kik-step and stainless-steel bucket

- Ensure that you have ready a container with a lid in which to transport the newly removed sample, in order to contain any explosion risk, and a pair of forceps to transfer the vial(s).
- All vials must be clearly labelled with owner's name or initials, date of sample and sample identity. If, during an audit of occupancy or for other purposes, samples are found where the labelling does not allow identification of the owner, samples may be discarded as "untraceable".
- Ensure that whenever possible the exact location for transfer is known by referring to accurate sample location records, which will minimise risk by reducing time taken to undertake transfer.
- There are recommendations as to what men and women can be expected to lift relative to the position of the load, and the distance from the ground, and the distance from the body (see Figure 7).
- Minimise transport distance by bringing the stainless-steel bucket as close as possible to the storage vessel
- Make sure that clothing and footwear is suitable (particularly footwear with good grip)
- Ensure that posture is as good as possible with feet slightly apart. Move feet whilst transporting the tower, do not twist your body. If you have any doubt that you can lift the tower (for example have special requirements such as musculoskeletal problems or pregnancy), ASK FOR ASSISTANCE from another member of staff

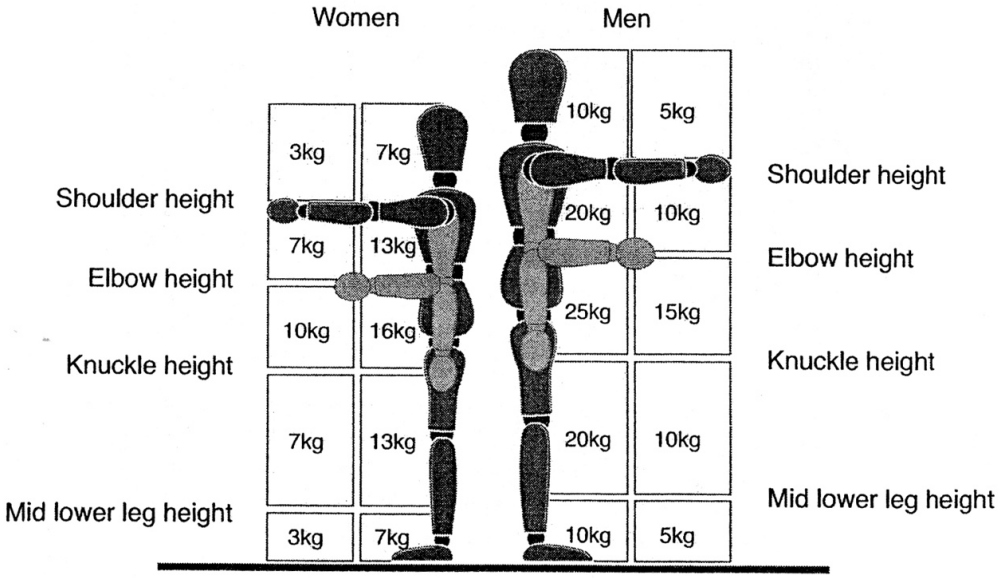


Figure 7: Recommendations expected weight to be lifted relative to the position of the load, distance from the ground, and distance from the body, for males and females

- Lift the storage rack from the cryobank, tilt gently to encourage any liquid nitrogen in the bottom levels to drain out then place in the stainless bucket
- Remove any retaining rods to a safe place
- Remove the desired tray and transfer vial(s) as required to closed transport container. Replace each tray before removing another.
- To access the boxes in the 3rd and 4th positions from the bottom, you may need to take the tower out of the bucket and place it on the black insulation mat. DO NOT PLACE IT ON THE FLOOR as it could crack the linoleum and become a trip hazard.
- Replace the final tray into the tower and insert retaining rod. Return tower to storage vessel in the correct orientation ensuring correct fit and good closure of the vessel lid.
- NOTE: if any samples are dropped into the liquid nitrogen users MUST obtain assistance from another user before attempting to collect the sample (samples must only be retrieved by using long tweezers in the smaller cryobank - if samples are dropped in the large cryobank they cannot be recovered)

2.3.6.Snap-freezing biological samples

- Snap-freezing reduces the chance of water present in a biological sample forming ice

crystals during the freezing process, and can be required to maintain sample integrity. In the case of tissue or lysates, snap freezing slows the actions of proteases and nucleases to inhibit degradation of molecules such as RNA or proteins.

