# Safety Documentation

Please select the forms you require by selecting the check boxes below.
You can select more than one.

☑ **Risk Assessment** ☑ **Method Statement** ☑ **Chemicals COSHH**

Once you have made your selections, scroll down and complete the forms.

**Buttons**: [+] will add a row to a list [X] will delete a row from a list

You may save this file to a local drive at any time.
When you have finished, save the file to a local drive and email it to your supervisor for authorisation.

**Supervisors** - There is a sign-off section at the end of the document set that must be completed.

**Staff may "self authorise", (as a supervisor), but the forms must still be submitted to the DSO for approval.**

**IMPORTANT:**

YOU ***MUST NOT*** START ANY PRACTICAL WORK UNTIL THESE FORMS HAVE BEEN RETURNED TO YOU WITH **BOTH** YOUR SUPERVISOR's AND DSO's APPROVAL SIGNATURES ATTACHED.

## Please complete these fields

| | |
|---|---|
| School or Service | Wolfson School of Mechanical, Electrical and Manufacturing Engineering |
| Department | Centre for Biological Engineering |
| Originator name | Jennifer Bowdrey |
| email address | j.bowdrey@lboro.ac.uk |
| Location | Centre for Biological Engineering |
| Project / Activity / Task | Liquid Nitrogen, delivery and manual refill. |
| Supervisor Name | Carolyn Kavanagh |

Version : 2.19

# Loughborough University
# Centre for Biological Engineering

## Risk Assessment

Reference: SAF/MM6405

| | | | |
|---|---|---|---|
| Location | Centre for Biological Engineering | Originator | Jennifer Bowdrey |
| Project / Activity / Task | Liquid Nitrogen, delivery and manual refill. | | |

Is this process risk assessment for a : ○ Laboratory / Workshop ☑ General use

| | |
|---|---|
| **Category 1: Workplace** | + |
| Centre for Biological Engineering | x |
| **Category 2: Hazardous and/or Harmful substances** | + |
| Liquid Nitrogen / Cryogens | x |
| **Category 3: Activity** | + |
| Delivery of liquid nitrogen by BOC | x |
| Manual refill of the cryobanks within the CBE from the liquid nitrogen dewars | x |
| Storage of cells in cryobanks, including insertion and retrival of cryovials into the cryo banks | x |
| **Category 4: Organisation** | + |
| Authorised individuals for manual refill and authorised lab users for insertion and retrival of cryovials. | x |
| Contractors/Service | x |

### Explain the risks associated with these hazards

People / Groups at risk: Everyone in the room — x

| Enter risk details here:- | Impact | Probability | Risk Score |
|---|---|---|---|
| Asphyxiation | Very Harmful | Highly Unlikely | Medium |

| What are the control measures? | Lowers Impact | Lowers Probability | + |
|---|---|---|---|
| Use an oxygen monitor, when working with liquid nitrogen. Check it is working before hand. If alarm sounds exit area immediately. Work in a well ventilated area.<br>When refilling the cryobanks in the CBE, the doors are propped open to allow for ventilation. Always work in pairs.<br>When retrieving or inserting cryo vials into the cryobank, ensure the O2 monitor is working and prop open door for ventilation. | Moderately | Moderately | x |

Residual Risk: Low

People / Groups at risk: Operator and people in proximity — x

| Enter risk details here:- | Impact | Probability | Risk Score |
|---|---|---|---|
| Extremely low temperatures- burns/hypothermia | Harmful | Unlikely | Medium |

| What are the control measures? | Lowers Impact | Lowers Probability | + |
|---|---|---|---|

