


Centre for Biological Engineering		
Document Ref: FSOP048	Issue no v3.1	Issue Date 18-Dec-12

RISK ASSESSMENT REVIEW/REVISION RECORD

Risk Assessment Ref No:	PART 1: Working with Liquid Nitrogen in the Cell Therapy Manufacturing Facility (CTMF)	Version Number
		1.0

This risk assessment should be reviewed **annually** or more frequently if there is any change in the work, or if new information becomes available that indicates the assessment may no longer be valid. **This form should be attached to the front of the current version of the risk assessment or to the new version of the risk assessment if one is issued**

The following review has been carried out on the dates indicated and either the assessment remains valid or it has been amended as indicated.

Name(s) of reviewer: Jon Harriman	Date: 28/10/2019
Signature: 	

Reason for Review:
Restart of use of 240L LN2 dewars for Planar CRF for Lift Bioscience project (RJT Commercial). Use by Jon Harriman (Lab Technician) and Dr. Katie Glen (RA).

Revision Required (Y/N)	N
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If Yes, give details of the revision:

Risk of normal use remains unchanged. Limits of normal use defined in risk assessment will be adhered to, no extra special considerations are required for use of dewars / planar CRF for new project.

Required PPE is available for use in CTMF cryoroom.

Oxygen depletion monitor remains in place in both the dewar storage cupboard and CTMF cryo-room.

Updated limits of use to named users (Jon Harriman, Katie Glen) and any future CTMF users with suitable training in use of the 240L dewars and planar CRF.

Issued by: P.Hourd	Authorised by: R.I.Temple 	Page 1 of 2
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Approval:	
<i>Instructions for Reviewer:</i>	
<p>1. The completed form should be forwarded to the CBE Quality Manager. NOTE: Significant revision (See Guidelines GN006 & GN007) will require approval by the person supervising the work and subsequent review and approval by the original approving authority. This may require a revised version of the risk assessment to be issued for re-approval.</p> <p>2. Where an annual review concludes that the risk assessment is still valid ie no revision is required, this should be recorded and the completed form forwarded to the CBE Quality Manager.</p>	
Name of Approver: C. Kavanagh	Date: 28/10/19.
Position: Lab manager.	
Signature: C. Kavanagh.	
Name of Approver:	Date:
Position:	
Signature:	
Name of Approver:	Date:
Position:	
Signature:	
Name of Approver:	Date:
Position:	
Signature:	


Centre for Biological Engineering		
Document Ref: FSOP048	Issue no v3.1	Issue Date 18-Dec-12

RISK ASSESSMENT REVIEW/REVISION RECORD

Risk Assessment Ref No:	PART 2: Filling of Liquid Nitrogen in dewars for GMP laboratory including the transfer of dewars from Storage Chase H06 to Courtyard	Version Number
		1.0

This risk assessment should be reviewed **annually** or more frequently if there is any change in the work, or if new information becomes available that indicates the assessment may no longer be valid. **This form should be attached to the front of the current version of the risk assessment or to the new version of the risk assessment if one is issued**

The following review has been carried out on the dates indicated and either the assessment remains valid or it has been amended as indicated.	
Name(s) of reviewer: Jon Harriman	Date: 28/10/2019
Signature: 	
Reason for Review:	
Restart of use of 240L LN2 dewars for Planar CRF for Lift Bioscience project (RJT Commercial). Use by Jon Harriman (Lab Technician) and Dr. Katie Glen (RA).	
Revision Required (Y/N)	N
If Yes, give details of the revision:	
<p>Risk of normal use remains unchanged. Limits of normal use defined in risk assessment will be adhered to, no extra special considerations are required for use of dewars for new project.</p> <p>Route taken by 240L dewars outlined in risk assessment appendix remains the same. All PPE required is available for use. Two suitably trained users (Jon Harriman, Katie Glen) available for transfer of dewars to courtyard and back.</p> <p>Oxygen depletion monitor remains in place in both the dewar storage cupboard and CTMF cryo-room.</p> <p>LN2 delivered by BOC group. Dewars next need inspection March 2021.</p>	


Issued by: P.Hourd	Authorised by: R.I.Temple 	Page 1 of 2
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Updated limits of use to named users (Jon Harriman, Katie Glen) and any future CTMF users with suitable training in use of the 240L dewars.

