

# STFC QUANTITATIVE RISK ASSESSMENT PRO-FORMA

Ref:	Description: <b>MICE cryogenic infrastructure and services</b>
Assessment Date: <b>10/07/15</b>	Location/Site: <b>MICE Hall (R 5.2)</b>
Assessor: <b>S Watson</b>	Department: <b>Particle Physics Department (owner), Technology (operator)</b>
Assessment Team: <b>MICE team</b>	Persons Exposed: <b>MICE operational team, ISIS crew</b>
Activity/Task: <b>Operation of MICE in the Step IV experimental context</b>	

Step 1 What are the hazards?  
Step 2 Who might be harmed and how?  
Step 3: What further action is necessary?  
Step 4: How will you put the Assessment into action?

Hazard/Task or Situation	H Harm	L Likelihood	R Risk	Action by whom	By when	Done			
<p><b>Exposure to cryogenic liquid or gas, resulting in burns</b></p> <ul style="list-style-type: none"> <li>- LN2 pre-cooling boil-off (SS)</li> <li>- LHe filling boil-off (SS &amp; FC)</li> <li>- Cold-trapping (DS)</li> </ul>	<p>Cryogenic operator, MICE shifters</p>	<p>All cryogenic operators will have completed the RAL training.</p> <p>Suitable PPE is provided.</p> <p>Procedural documents, which highlight the risks, must be read and understood by operators before operations.</p> <p>These documents can be found at:</p> <ul style="list-style-type: none"> <li>- <a href="#">Spectrometer Solenoid filling procedure</a></li> </ul>	<p>Moderate</p>	<p>Likely</p>	<p style="background-color: yellow;">Medium</p>	<p>Temporary tape-fences to be obtained and placed around areas where the cryogenic operations are to be performed, and only trained operators are allowed in these areas.</p>	<p>J Govans</p>	<p>17/07/15</p>	

## STFC QUANTITATIVE RISK ASSESSMENT PRO-FORMA

		<ul style="list-style-type: none"> <li>- <a href="#">Focus Coil filling procedure</a></li> <li>- <a href="#">Decay solenoid manual</a></li> </ul>							
<b>Exposure to cryogenic liquid or gas, resulting in burns</b> <ul style="list-style-type: none"> <li>- Magnet quench (FC &amp; SS)</li> <li>- Loss of insulating vacuum (FC &amp; SS)</li> </ul>	Cryogenic, operator, MICE shifters	<p>During magnet running, the PPS system will control access to the Hall, limiting exposure.</p> <p>Quench relief valves are contained within the beamline and do not vent into commonly-occupied areas.</p>	Moderate	Unlikely	Medium	<p>Ensure that the risks and mitigating actions are explicitly included in the shifter induction. This will include at least:</p> <ul style="list-style-type: none"> <li>- Location and area affected by quench PRVs</li> <li>- Scenarios leading to accidental vacuum loss</li> <li>- Expected response to an unexpected cryogen release</li> </ul>	J Govans	17/07/15	
<b>Fall and trips</b> <ul style="list-style-type: none"> <li>- During connection of syphon for filling operations</li> </ul>	Cryogenic operator	<p>Platform to be attached to side of PRY for the safe manipulation of transfer syphons – awaiting delivery at time of writing.</p> <p>In the meantime, temporary scaffold tower will be used.</p>	High	Likely	High	<p>Install harnesses for operators on the platform/scaffold tower.</p>	A Nichols	17/07/15	

## STFC QUANTITATIVE RISK ASSESSMENT PRO-FORMA

<p><b>Manual handling injuries</b></p> <ul style="list-style-type: none"> <li>- Lifting of transfer syphons</li> <li>- Moving helium and nitrogen dewars</li> </ul>	Cryogenic operator	<p>All cryogenic operators will have completed mandatory RAL manual handling course.</p> <p>Dewars to be lifted with crane as far as possible to minimise manual operations.</p> <p>Standard PPE to be worn at all times when inside the MICE Hall.</p>	Moderate	Likely	Medium				
<p><b>Asphyxiation due to oxygen depletion</b></p> <ul style="list-style-type: none"> <li>- LN2 pre-cooling boil-off (SS)</li> <li>- LHe filling boil-off (SS &amp; FC)</li> <li>- Magnet quench boil-off (SS &amp; FC)</li> </ul>	Cryogenic operator, MICE shifter	<p>ODH system is installed.</p> <p>Personal oxygen monitors are available to wear.</p> <p>Oxygen deficiency scenarios and risks are covered in more detail in:</p> <ul style="list-style-type: none"> <li>- <a href="#">ODH analysis</a></li> </ul>	Major	Very unlikely	High	ODH system to be made operation prior to magnet powering	J. Govans	17/07/15	
<p><b>Electrocution</b></p> <ul style="list-style-type: none"> <li>- Condensation from cryogenic operation falls onto high voltage live electrical equipment</li> </ul>	Cryogenic operator, MICE shifter	<p>Ensure all cold pipework is not routed above electrical equipment.</p> <p>Anti-icing cartridge heaters are included on the FC current leads.</p>	High	Very unlikely	Medium	Install insulation or finger guard over exposed cartridge heater terminals on FC current leads.	S Watson	01/08/15	