## Process Risk Assessment Form (Continued)

| | | | |
|---|---|---|---|
| For extremely low temperatures, wear the appropriate PPE to minimize the chances of coming into direct contact with the liquid nitrogen. Mandatory PPE is blue cold insulated gloves for use with working with cold temperatures and safety visor/safety glasses. Closed toe shoes also must be worn. | Moderately | Moderately | x |
| | | Residual Risk | Low |

| | | | |
|---|---|---|---|
| People / Groups at risk | Operator | | x |
| Enter risk details here:- | Impact | Probability | Risk Score |
| Movement of dewars- manual handling/spills | Slightly Harmful | Highly Unlikely | Low |
| What are the control measures? | Lowers Impact | Lowers Probability | + |
| Dewar is on a trolley this allows for the dewar to be safely and easily moved from gas pod 3 to H30 for cyobank refill, or from gas pod 3 to the BOC truck for liquid nitrogen deliveries and back again.<br>The dewars also have lids on, which prevents liquid nitrogen from escaping.<br>SOP013 Safe use and Maintenance of Liquid Nitrogen stores provides guidance for handling liquid nitrogen.<br>Authorised laboratory users are trained in how to deal with spills ( including liquid nitrogen). | Significantly | Moderately | x |
| | | Residual Risk | Low |

| | | | |
|---|---|---|---|
| People / Groups at risk | Operator | | x |
| Enter risk details here:- | Impact | Probability | Risk Score |
| Pouring of liquid nitrogen- asphyxiation/low temps | Very Harmful | Unlikely | High |
| What are the control measures? | Lowers Impact | Lowers Probability | + |
| -Use of correct PPE<br>-Use of Oxygen monitors to detect a fall in the oxygen levels<br>-Use of a cryo bucket which is insulated and also a funnel which allows for easier pouring of liquid nitrogen into the cryobanks.<br>-The liquid nitrogen dewar, is able to be tipped on its stand which allows the liquid nitrogen to be poured safely into the cryo bucket.<br>-There is always another person present, in case something should go wrong.<br>- The area is always well ventilated while this process is occuring<br>-Full training is given to those handling/manual re-filling cryostores. Training is recorded in training files. | Significantly | Moderately | x |
| | | Residual Risk | Low |

+ Add another Risk

With these controls in place, the risk is:

Process Risk Assessment Form (Continued)

**The activity is LOW RISK  - and is effectively controlled**

# Loughborough University
# Centre for Biological Engineering

## Safety Method Statement

Reference: SAF/MM6405

| | | | |
|---|---|---|---|
| Location | Centre for Biological Engineering | Originator | Jennifer Bowdrey |
| Project / Activity / Task | Liquid Nitrogen, delivery and manual refill. | | |

| What equipment will be used in this activity? | + |
|---|---|
| Liquid Nitrogen Cryobanks | x |
| Liquid nitrogen storage dewars- 25L | x |
| Liquid nitrogen bucket and funnel for filling up cryobanks | x |
| Metal splash trays | x |
| Measuring sticks for cryobank filling | x |
| Appropriate PPE (see below) | x |
| Oxygen monitors | x |
| Padlocks and keys | x |

| What training must be completed to do this activity? | + |
|---|---|
| Liquid Nitrogen training needs to be completed for insertion and retrieval of cryovials from banks. | x |
| Liquid nitrogen cryobank filling needs to be done for filling the banks. | x |

| What chemicals are being used? (These must be included in the COSHH Form) | + |
|---|---|
| Liquid nitrogen | x |

Spill and accident procedures. +

## Safety Method Statement (Continued)

| | |
|---|---|
| Spill tray- contains the liquid nitrogen into one area.<br><br>If the volume of liquid nitrogen spilled is < 100 ml (Minor Spill) and correct procedures have been followed; then spill will be in a well-ventilated area and may be allowed to evaporate.<br>a. Move any other personnel away from the spill area.<br>b. Prop open doors to the laboratory if additional ventilation is required (determined by oxygen monitor alarms,<br>c. If oxygen monitors are alarming (<18 % O2) then immediately evacuate the area and contact the Laboratory Manager and Departmental Safety Officer.<br><br>If the volume of liquid nitrogen spilled is ≥ 100 ml (Major External Spill) and external to the CBE laboratory then:<br>a. Immediately evacuate the area.<br>b. Cordon off the spill area and prevent any individual (whether staff member, student or general public) from accessing the spill area.<br>c. Allow the liquid nitrogen to evaporate into the atmosphere.<br>d. Contact the Laboratory Manager and Departmental Safety Officer.<br><br>If the volume of liquid nitrogen spilled is ≥ 100 ml (Major Internal Spill) within the CBE laboratory then:<br>a. All personnel must immediately evacuate the surrounding area or risk death from asphyxiation.<br>b. Immediately contact the Laboratory Manager and Departmental Safety Officer.<br>c. If the spill is very large (> 10 L) and/or in an enclosed space, a complete evacuation of the building may be necessary.<br>d. The Fire Service should also be alerted to the situation if there is serious risk of combustion.<br><br>All incidents involving spillage of liquid nitrogen must be reported to your immediate supervisor or laboratory manager.<br><br>It is University Policy that a full Incident Report must be written and submitted to the Area Safety Advisor immediately after the spillage is resolved. | x |