Approval:

Instructions for Reviewer:

- 1. The completed form should be forwarded to the CBE Quality Manager. NOTE: Significant revision (See Guidelines GN006 & GN007) will require approval by the person supervising the work and subsequent review and approval by the original approving authority. This may require a revised version of the risk assessment to be issued for re-approval.*
- 2. Where an annual review concludes that the risk assessment is still valid ie no revision is required, this should be recorded and the completed form forwarded to the CBE Quality Manager.*

Name of Approver: C-Kavanaugh	Date: 28/10/19
Position: Lab manager	
Signature: 	
Name of Approver:	Date:
Position:	
Signature:	
Name of Approver:	Date:
Position:	
Signature:	
Name of Approver:	Date:
Position:	
Signature:	

Risk Assessment Record

Department	Centre for Biological Engineering, Holywell Park
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Item Description	PART 1: Working with Liquid Nitrogen in the Cell Therapy Manufacturing Facility (CTMF)
Location	CTMF, Room H08 and Chase H06
Date	10 May 2011

Highest Risk Rating	HIGH RISK
Review Date	10 th May 2012

Assessor	P.Hourd		
Comments	Part 1 of Liquid Nitrogen risk assessment. Part 2 shall assess the Handling, Filling and transport of Liquid Nitrogen Dewars in CTMF		
Signature		Date	

Supervisor	N/A		
Comments			
Signature		Date	

Safety Officer	R.I.Temple		
Comments			
Signature		Date	

Personnel at Risk

The Health & Safety at Work Act requires that you ensure, so far as is reasonably practicable, the health and safety of yourself and others who may be affected by what you do or fail to do. Indicate using the groups listed below the individuals (restricted high-risk users) and numbers of people (e.g. with restricted user privileges or unrestricted access) who may be at risk from the hazards. Classify the *maximum* level of activity/exposure to the equipment to be permitted for each group/individual using the categories indicated below.

Activity/Exposure Categories

- 1. Reconfiguration (high exposure)
- 2. Maintenance
- 3. Normal use
- 4. Unsupervised observation
- 5. Supervised reconfiguration
- 6. Supervised normal use
- 7. Supervised observation
- 8. Prohibited (no exposure)

Personnel Groups

	Group	Individuals/Numbers	Activity/Exposure
+	Academic Staff	All trained CTMF users	Normal use
-			
+	Technical Staff	Jon Harriman, All trained CTMF users	Normal use
-			
+	Research Staff	Katie Glen, All trained CTMF users.	Normal use
-			
+	Project Students		Supervised normal use
-			
	Others	Lab Management (Kul Sikand, Carolyn Kavanagh)	Maintenance

Hazard Checklist

Indicate below whether or not a hazard is present for *each* type listed.

Category 1: Machinery & Work Equipment: Mechanical Hazards

Type	Yes	No
Crushing.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Shearing.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Cutting/severing.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Entanglement.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Drawing-in/Trapping.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Type	Yes	No
Impact.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Stabbing/puncture.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Friction/abrasion.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Other mechanical hazard(s).....	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Category 1: Machinery & Work Equipment: Electrical Hazards

Type	Yes	No
Direct contact.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Indirect contact.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Electrostatic phenomena.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Short circuit/overload.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Type	Yes	No
Source of ignition.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Electrical test labels current.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Other electrical hazard(s).....	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Category 2: Workplace

Type	Yes	No
Slips/trips/falls on a level.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Falls from a height.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Falling/moving objects/materials.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Striking objects.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Localised hot surfaces.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Type	Yes	No
Localised cold surfaces.....	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Storage and stacking.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Confined work area (knocks).....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Confined space/lack of oxygen.....	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Other workplace hazard(s).....	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Category 3: Hazardous Substances

Type	Yes	No
Toxic fluids.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Toxic gas/mist/fumes/dust.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Flammable liquids.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Flammable gas/mist/fumes/dust.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
High pressure gas/fluid.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
High pressure fluid injection.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Type	Yes	No
Corrosive substances.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Irritants/sensitising substances.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Oxidising substances.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Explosive substances.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Biological substances (infection).....	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Other substance hazard(s).....	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Category 4: Work Activity

Type	Yes	No
Highly repetitive actions.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Stressful posture.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Awkward/heavy lifting/handling.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Mental overload/stress.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Type	Yes	No
Visual fatigue (e.g. >3 hours VDU)...	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Poor workplace design.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Use of hand tools.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Other work activity hazard(s).....	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Risk Assessment Record

Assessment No. [SAF/CBE/.....]

Category 5: Work Organisation

Type	Yes	No
Contractors/service.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Type	Yes	No
Other work organisation hazard(s)	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Category 6: Work Environment

Type	Yes	No
Significant noise.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Significant vibration.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Poor/excessive lighting	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Type	Yes	No
Hot/cold ambient temperature	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Poor ventilation	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Other work environment hazard(s)....	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Category 7: Other Hazard Types

Type	Yes	No
Violence	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Stress	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Drugs.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Type	Yes	No
Substance abuse.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Other hazard(s)	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Category 8: Outdoor Work

Type	Yes	No
Outdoors on campus.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Outdoors off campus	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Overseas fieldwork.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Type	Yes	No
Site visit: construction	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Site visit: non-construction.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Other hazard(s)	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Other Hazards: Radiation

Type	Yes	No
Radiation: Lasers.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Radiation: Electromagnetic effects ...	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Type	Yes	No
Radiation: Ionising/non-ionising	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Other radiation hazard(s)	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Hazard Assessment

Describe the hazards identified above on the following pages. For each hazard assess the risk to health and safety using the risk rating formula and categories indicated below.