- Wearing appropriate PPE, check that the hose is correctly attached to the liquid valve of the bulk storage cylinder tank (left Figure 8). Place the small dewar (second picture in Figure 8) inside the bucket and remove the lid. Holding the end of hose slightly below the opening of the small dewar, slowly open the liquid valve (blue valve in Figure 9), and add LN2 to no more than half-full. Close the liquid (blue) valve. Close the lid of the small dewar.
- Use the slotted spoon to hold the sample tube above the level of liquid nitrogen until frozen rather than immerse the tube and immediately transfer to storage.

Figure 8: Precautions for filling a small dewar from a large dewar

Figure 9: Blue valve for feeding LN2 to small dewar.

- When you have finished with the LN2 in the small dewar, leave this in a safe place (ideally in the LN2 repository, or a large well-ventilated lab) for the LN2 to fully evaporate, with the lid clipped on (a space between the top of the dewar and the lid allows this to occur gradually). NEVER pour the LN2 into a sink or into a cryobank. NEVER store LN2 in an office.

2.3.7. Connecting and disconnecting a LN2 vessel (dewar) to supply cryobanks

- Two cryobanks are now automatically filled from the connected dewar via a tee-bar system (see Figure 10).
- To disconnect an empty vessel, you MUST first fully close the main valve labelled 'Liquid' and painted blue on top of the empty vessel AND the two blue-handled valves on the tee-bar so they are perpendicular to the flexes (ensuring you are wearing cryogloves if there is any sign that the equipment is cold). This will prevent the flow of any nitrogen remaining in the flexes after the T-bar is disconnected. Follow the arrows on the valves for clear directions on how to close and open them (also refer to images in Figure 11).

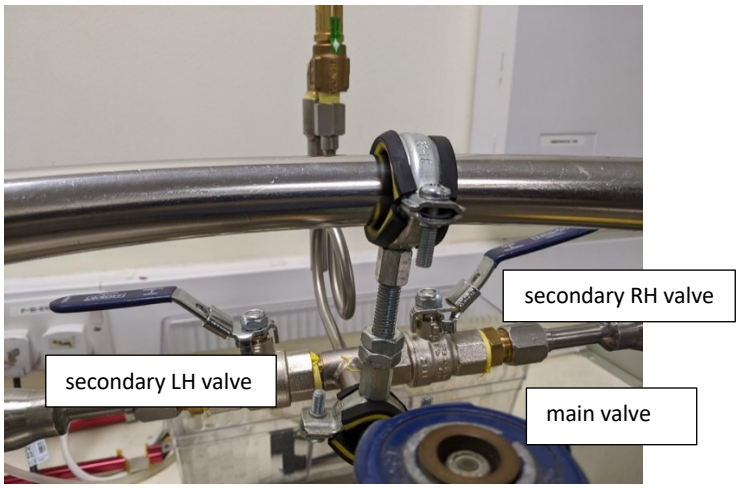
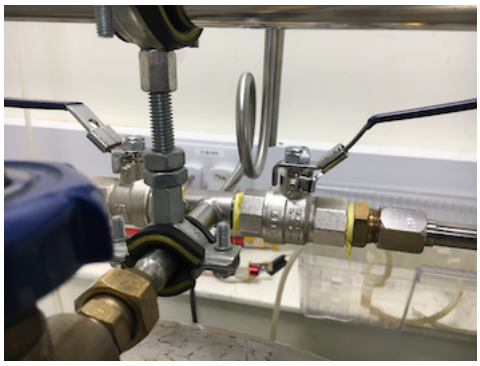


Figure 10: Tee-bar valves



LH & RH valves open

LH valve open, RH valve closed

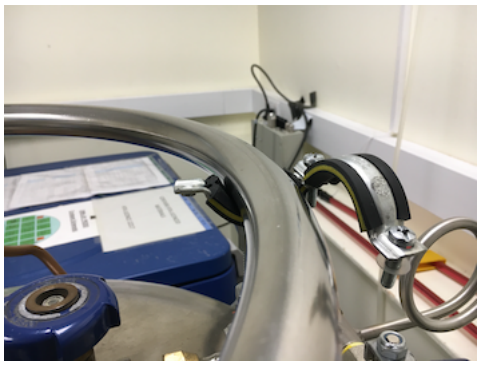
LH valve closed

LH & RH valves closed

Figure 11: Opening and closing tee-bar valves

- You may need to stand on the Kik-step to minimise strain on your back and shoulders for the next step. Using two spanners, loosen the connection between the empty vessel and the tee-bar, holding the one closest to the blue valve in place while rotating the other nut clockwise (as viewed from the perspective shown in Figure 10). Then using a screwdriver, partially undo the screw on the far side and fully undo the front screw securing the bracket for the tee-bar to the rim of the vessel. Swivel the top part of the bracket over, ensuring the loose screw does not fall out, supporting the tee-bar with a full hand (you may need assistance from a colleague if you can't reach comfortably) and place the tee-bar on top of the plastic box directly behind the tank (see Figure 12).