| Procedure in the event of an emergency. (How to leave the process in a safe condition in such an event) | + |
|---|---|
| Oxygen depletion response<br><br>If the oxygen monitors are alarming and/or there is visible evidence of a liquid nitrogen spill then:<br>a. Follow the appropriate spill response (Section 5.3.1).<br>b. Do not enter or allow others to enter the spill location until (1) the atmospheric oxygen concentration has returned to normal (19.5 %); (2) there is no sign of spilled liquid nitrogen remaining; and (3) there is no risk of cryogenic burns from chilled surfaces in the local area.<br>c. Contact the Laboratory Manager and Departmental Safety Officer immediately. | x |
| Fire alarm response<br><br>If the fire alarm sounds while you are working with liquid nitrogen then:<br>a. Make safe the liquid nitrogen if possible before evacuating.<br>b. If it is not possible to make safe the liquid nitrogen, then evacuate the building and immediately inform the Fire Brigade to the risks posed by liquid nitrogen (oxygen depletion and combustion in particular). | x |

## Safety Method Statement (Continued)

| | |
|---|---|
| First aid response<br><br>Exposure to liquid nitrogen or cold vapour will cause Frost Bite to varying degrees. Treatment of such injuries all aim to restore tissue slowly back to normal body temperature (37°C). Short-term contact may be treated as minor as follows:<br><br>In the case of Minor Frost Bite:<br><br>a. Move the injured person to a comfortable room if possible<br>b. Remove or loosen clothing which may constrict blood flow to the frozen area.<br>Caution: Do not remove adherent clothing until the area has been thoroughly thawed<br>c. Place the affected area in tepid water or flow tepid water (40°C to 42°C) over the area for half an hour. Skin should change from pale yellow through blue to pink or red during this process.<br><br>Caution: Hot water (45°C) or dry heat should not be used.<br><br>Caution: Do not rub the affected area during or after treatment.<br><br>d. The injured person should not smoke or drink alcohol.<br>e. Cover the affected area with bulky dry sterile dressing.<br>f. Send the injured person to hospital.<br><br>Prolonged contact with liquid nitrogen may cause serious burns and blood clots requiring more sophisticated medical treatment. Any individual with a severe burn or who had liquid held in contact with the skin by gloves or clothing should immediately seek medical attention.<br><br>In the case of Major Frost Bite:<br><br>h. Call for an ambulance.<br>i. Follow the procedure for Minor Frost Bite as much as possible.<br>In the case of significant body exposure, the injured person must be re-warmed without delay.<br>g. The injured person should be placed in a bath of warm water at a temperature between 40°C and 42°C.<br><br>Caution: The temperature should be maintained within this range to ensure maximal rate of warming.<br>Note: If the facilities for this treatment are absent, then the injured person should be taken to a warm environment and lightly covered with one or two blankets until recovery is complete.<br><br>Caution: The injured person may go into shock during rewarming.<br><br>Note: Frozen tissues are often painless and appear waxy with a pale colour. Thawing after deep burns will result in vasodilation, increased capillary permeability and oedema. Tissues will become painful, swollen and vulnerable to infection after thawing. Thawing may take 15 – 60 minutes and should be continued until the pale colour of skin turns to pink or red. The thawing process may require major analgesia. Symptomatic treatment and the prevention of infection are indicated.<br>Caution: If the frozen body part is thawed by the time medical attention is obtained, do not re-warm. Cover the area with dry sterile dressing and with a large bulky protective covering. | x |
| In the case of Suffocation:<br>If a person becomes dizzy or loses consciousness while working with liquid nitrogen, follow the procedure below:<br>h. Immediately move the person to a well-ventilated area.<br>i. Determine whether the person is still breathing.<br>I. If breathing has stopped, apply artificial respiration and call a first aider<br>II. If the person is still breathing, call a first aider.<br>j. Call for emergency medical assistance.<br>5.3.5 Incident Reporting procedure | x |