Risk Calculation

<p>Severity</p> <p>Major = 3 (e.g. death, major injury as per RIDDOR, irreversible health damage)</p> <p>Serious = 2 (e.g. injuries causing >3 days absence or reversible health damage)</p> <p>Minor = 1 (e.g. first aid treatments and other lost time)</p>	×	<p>Probability</p> <p>High = 3 (where certain or near certain harm will occur)</p> <p>Medium = 2 (where harm will frequently occur)</p> <p>Low = 1 (where harm will seldom occur)</p>	=	<p>Risk</p> <p>High = 6,9</p> <p>Medium = 2,3,4</p> <p>Low = 1</p>
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Hazard Risk Rating

Activity	Groups at risk	Hazard Description	Controls in place	Severity	Probability	Risk	Action needed? Yes No
Normal use	All people in the vicinity of the storage tanks at the time of handling, transportation and filling, including public access areas	A. Manual Handling Hazards including transport/load handling and storage tank failure 1. Personal injury resulting from manual load handling of storage tanks. 2. Physical damage to storage tanks causing an increased risk of spillage	A1: Manual Load Handling - see attachment	Serious	Low	Medium	<input checked="" type="checkbox"/> <input type="checkbox"/>
			A2. Design and qualification (DQ) of the Chase area (that houses the Storage Tanks) and the 2 Storage Tanks (240L capacity) has been qualified (DQ) - see attachment .	Serious	Low	Medium	<input type="checkbox"/> <input checked="" type="checkbox"/>
			A3. Procedure for the maintenance of the Chase area and the Storage Tanks - see attachment	Serious	Low	Medium	<input checked="" type="checkbox"/> <input type="checkbox"/>
			A4. Storage Tanks are stored in clean/dry areas. Cleaning procedures shall ensure that contact with strong alkaline or acid cleaners and other corrosive substances is avoided - see attachment	Serious	Low	Medium	<input checked="" type="checkbox"/> <input type="checkbox"/>

Hazard Risk Rating

Activity	Groups at risk	Hazard Description	Controls in place	Severity	Probability	Risk	Action needed? Yes No
Normal use	All staff handling liquid nitrogen, and any other people in the vicinity of the material. Staff handling materials that have been in contact with liquid nitrogen Staff dispensing liquid nitrogen. People in the vicinity	B: Low temperature hazards - Cryogenic Burns/Frostbite/Hypothermia when handling LN2 in room H08; using cryostore and CRF units	B1. The design of H08 room (that houses the Cryostorage unit and the CRF) has been qualified (DQ) Fixed installation and piping system minimises risk of spills - see attachment	Serious	Low	Medium	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
			B2. The CTMF facility and associated Quality Management System (QMS) has been designed to prevent unauthorised access to areas used for delivering, storing, dispensing and using LN2 - see attachment.	Serious	Low	Medium	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
			B3. Procedure to identify, document and maintain training requirements for authorised staff working with LN2 and associated equipment in the CTMF - see attachment.	Serious	Low	Medium	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No

Hazard Risk Rating

Activity	Groups at risk	Hazard Description	Controls in place	Severity	Probability	Risk	Action needed? Yes No
			B4. Procedure for the Maintenance of the H08 room documented as part of a Facility Maintenance Programme. A work Instruction will document the operational procedure for the use and management of the Cryostore facility - see attachment.	Serious	Low	Medium	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
			B5. Procedure for the Maintenance of the CRF documented as part of a Facility Maintenance Programme. A work Instruction will document the operational procedure for using Controlled Rate Freezer - see attachment	Serious	Low	Medium	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
			B6. Appropriate signage is placed in H08, inc PPE instruction, emergency procedures, hazard warnings.	Serious	Low	Medium	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
			B7. Ancillary and emergency equipment is located within H08, including PPE worn in addition to the usual dress code for the facility - see attachment	Serious	Low	Medium	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No

Hazard Risk Rating

Activity	Groups at risk	Hazard Description	Controls in place	Severity	Probability	Risk	Action needed? Yes No
Normal use	All people with access to the area where liquid nitrogen is stored, dispensed or used.	C: Asphyxiation hazard - depletion of oxygen from slow or rapid release of LN2	C1. Ventilation systems servicing the H08 room (that houses the Cryostorage unit and the CRF) have been qualified (DQ). Fixed installation and piping system minimises risk of spills - see attachment . C2. The design of H08 room (that houses the Cryostorage unit and the CRF) and the adjacent Clean Corridor H12 have been qualified (DQ) to include an appropriately sited (below head height) wall mounted oxygen monitor - see attachment	Major	Low	Medium	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
			C3. Procedure for the Maintenance of the O2 detector will be documented as part of a Facility Maintenance Programme. A work Instruction will document the operational procedure for using the O2 detector and responding to alarms.	Major	Low	Medium	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No