Loosened bracket



Swivelled bracket

Figure 12: Detaching the T-bar

- To fit a filled vessel back, first roll out the empty vessel (ensuring the brakes on the platform are not engaged), into the corridor. Roll the replacement vessel into the space between the two cryobanks. Using the Kik-step again if necessary and/or with assistance from a colleague, re-attach the tee-bar by lining it up with the thread on the vessel and use your hands to begin to screw the nut onto the vessel. It should screw some distance without any resistance: if you find resistance, adjust the height or left-right alignment of the tee-bar, do not force the nut onto the vessel. Once hand-tight, swivel the bracket onto the rim of the dewar and fix that with the screwdriver (this is not possible on the 126L dewar due to the bracket being too tall for the height of the handling circle), as this is only meant to be used in an emergency / as back up, just be careful not to knock the tee-bar after attaching). Then use the spanners to tighten the nut onto the vessel - do not over tighten.
- Once attached, open the blue valve on top of the dewar, open the two secondary valves on the flexes: NOTE To turn the two valves on the tee-bar you will need to lift the movable metal piece that sits on top of the valve:

LH & RH valves closed

Lifting metal piece to unlock RH valve

LH valve closed

Lifting metal piece to unlock LH valve

Figure 13: Opening the Tee-bar valves after re-connection of dewar

- When all valves have been opened, check feed to either of the cryobanks is working by pressing on the LN2 button on the control panel to feed LN2 for a few seconds. Check that no liquid nitrogen is dripping from the connection of the nut to the dewar (it is normal for some condensation which appears as smoke to be seen as surfaces cool, in the tee-bar and in the flex towards the cryobank). If there is liquid dripping from the connection of the nut or a draft blowing towards you, try tightening the nut a little bit more. If this doesn't resolve the leak, close all the valves, unscrew the nut and try again (beware the entire system is likely to be very cold by then, so you must wear appropriate gloves). If everything is in order, stop the refilling by pressing the LN2 button again.

2.3.8. Sending the storage vessel for refilling

Checking availability of LN2 in the dewar is a task split between the ORB team (main contacts David Maldonado-Perez and Eve Warner) and the NDCLS Academic corridor teams & GMG team (main contacts Ajay Pandey-and Stephanie Jones), alternating one week each. Communicate with your team and with the other team to keep everyone informed of any delays to refilling. If your team took the tank down, your team must remember to get the dewar back as soon as possible (if taken down before 10am, it is typically returned before the end of the day to where it was dropped off). We are currently using a bleep / pager system. When the tank needs to be refilled, decide who is going to be responsible for going to collect the filled tank later in the day, let's call them the "Bleep responder".

- Use of the bleep / pager

- When you collect the lift override key from the repository and additional signage attached to the wall with blue-tack, also take the bleep and give it to the Bleep responder.
- It would be wise to **test the bleep** every so often: to do this dial 89 from a hospital phone, in

response to first instruction enter "1468", then enter the extension number of the hospital phone you are using. The bleep should emit a sound within 30 seconds. If not, it could be out of battery (insert a new A4 battery).

- Notify Mark.Prince@ouh.nhs.uk and Paul.Mark@ouh.nhs.uk that "one empty dewar has been left on level 0 for refilling. When returned to Level 4 lift bay, please either bleep 1468 or email <add your email address>, or call <add appropriate number>".
- If using the bleep, when the bleep rings, a message including a five-digit extension will be displayed. **Make a note of the extension number**, this may be the lift bay or another number - **call the extension to confirm you are collecting the dewar**. Press any combination of keys to make the ringing stop, and immediately go to the lift bay. Then take the dewar to the academic block, do not leave it unattended in the lift bay.
- Return the bleep to the repository, when you return the dewar.
- These instructions and the bleep are just inside the Repository door, near the override key.