References. +

| | |
|---|---|
| SOP013- Safe use and maintenance of liquid nitrogen stores. | x |

## Detailed sequential description of the process

| Process step | Precautionary measures and comments | + |
|---|---|---|

## Safety Method Statement (Continued)

| Process step | Precautionary measures and comments | + |
|---|---|---|
| Movement of dewar from Gaspod 3 to the spill tray in H31 or to the Liquid nitrogen delivery truck for refill and return of dewars. | Make sure pathway is clear.<br>Make sure Gas Pod 3 is locked again afterwards.<br>If it is for a delivery make sure that the delivery is signed for. | x |
| Liquid nitrogen top up - see SOP013 for full details<br>Filling volume for the cyrostorage units is 19cm.<br>Fill log must be filled in for each bank after each fill. | Check oxygen monitor is working correctly<br>Put liquid nitrogen in use signs up.<br>Prop doors open to allow proper ventilation.<br>Deploy metal spill trays in the autoclave room in case of spills.<br>Wear appropriate PPE- remember to remove nitrile gloves before putting on thermal gloves. Ensure eye protection is worn.<br>Use cryo bucket and funnel.<br>Pour liquid nitrogen slowly and carefully to avoid spillages. | x |

# Loughborough University
# Centre for Biological Engineering

## COSHH Form

Reference: MEME/536

Location: Centre for Biological Engineering

Originator: Jennifer Bowdrey

Project / Activity / Task: Liquid Nitrogen, delivery and manual refill.

**CHEMICAL NAME**

**Liquid Nitrogen**

CAS No. 7727-37-9

W.E.L. (Itel / stel)

Hazard Rating: High

| Amount used | | Period of use (hrs) | The process is: | Physical State | | Exposure Potential |
|---|---|---|---|---|---|---|
| 40 | l | 0.5 | Open | Non-Volatile Liquid | ☐ Eyes ☐ Skin ☐ Inhaled ☐ Ingested | Low |

**OVERALL RISK:** Low

| Hazard Statement and Description | Precaution Statement and Description |
|---|---|
| H281 Contains refrigerated gas; may cause cryogenic burns or injury. | P282 Wear cold insulating gloves/face shield/eye protection. |
| | P336 Thaw frosted parts with lukewarm water. Do no rub affected area. |
| | P315 Get immediate medical advice/attention. |
| | P403 Store in a well-ventilated place. |

**How will the precautions listed above be implemented?**

Wear appropriate PPE - cold insulating gloves (nitrile gloves will not be worm under cold insulating gloves), face shield, lab coat.
Use of oxygen monitors- check if it is working before starting work, will alarm if there is an oxygen depletion.
Storage dewars are stored in Gas Pod 3, which is very well insulated. Cryobanks, when they are being used or filled, ventilation will be increased by having doors open. Filling of cryobanks will always be done in pairs, this will allow for the alarm to be raised if something goes wrong.

| Special Storage and Containment Measures | Disposal Method |
|---|---|
| Storage dewars are to be kept in Gas Pod 3, the cryobanks are kept within 3 areas of the CBE lab. The cryobanks are kept locked at all times unless in use. | Place in very well ventilated area and allow the liquid nitrogen to evaporate into the atmosphere (if a large amount this should be done outside) |
| How will spillages be dealt with? | *Please note: any material used to clean up a spill of hazardous material must also be disposed of as hazardous material.* *Click here to see spill procedures* |

If the volume of liquid nitrogen spilled is < 100 ml (Minor Spill) and correct procedures have been followed; then spill will be in a well-ventilated area and may be allowed to evaporate.
a. Move any other personnel away from the spill area.
b. Prop open doors to the laboratory if additional ventilation is required (determined by oxygen monitor alarms,
c. If oxygen monitors are alarming (<18 % O2) then immediately evacuate the area and contact the Laboratory Manager and Departmental Safety Officer.