Hazard Risk Rating

Activity	Groups at risk	Hazard Description	Controls in place	Severity	Probability	Risk	Action needed? Yes No
			C4. All personnel using H08 will be issued with personal O2 alarms	Major	Low	Medium	<input checked="" type="checkbox"/> <input type="checkbox"/>
			C5. Storage facility (H06) has extract systems to prevent build up of nitrogen gas.	Major	Low	Medium	<input type="checkbox"/> <input checked="" type="checkbox"/>
Normal use	People with access to the area where liquid nitrogen is stored, dispensed or used.	D: Explosion and fire hazard - inappropriate storage of materials/vessels and/or cryopreservation/thawing procedures/conditions.	D1. A work Instruction will document the operational procedure for using CRF to ensure that cells are frozen in appropriate vessels. - see attachment D2. Cryogenic freezer is designed for vapour phase storage, which reduces the possibility of leaky vials exploding during removal and reduces the explosion hazard. Safeguards provided by audible alarm systems for detecting low liquid nitrogen levels and temperature levels (via FMS); monitored 24 hrs/day. A work instruction will document operational procedure for using the cryostorage facility to ensure correct	Major	Medium	HIGH	<input checked="" type="checkbox"/> <input type="checkbox"/>
				Major	Low	Medium	<input checked="" type="checkbox"/> <input type="checkbox"/>

Risk Assessment Record

Assessment No. [SAF/CBE/.....]

Hazard Risk Rating

Activity	Groups at risk	Hazard Description	Controls in place	Severity	Probability	Risk	Action needed?	
							Yes	No
Normal use	All CTMF staff	E: Biological hazard	storage procedures are maintained - see attachment Subject to a separate biological risk assessment	Serious	Low	Medium	<input type="checkbox"/>	<input checked="" type="checkbox"/>
							Add Row	Delete Row

Risk Reduction

Physical

Determine whether the risk to health and safety can be reduced by modifications to the equipment or workspace, especially for those hazards identified as having medium to high risk. List planned action and completion dates below.

Hazard	Action to be taken	Responsible Personnel	Completion Date
A: Manual Handling	1. Complete risk assessment of manual Load Handling and filling of LN2 Dewars (A1)	AC	10.05.11
A: Manual Handling	2. Generate maintenance schedule and work instruction for LN2 Dewars and LN2 supply (A3)	PH	20.05.11
A: Manual Handling	3. Work instruction for cleaning of H06 area and storage dewars (A4)	PH	20.05.11
B: Low temperature	4. Training procedure for handling LN2 and use of cryostore and CRF (B3)	PH	20.05.11
B: Low temperature	5. Work instruction for routine Cleaning of Cryostorage Room H08 and equipment	PH	20.05.11
B: Low temperature D: Explosion	6. Maintenance Schedule and work instruction for use and maintenance of cryostorage unit (B4, D2)	PH	20.05.11
B: Low temperature D: Explosion	7. Maintenance Schedule and work instruction for use and maintenance of CRF (B5, D1)	PH	20.05.11
B: Low temperature	8. ID and affix liquid nitrogen hazard warning signs, etc. (B6)	AC	20.05.11
B: Low temperature	9. ID and place PPE and utensils for handling vessels (tongs etc) (B7)	AC	20.05.11
C: Asphyxiation	11. Complete commissioning of LN2 storage system inc servicing of the cryostorage unit and CRF	AC	20.05.11
C: Asphyxiation	12. Maintenance Schedule and work instruction for O2 detectors (personal and fixed). (C3,C4)	PH	20.05.11
D: Explosion	13. Specify accessories for cryostorage unit - shelves< vessels etc	AC	20.05.11
D: Explosion	13. Specify accessories for cryostorage unit – shelves, vessels etc	AC	10.05.11

Risk Assessment Record

Assessment No. [SAF/CBE/.....]

Add Row	Delete Row
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Procedural

Determine and indicate below whether acceptable levels of risk to health and safety can only be achieved when equipment use must follow prescribed procedures, and/or where use must be restricted to specified personnel. Prepare and attach user guides, user restriction and other HSE documents as appropriate. Contact the Department Safety Officer for guidance/assistance as necessary.

Item	Yes	No
Does the equipment/process need an operating procedure document?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
• If yes, has one been prepared and appended to this form?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Must protective equipment be worn to use the equipment/process safely? (cf. Personal Protective Equipment (PPE) regulations)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
• If yes, have the users been adequately notified?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
• If yes, is suitable protective equipment available for all potential users/observers?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Should the use of this equipment be restricted to certain qualified personnel?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
• If yes, has a list of permitted users been prepared, appended to this form and displayed near the equipment?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Is training required to use the equipment/process safely?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
• If yes, have all identified users been adequately trained?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Does the equipment have a CE mark?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
• If not, does the equipment need a separate Machinery Risk Assessment?	<input type="checkbox"/>	<input type="checkbox"/>
• If yes, has one been prepared and appended to this form?	<input type="checkbox"/>	<input type="checkbox"/>
If a lifting hazard has been identified is a manual handling assessment required?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
• If yes, has one been prepared and appended to this form?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
If hazardous substances will be in use, is a COSHH form required?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
• If yes, has one been prepared and appended to this form?	<input type="checkbox"/>	<input type="checkbox"/>
Does the equipment involve the use of lasers?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
• If yes, has a laser description form been completed and appended to this form?	<input type="checkbox"/>	<input type="checkbox"/>