## STFC QUANTITATIVE RISK ASSESSMENT PRO-FORMA

		<p>Anti-icing fan heaters are included on the SS current leads.</p> <p>Electrical equipment on the beamline, where condensation is likely to collect, is exclusively low voltage (&lt;20V) with the exception of the FC anti-icing heaters (110V).</p>							
<p><b>Slips</b></p> <ul style="list-style-type: none"> <li>- Condensation from cryogenic operation falls onto floor</li> </ul>	<p>Cryogenic operator, MICE shifter</p>	<p>Paper towels to be readily available to absorb pooled condensation.</p> <p>Risk included in MICE shifter induction.</p>	<p>Slight</p>	<p>Unlikely</p>	<p>Low</p>				

Distribution List:	Signed:	Date:
MICE GLIMOS (A. Nichols)		
MICE Spokesperson (K. Long)		
ISIS representative (Z. Bowden)		
SHE representative (M. Dickson)		
<p><b>Step 5 Review Date:</b></p>	<ul style="list-style-type: none"> <li>▪ Review your assessment to make sure you are still improving, or at least not sliding back.</li> <li>▪ If there is a significant change in your workplace, remember to check your risk assessment and where necessary, amend it.</li> </ul>	

# STFC QUANTITATIVE RISK ASSESSMENT PRO-FORMA

## LEVEL OF RISK

There will be some instances where you may need to assign priorities to actions from an assessment or you may be responsible for managing the actions from a number of assessments. In either case you will need a coherent method for assigning a priority to actions. This Quantitative Risk Assessment pro-forma gives you this option.

There are three additional fields available when entering or editing any task in an assessment:

- Harm,
- Likelihood and
- Risk.

For each hazard, you choose options for the Harm and Likelihood categories.

Use the information contained in Step 2, categorise the harm that might be caused: As a general rule you are looking for 'the most likely reasonably foreseeable injury' **not** just the worst case.

Decide How Someone Might be Harmed	
Major	Fatality.
High	Amputations; multiple serious injuries; major fractures; major burns.
Moderate	Lacerations; burns; concussion; serious sprains; minor fractures.
Slight	Superficial injuries; minor cuts and bruises; eye irritation from dust.

Below are the phrases that are used in the risk database to describe the likelihood of something happening and how someone might be harmed:

How Likely is it to Happen?	
Very Unlikely	The hazard is very rarely experienced and exposure will seldom result in injury.
Unlikely	The hazard is rarely experienced and exposure will seldom result in injury.
Likely	The hazard is persistent but exposure may not always result in injury.
Very Likely	The hazard is persistent and exposure will undoubtedly result in injury.

Then use the matrix below to obtain a 'risk factor' from the likelihood and harm categories for each hazard (e.g. if you decided the *harm* category was 'moderate' and the *likelihood* was 'unlikely' the *risk factor* would be 'medium'). This risk category is then used to determine what priority should be given to reducing the risk factor for that particular hazard.

# STFC QUANTITATIVE RISK ASSESSMENT PRO-FORMA

## Risk Factor

To manually calculate the risk factors use the table below:

<b>Harm</b>	Major	High	High	V High	V High
	High	Med	Med	High	V High
	Moderate	Low	Med	Med	Med
	Slight	Low	Low	Low	Low
		Very Unlikely	Unlikely	Likely	Very Likely
		<b>Likelihood</b>			

	<p>Low Risk - No additional controls are necessary unless they can be implemented at very low cost (in terms of time, money and effort). Actions to further reduce these risks can be assigned low priority.</p>
	<p>Medium Risk - Consideration should be given as to whether the risks can be lowered, where applicable, to a low risk level, but the costs of additional risk reduction measures should be take into account. The risk reduction measures should be implemented within a defined time period.</p>
	<p>High Risk – Substantial efforts should be made to reduce the risk. Risk reduction measures should be implemented urgently within a defined time period and it might be necessary to consider suspending or restricting the activity, or to apply interim control measures, until this has been completed. Considerable resources might have to be allocated to additional control measures.</p>
	<p>V High Risk - These risks are unacceptable. Substantial improvements in risk controls are necessary. The work activity should be halted until risk controls are implemented. If it is not possible to reduce risk the work should remain prohibited.</p>