If the volume of liquid nitrogen spilled is ≥ 100 ml (Major External Spill) and external to the CBE laboratory then:
a. Immediately evacuate the area.
b. Cordon off the spill area and prevent any individual (whether staff member, student or general public) from accessing the spill area.
c. Allow the liquid nitrogen to evaporate into the atmosphere.
d. Contact the Laboratory Manager and Departmental Safety Officer.

If the volume of liquid nitrogen spilled is ≥ 100 ml (Major Internal Spill) within the CBE laboratory then:
a. All personnel must immediately evacuate the surrounding area or risk death from asphyxiation.
b. Immediately contact the Laboratory Manager and Departmental Safety Officer.
c. If the spill is very large (> 10 L) and/or in an enclosed space, a complete evacuation of the building may be necessary.
d. The Fire Service should also be alerted to the situation if there is serious risk of combustion.

All incidents involving spillage of liquid nitrogen must be reported to your immediate supervisor or laboratory manager.

It is University Policy that a full Incident Report must be written and submitted to the Area Safety Advisor immediately after the spillage is resolved.

+ Add another chemical

Statement of work (Process to be undertaken)

Filling cryostores with liquid nitrogen and movement of dewars in and out of Gas pod 3.
See SOP013 for full details.

Show image

Personal protection requirements not covered in the precaution statements above.

Check oxygen monitor is working correctly
Put liquid nitrogen in use signs up.
Prop doors open to allow proper ventilation.
Deploy metal spill trays in the autoclave room in case of spills.
Wear appropriate PPE- remember to remove nitrile gloves before putting on thermal gloves. (Face visor, appropriate shoes, thermal gloves and lab coat- fastened correctly)
Use cryo bucket and funnel.
Pour liquid nitrogen slowly and carefully to avoid spillages.

Sources of information and references

SOP013

Reference to **existing approved** Risk Assessment

With the current controls, the risk of using these chemicals is: Low

Supervisor to check that the process involving the safe use of these chemicals has been satisfactorily evaluated

# Supervisor and Departmental Safety Office (DSO) Sign-off.

## Supervisors

Please check the documents above and if you want to approve them:

1) Electronically sign this document
2) Save it to a local drive (You will be prompted to do this)
3) eMail the signed document to the DSO.

## DSO

Please review the documents above and if you want to approve them:

1) Enter the reference numbers as appropriate
2) Electronically sign this document
3) Save it to a local drive (You will be prompted to do this)
3) eMail the signed document to the originator

**IF YOU DO NOT WANT TO AUTHORISE THE FORMS,**

Please do not sign the form, but click the "Not Approved" check-box and return it to the originator by email stating why and what you expect them to do to put it right in the comments box below.

Not Approved ☐

Supervisors Signature: Carolyn Kavanagh — Digitally signed by Carolyn Kavanagh
Date: 2019.11.28 10:29:52 Z

Form Reference Numbers

| Risk Assessment | Method Statement | COSHH Assessment |
|---|---|---|
| SAF/MM6405 | SAF/MM6405 | MEME/536 |

DSO Signature: Digitally signed by David Green
Date: 2020.03.12 15:58:39 Z
Adobe Acrobat version: 2020.006.20034

**This document set must be reviewed and re-approved at the following times:**

1) After the first occurrence of the activity described above (Review only)
2) After any change to the procedure or reagents used
3) After any incident resulting from this activity
4) At least annually from the date of approval

Next Review: 27/11/2020

Review comments