Risk Assessment Record

Department	Centre for Biological Engineering
Item Description	Filling of Liquid Nitrogen in dewars for GMP laboratory including the transfer of dewars from Storage Chase H06 to Courtyard
Location	CBE Laboratory Unit - Storage Chase H-06, Carpetted Corridor, Corridor outside the Caretakers room, High Bay GW, Courtyard.
Date	09 May 2011
Highest Risk Rating	Medium Risk
Review Date	31 March 2012

Assessor	A. Chandra		
Comments	<p>This is Part 2 of the risk assessments for the use of liquid nitrogen. Liquid nitrogen is used in the GMP Cryostorage for preserving cells for long durations. The use of liquid nitrogen is risk assessed in Part 1.</p> <p>This risk assessment covers the following:</p> <ul style="list-style-type: none"> a. Delivery of liquid nitrogen to the CBE by the contractor, b. The transfer of the empty or semi-filled dewars from their storage location H-06 to the courtyard, c. Filling of the dewars with liquid nitrogen in the courtyard d. Transfer of the filled liquid nitrogen dewars back to the storage location, H-06 in the CBE. <p>There are two dewars in H06. Characteristics are as follows:</p> <ul style="list-style-type: none"> a. Model: Statebourne Cryostore 240L, type CS240 b. Serial Nos: SC004587-0001 and SC004587-0002 c. Volume: 240L d: Maximum Pressure: 3 BARG <p>Procedure for filling Liquid Nitrogen is attached to the risk assessment.</p>		
Signature		Date	

Supervisor			
Comments			
Signature		Date	

Safety Officer	R.I.Temple		
Comments			
Signature		Date	

Filling of Liquid Nitrogen in dewars for GMP laboratory including the transfer of dewars from Storage Chase H06 to Courtyard CBE Laboratory Unit - Storage Chase H-06, Carpetted Corridor, Corridor outside the Caretakers room, High Bay GW, Courtyard.

Personnel at Risk

The Health & Safety at Work Act requires that you ensure, so far as is reasonably practicable, the health and safety of yourself and others who may be affected by what you do or fail to do. Indicate using the groups listed below the individuals (restricted high-risk users) and numbers of people (e.g. with restricted user privileges or unrestricted access) who may be at risk from the hazards. Classify the *maximum* level of activity/exposure to the equipment to be permitted for each group/individual using the categories indicated below.

Activity/Exposure Categories

- | | |
|------------------------------------|-------------------------------|
| 1. Reconfiguration (high exposure) | 5. Supervised reconfiguration |
| 2. Maintenance | 6. Supervised normal use |
| 3. Normal use | 7. Supervised observation |
| 4. Unsupervised observation | 8. Prohibited (no exposure) |

Personnel Groups

Group	Individuals/Numbers	Activity/Exposure
<input type="checkbox"/> + Academic Staff	All trained CTMF users	Normal use
<input type="checkbox"/> -		
<input type="checkbox"/> + Technical Staff	Jon Harriman, All trained CTMF users	Normal use
<input type="checkbox"/> -		
<input type="checkbox"/> + Research Staff	Katie Glen, All trained CTMF users	Normal use
<input type="checkbox"/> -		
<input type="checkbox"/> + Project Students		Supervised normal use
<input type="checkbox"/> -		

Risk Assessment Record

Assessment No. [SAF/CBE/.....__

]

Others

Contractor delivering the liquid nitrogen, Lab
Management (Kul Sikand, Carolyn Kavanagh

Normal use

Hazard Checklist

Indicate below whether or not a hazard is present for *each* type listed.

Category 1: Machinery & Work Equipment: Mechanical Hazards

Type	Yes	No
Crushing.....	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Shearing.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Cutting/severing.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Entanglement.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Drawing-in/Trapping.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Type	Yes	No
Impact.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Stabbing/puncture.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Friction/abrasion.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Other mechanical hazard(s).....	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Category 1: Machinery & Work Equipment: Electrical Hazards

Type	Yes	No
Direct contact.....	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Indirect contact.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Electrostatic phenomena.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Short circuit/overload.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Type	Yes	No
Source of ignition.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Electrical test labels current.....	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Other electrical hazard(s).....	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Category 2: Workplace

Type	Yes	No
Slips/trips/falls on a level.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Falls from a height.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Falling/moving objects/materials.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Striking objects.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Localised hot surfaces.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Type	Yes	No
Localised cold surfaces.....	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Storage and stacking.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Confined work area (knocks).....	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Confined space/lack of oxygen.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Other workplace hazard(s).....	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Category 3: Hazardous Substances