- Moving the empty dewar from repository to Level 0

When refilling of a bulk storage cylinder tank is required, the tank must be left on Level 0 for collection by NHS Estates staff. Use a buddy to help with clearing any obstructions and open doors on the way to the North lifts (lifts C). Wheel the tank into the lift, apply the additional warning sign about not using the lift with the dewar inside to the lift control panel and, using the lift over-ride key (which is kept in the Cryostorage Facility) to ensure an uninterrupted journey, send the tank down to Level 0. PEOPLE MUST NEVER ACCOMPANY THE DEWAR IN THE LIFT even when the dewar appears to be empty. ~~Go~~ The buddy should go ahead down the stairs to Level 0 to remove the tank from the lift as soon as it arrives in the lift.

The refilled dewar is returned to level 4 lift bay by JRH Estates staff.

- Troubleshooting and contingencies

- If the floor of the lift is found not to align with the entry point on Level 4 or on Level 0, report this on IRIS as well as to OUH Estates immediately via x20600 or via the online helpdesk (https://s0893.planetfmsystem.com/PlanetPortal/), to minimise the risk of incidents transferring the tank in or out of the lift. Report other issues that are giving rise to manual handling hazards or injuries in the same way.
- Normal procedure is to use North lifts (lifts C), accessed through the corridor to the NHS department of Clinical Biochemistry.
- **The contingency procedure in exceptional circumstances** (when both North lifts are broken and

there is no time to wait for a repair before a refill is needed) is to use the main patient and visitors lifts, Lifts A. Important points here but refer to Section 5 for full details of procedure:

- This will require a team of at least three staff members to limit the risk of manual handling injuries when rolling the tank through Clinical Biochemistry lab, through the NDCLS lab towards John Warin Ward, and down the corridor to the main lift bay taking turns to push the tank (or in the opposite direction once filled), and staff on every accessible floor to prevent anyone entering the lift while it contains the tank.
- No override keys are available for the A lifts without the shift engineer being contacted.
- Any use of the Lifts A would need to be planned for times of day when patients are least likely to require transport in the lifts (so very early in the day or late in the day).
- You will need to notify OUH Medical Gasses team about the need to use an A lift and agree with them where the tank can be collected from, once it has been filled, if the North lifts are still out of order (ideally from the same place it will have been dropped off to avoid us having to wheel the filled tank yet further).

2.4. First Aid procedures

In the event of an incident requiring first aid, the procedures below must be followed. If medical treatment is required at A&E, take a copy of the 'Treatment of Cryogenic Burns' poster with the patient. All accidents/incidents/near misses must be reported. Do not put yourself, or others around you, at risk in an attempt to administer First Aid treatment. If in doubt, call for assistance.

2.4.1. Cryogenic Burns

Cold burns and frostbite should receive medical treatment as quickly as possible. The aim of the treatment is to raise the temperature of the affected part back SLOWLY back to normal.

- Minor injuries treatment

- Flush the area with TEPID water. Do not use a forceful flow of water as this could cause tissue damage.
- Do not use hot water or apply any form of direct heat.
- Move the casualty to a warm place (approx. 22°C) and seek medical attention

- Major injuries treatment

- Call for assistance (from a hospital phone dial 4444)
- While waiting for medical attention/ambulance continue to flush the affected area of the skin with tepid water

- Loosen the casualty's clothing and remove any tight jewellery
- Keep the patient warm and at rest
- Do not allow the patient to smoke and do not offer hot beverages or alcohol

2.4.2. Asphyxia

The release of nitrogen into the atmosphere reduces oxygen levels and causes hypoxia, which can be sudden or gradual.

- Sudden asphyxia: In sudden asphyxia (inhalation of gas containing little or no oxygen) unconsciousness is immediate and death follows quickly, unless action is taken.
- Gradual asphyxia: Gradual asphyxia can occur if nitrogen gradually displaces atmospheric oxygen. Unconsciousness and death may follow. The risk of gradual asphyxiation is particularly acute because the affected individual will not be aware of the development of dangerous levels of hypoxia.
    - First Aid for asphyxiation
- If safe to enter, move the casualty to fresh air. If unconscious, open the airway, check breathing and pulse, call for help from a First Aider (or from a hospital phone dial 4444) and be ready to resuscitate.
- If not safe to enter, call for help from a hospital phone (4444) and inform the operator that this is an oxygen deprivation incident.