Type	Yes	No
Toxic fluids.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Toxic gas/mist/fumes/dust.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Flammable liquids.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Flammable gas/mist/fumes/dust.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
High pressure gas/fluid.....	<input checked="" type="checkbox"/>	<input type="checkbox"/>
High pressure fluid injection.....	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Type	Yes	No
Corrosive substances.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Irritants/sensitising substances.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Oxidising substances.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Explosive substances.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Biological substances (infection).....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Other substance hazard(s).....	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Category 4: Work Activity

Type	Yes	No
Highly repetitive actions.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Stressful posture.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Awkward/heavy lifting/handling.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Mental overload/stress.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Type	Yes	No
Visual fatigue (e.g. >3 hours VDU) ..	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Poor workplace design.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Use of hand tools.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Other work activity hazard(s).....	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Filling of Liquid Nitrogen in dewars for GMP laboratory including the transfer of dewars from Storage Chase H06 to Courtyard CBE Laboratory Unit - Storage Chase H-06, Carpetted Corridor, Corridor outside the Caretakers room, High Bay GW, Courtyard.

Risk Assessment Record

Assessment No. [SAF/CBE/.....]

Category 5: Work Organisation

Type	Yes	No
Contractors/service.....	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Type	Yes	No
Other work organisation hazard(s)....	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Category 6: Work Environment

Type	Yes	No
Significant noise.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Significant vibration.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Poor/excessive lighting.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Type	Yes	No
Hot/cold ambient temperature.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Poor ventilation.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Other work environment hazard(s)....	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Category 7: Other Hazard Types

Type	Yes	No
Violence.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Stress.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Drugs.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Type	Yes	No
Substance abuse.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Other hazard(s).....	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Category 8: Outdoor Work

Type	Yes	No
Outdoors on campus.....	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Outdoors off campus.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Overseas fieldwork.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Type	Yes	No
Site visit: construction.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Site visit: non-construction.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Other hazard(s).....	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Other Hazards: Radiation

Type	Yes	No
Radiation: Lasers.....	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Radiation: Electromagnetic effects ...	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Type	Yes	No
Radiation: Ionising/non-ionising.....	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Other radiation hazard(s).....	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Hazard Assessment

Describe the hazards identified above on the following pages. For each hazard assess the risk to health and safety using the risk rating formula and categories indicated below.

Risk Calculation

Severity	×	Probability	=	Risk
Major = 3 (e.g. death, major injury as per RIDDOR, irreversible health damage)		High = 3 (where certain or near certain harm will occur)		High = 6,9
Serious = 2 (e.g. injuries causing >3 days absence or reversible health damage)		Medium = 2 (where harm will frequently occur)		Medium = 2,3,4
Minor = 1 (e.g. first aid treatments and other lost time)		Low = 1 (where harm will seldom occur)		Low = 1

Filling of Liquid Nitrogen in dewars for GMP laboratory including the transfer of dewars from Storage Chase H06 to Courtyard CBE Laboratory Unit - Storage Chase H-06, Carpetted Corridor, Corridor outside the Caretakers room, High Bay GW, Courtyard.

Hazard Risk Rating

Activity	Groups at risk	Hazard Description	Controls in place	Severity	Probability	Risk	Action needed? Yes No
Normal use	All research and technical staff and students	Machinery & Work Equipment: Electrical Hazards. All electrical equipment poses a risk of electrocution to workers	All kit has been PAT tested and is CE marked for the usage	Minor	Low	Medium	<input checked="" type="checkbox"/> <input type="checkbox"/>
Normal use	a. All research and technical staff and students b. Vendor of liquid nitrogen c. People with access to the areas in which the dewar is transferred.	Machinery & Work Equipment: Mechanical Hazards. The pressurised cylinders for liquid nitrogen storage weigh a maximum of 476 kg when filled. In case they topple over, there is a chance of crushing the user.	a. Users will be trained and tested by the Health and Safety Officer or moving the cylinders b. To ensure that there is always help available, two users will work together with at least one user keeping a telephone available. c. In case a cylinder is toppled, the user with the telephone will be able to call security to evacuate the building d. Both users will know the nearest fire alarms to sound the evacuation. e. While transferring liquid nitrogen dewars through the buildings, users will have personal O2 sensors which will monitor leakage of nitrogen. f. Signs will be placed in the area when the dewar is being transferred to warn other people that liquid	Major	Low	Low	<input type="checkbox"/> <input checked="" type="checkbox"/>

Hazard Risk Rating

Activity	Groups at risk	Hazard Description	Controls in place	Severity	Probability	Risk	Action needed? Yes No
Normal use	All research and technical staff and students	Workplace. 2. Localised cold surfaces. The liquid nitrogen tanks will contain liquid at the boiling point of nitrogen (-196degC).	nitrogen is being transferred. This will apply to the carpeted corridor, the High Bay GW, and the courtyard. Both users will have the following PPE for use with liquid nitrogen: a. Gloves for cold surfaces, b. Eye protection goggles/face visor c. Laboratory coat. This will be distinct from the white or coloured coats used in the Class II labs.	Serious	Low	Medium	<input checked="" type="checkbox"/> <input type="checkbox"/>
Normal use	All research and technical staff and students	Category 3: Hazardous Substances. Liquid nitrogen is stored in the dewar at 3 BARG which is a low pressure vessel. There is a risk of explosion.	The pressure vessels will be inspected annually. In the first instance the inspection was performed with the commissioning.	Major	Low	Low	<input type="checkbox"/> <input checked="" type="checkbox"/>
Normal use	All research and technical staff and students	Category 3: High pressure fluid injection: Liquid nitrogen will be transferred from vendors tank to the dewar at high pressure. This activity will be performed in the courtyard in the outdoors. The vendor is responsible for maintaining the connectors on the vendor's tank as well as the hose.	Liquid nitrogen will be transferred in the open air in the Holywell Park Courtyard. In case of leakage, the liquid nitrogen will evaporate and not affect any personnel. The vendor's safety certificate will be inspected by the users.	Minor	Low	Low	<input type="checkbox"/> <input checked="" type="checkbox"/>

Risk Assessment Record

Assessment No. [SAF/CBE/.....]

Hazard Risk Rating

Activity	Groups at risk	Hazard Description	Controls in place	Severity	Probability	Risk	Action needed? Yes No
Normal use	Delivery vendor	Category 5: Work Organisation. The liquid nitrogen is delivered by the vendor in their truck. The vendor will be responsible for the risk assessment of the transfer of liquid nitrogen to the Holywell Courtyard and filling of the CBE dewars.	Liquid nitrogen will be transferred in the open air in the Holywell Park Courtyard. In case of leakage, the liquid nitrogen will evaporate and not affect any personnel. The vendor's safety certificate will be inspected by the users.	Serious	Low	Medium	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Normal use	All research and technical staff and students	Category 8: Working in the courtyard.	Liquid nitrogen will be transferred in the open air in the Holywell Park Courtyard. In case of leakage, the liquid nitrogen will evaporate and not affect any personnel. In case it is inclement weather, the users will be appropriately dressed.	Minor	Low	Low	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No

Add Row Delete Row

Risk Reduction

Physical

Determine whether the risk to health and safety can be reduced by modifications to the equipment or workspace, especially for those hazards identified as having medium to high risk. List planned action and completion dates below.

Hazard	Action to be taken	Responsible Personnel	Completion Date
Safety equipment needs purchasing	The following safety equipment will be purchased: a. Gloves b. Face visor c. Goggles d. Personal O2 sensors e. Signs for showing liquid nitrogen use in the area (1. Carpetted corridor, 2. Corridor outside the cleaners room, 3. Corridor in High Bay GW, 4. Courtyard).	AC	20 May 2011
Training on use of the pressure vessels	Area Safety Officer will train the authorised users on the use of the pressure vessels. It is anticipated he will want to watch the users move the pressure vessels to the courtyard and back.	RIT/AC	20 May 2011

Add Row	Delete Row
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Procedural

Determine and indicate below whether acceptable levels of risk to health and safety can only be achieved when equipment use must follow prescribed procedures, and/or where use must be restricted to specified personnel.

Risk Assessment Record

Assessment No. [SAF/CBE/.....]

Prepare and attach user guides, user restriction and other HSE documents as appropriate. Contact the Department Safety Officer for guidance/assistance as necessary.

Item	Yes	No
Does the equipment/process need an operating procedure document?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
• If yes, has one been prepared and appended to this form?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Must protective equipment be worn to use the equipment/process safely? (cf. Personal Protective Equipment (PPE) regulations)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
• If yes, have the users been adequately notified?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
• If yes, is suitable protective equipment available for all potential users/observers?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Should the use of this equipment be restricted to certain qualified personnel?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
• If yes, has a list of permitted users been prepared, appended to this form and displayed near the equipment?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Is training required to use the equipment/process safely?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
• If yes, have all identified users been adequately trained?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Does the equipment have a CE mark?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
• If not, does the equipment need a separate Machinery Risk Assessment?	<input type="checkbox"/>	<input type="checkbox"/>
• If yes, has one been prepared and appended to this form?	<input type="checkbox"/>	<input type="checkbox"/>
If a lifting hazard has been identified is a manual handling assessment required?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
• If yes, has one been prepared and appended to this form?	<input type="checkbox"/>	<input type="checkbox"/>
If hazardous substances will be in use, is a COSHH form required?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
• If yes, has one been prepared and appended to this form?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Does the equipment involve the use of lasers?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
• If yes, has a laser description form been completed and appended to this form?	<input type="checkbox"/>	<input type="checkbox"/>

Protocol for the Transfer of Liquid Nitrogen Dewars to the Filling Stage

Equipment:

- a. Liquid Nitrogen Dewars (x2) – Statebourne Cryostore 240L, type CS240
- b. Face Visor (x2)
- c. Safety Goggles (x2)
- d. Low temperature gloves (x2 pairs)
- e. Portable signs “Liquid Nitrogen Dewars in this Area” (x4)
- f. Personal O2 monitors (x2)

Initial Steps:

- a. Ensure that there are two users.
- b. Both users must be aware of the fire alarms.
- c. At least one user must carry a telephone.
- d. Both users must carry the PPE and personal O2 monitors.