3. Training Requirements

In order to obtain a proximity fob allowing access to the NDCLS Cryostorage Facility, users must complete the University 'Safe Use of Cryogenics' training course which covers University policy, and must also complete 'hands-on' training in handling cryogenic liquids and in use of the Cryostorage Facility. Competency will be assessed by a suitably experienced person before the person is allowed to work independently. All users of the cryostorage Facility MUST undertake mandatory annual refreshers of the hands-on training or their access will be revoked until such time as they complete this. Any related SOPs and Risk Assessment documents must also have been read prior to undertaking work in the Cryostorage Facility, and the hard copies must be signed by the user. In addition, users are recommended to complete the Introduction to Manual Handling course run by the University Safety Office. https://safety.admin.ox.ac.uk/training-a-z#widget-id-1530906

4. Staff Record of Acknowledgement

4.1. By signing the associated Competency sheet, I agree that:

4.2. I have read and I understand the contents of this document and will work in accordance with this SOP

4.3. My supervisor/manager agrees that, subject to having received any further relevant training for procedures associated with this SOP, I am able to perform work covered by this document

4.4. I understand that further 'on the job' or other training/supervision may be required before working independently

4.5. I understand that I may discuss my needs with my supervisor or line manager

5. Addendum 1: Arrangement for Transporting of Liquid Nitrogen

The following instructions apply as interim arrangements when there is no ability to use a lift override key for isolating the lifts to transport liquid nitrogen. These alternative arrangements will eliminate the risk of passengers using the lifts when liquid nitrogen vessels are being transported. Essentially, a 'warning team' of people will be deployed at the lobbies of the lift being used for transport ON EVERY LEVEL to prevent other people entering the lift if it stops anywhere on its journey to/from level 0.

5.1. Delivery of an empty liquid nitrogen tank to level 0 for refilling

5.1.1. Assemble a warning team of seven people and wheel the tank to the North lift or the main lift bay (Lifts A) on level 4.

5.1.2. Deploy people to lift lobbies on ALL other levels, including level 0. One person stays with the LN2 tank on level 4.

5.1.3. When all are in place, the person on Level 7 calls the lift, ensures it is empty and then directs the lift to level 4, travelling in the lift to ensure no-one else enters en route. The people on level 0 and level 4 should also call the lift at their levels. If the lift call light on level 0 goes out for any reason before the lift arrives, the person should call the lift again. Repeat this as necessary until the lift with the tank arrives on level 0. This is particularly important on the lifts where there is more than one car e.g. the North lifts.

5.1.4. Once the warning team are in place, push the tank into the lift (the level 7 person should assist the level 4 person in moving the tank into the lift if necessary), then swipe the card reader and press level 0. Step back out of the lift and wait for the doors to close and to hear the sound of the lift moving off before leaving to ensure that no-one manages to reopen the doors and enter the lift car with the tank.

5.1.5. If the lift stops at any other floor before arriving at level 0 (including those above level 4), the person assigned to that floor must prevent people from entering the lift car and ask them to wait for the next one. Wait for confirmation that the tank has arrived at its destination before leaving the lift lobby.

5.1.6. Once the lift arrives at level 0, the person on level 0 should remove the tank and push it to its designated collection space. It may be necessary to have two people available to roll the tank out of the lift. The easiest is for the Level 1 person to walk down once the lift has passed them.

5.1.7. Inform all other people on the warning team that the tank has arrived at level 0.

5.2. Return of a full liquid nitrogen tank from level 0

5.2.1. OUH Medical Gases will call or email or potentially use the bleep system to say when the dewar is being returned.

5.2.2. Assemble a warning team of seven people. The lead person will go to level 0.

5.2.3. Deploy remaining people to lift lobbies on ALL other levels. The Level 1 person may initially stay on level 0 to assist with getting the tank in the lift, then promptly make their way to level 1 before the car is sent up.

5.2.4. When all members of the warning team are in place, the person on level 0 should wheel the tank into the car and send the lift to level 4. The person on level 4 should also call the lift as well as the person at level 0 sending the lift to level 4. If the lift call light on level 4 goes out for any reason before the lift arrives, the person should call the lift again. Repeat this as necessary until the lift with the tank arrives on level 4. This is particularly important on the lifts where there is more than one car e.g. the North lifts.

5.2.5. If the lift stops at any other floor before arriving at level (including those above level 4), the person assigned to that floor must prevent people from entering the lift car and ask them to wait for the next one. Wait for confirmation that the tank has arrived at its destination before leaving the lift lobby.

5.2.6. Once the lift arrives at level 4, the person on level 4 should remove the tank and transfer it to the NDCLS Cryostorage Facility. This may require a second person to minimise the risk of manual handling injuries when rolling the tank out of the lift.

5.2.7. Inform all other people on the warning team that the tank has arrived at level 4.

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