Based on Figure 1, stages in the transfer of Dewars

- a. Stage 1: Dewar storage room, H06
 - a. Place sign in carpeted corridor.
 - b. Disconnect the liquid fill sensor.
 - c. Disconnect the dewar from the fill pipelines
 - d. Gently roll the dewar out of H06 into the corridor
- b. Stage 2: Carpeted corridor
 - a. Place sign in Stage 3, opposite the caretakers office.
 - b. Gently move the dewars into the area through the double doors.
- c. Stage 3: Opposite the Caretakers office
 - a. Place sign in Stage 4, High Bay GW.
 - b. Gently move the dewars into the area through the double doors.
- d. Stage 4: High Bay GW
 - a. Place sign in courtyard, Stage 5.
 - b. Open the roller shutter doors.
 - c. Gently move the dewars into the area through the roller shutter doors.
- e. Stage 5: Courtyard
 - a. Fill liquid nitrogen into dewars based on the vendors instructions.

Return the dewars back to H06 and remove signs.

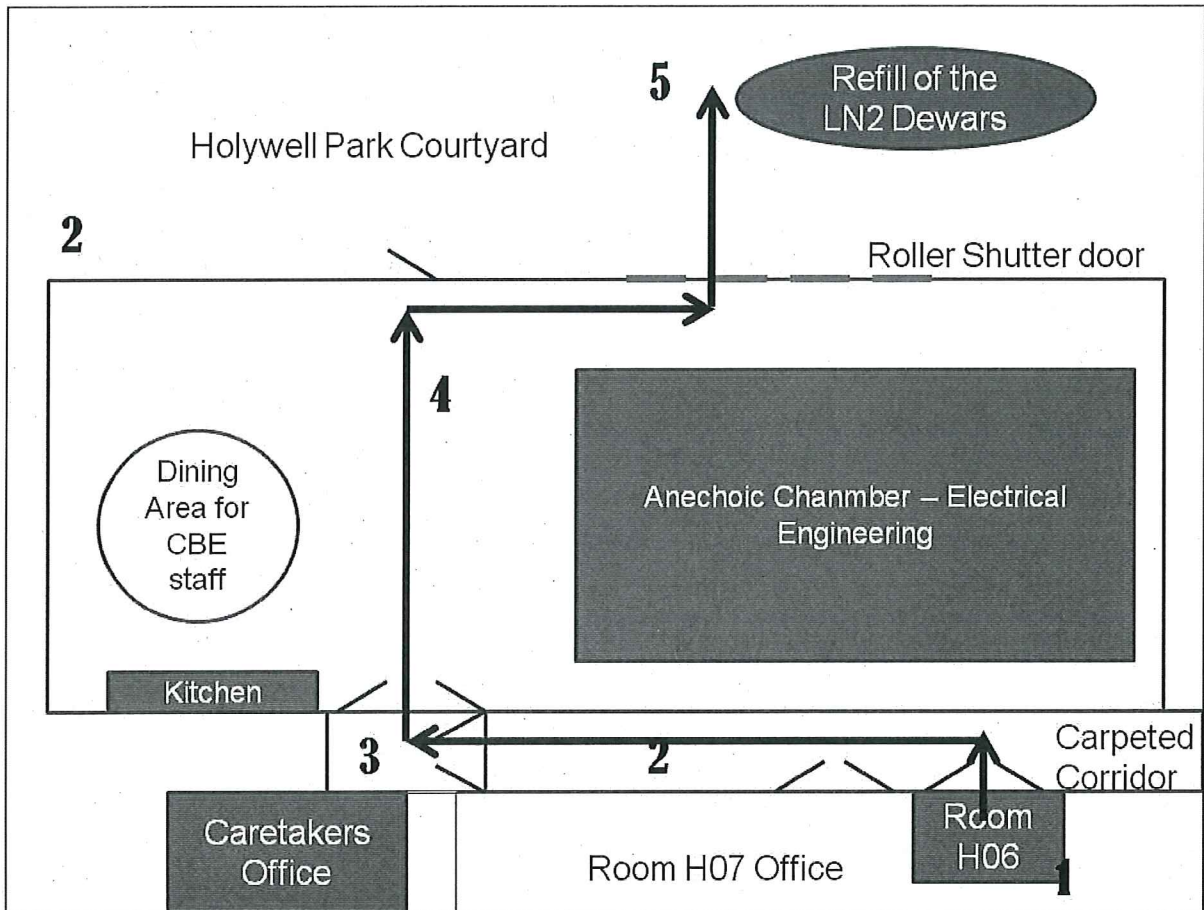


Figure 1. Plan of the route of the dewar transfer showing the 5 stages