



# Equipment Risk, Training and Maintenance

## 1. Purpose

In a chemical laboratory, a high risk environment may not simply be limited to the use of hazardous substances. Some instruments either through direct use or in maintenance may place a student or staff member at some risk. This guideline outlines the identification of hazards and control measures to aid in the completion of an equipment risk assessment in order to minimise risks that may be associated with laboratory equipment. It also requires the entry of equipment information into an equipment register.

## 2. Scope

This guideline and associated documentation should be read by all laboratory supervisors and managers that have students and staff operating a piece of equipment.

## 3. References

Risk Management Guidelines

[http://staff.uow.edu.au/ohs/managingrisk/OHS106-Risk\\_Management\\_Guidelines.pdf](http://staff.uow.edu.au/ohs/managingrisk/OHS106-Risk_Management_Guidelines.pdf)

Risk Assessment OHS031.6 <http://staff.uow.edu.au/ohs/managingrisk/index.html#3>

## 4. Definitions

*Category 1 equipment:* A complex piece of equipment or one with medium -high risk that requires formalised training and assessment of competency before use.

*Category 2 equipment:* Equipment which has medium complexity or risk, requiring simple training for use.

*Category 3 equipment:* Equipment that requires little training and is of low risk.

*Trainer:* The person nominated by the supervisor to carry out training for a particular piece of equipment.

*Major equipment facility:* In the Department of Chemistry major equipment facilities are considered to be the NMR facility and Mass Spectrometry Facility.

## 5. Procedure

### 5.1. Identify the equipment under your Supervision

Identify the major equipment in your laboratory area and enter the name, manufacturer and model number in the equipment register (Appendix 1) eg. *300MHz NMR spectrometer, Varian, Mercury Vx*. Include any meaningful identifiers. If possible also include the asset number. Some pieces of equipment may have more than one asset number. List those you consider most relevant.

### 5.2. Complete a Risk Assessment

Complete a risk assessment form (document number OHS031.6) for any equipment considered as 'major' equipment.

#### 5.2.1. Identification of Hazards

In the operation of equipment or during maintenance procedures identify the substances, processes and techniques that are used that may represent a hazard. Some examples are:

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Hazard	Example
High or low temperature Cryogenics, Dry ice, temperatures > 60°C	Vacuum traps
High or Low pressures Gas, Liquid, Mechanical (glass, springs etc)	HPLC
Lasers	Raman Spectrometer
High magnetic fields	NMR – superconducting magnet
Hazardous Substances Solvents, Corrosives, Toxic, Mixtures Biohazardous / Infectious materials	HPLC eluents
Radiation Ionising and non-ionising	Use of radio-isotopes
Electricity Is the instrument correctly tagged? Is the instrument in good working order-cabling, power plugs. Power outage – are there contact lists?	Any instrument that has special power shutdown procedures.
Mechanical	Rotators, auto-injectors
Sharps	Use of injection syringes
Manual Handling	Operation of equipment that requires heavy or awkward lifting.
Ergonomics Are users in comfortable position in the use of the instrument?	Repetitive procedures involved in use of instrument.

Try also to think laterally about incidents that may occur to identify other possible hazards.

- What could happen if the equipment is not maintained correctly or not used appropriately?
- Are there any special emergency procedures required in the event of power outage?
- Is there procedures that only occur occasionally, perhaps during maintenance?

### 5.2.2. Controls

The method of ensuring that risks are controlled effectively is by using the “hierarchy of controls”.  
The Hierarchy of Controls are:-

Order	Control	Example
1	Eliminate	Removing the hazard, e.g. Taking a hazardous piece of equipment out of service
2	Substitute	Replacing a hazardous substance or process with a less hazardous one
3	Isolate	Isolating the hazard from the person at risk, e.g. using a guard or barrier. Limit entry to a room.
4	Engineer	Redesign an experiment, piece of equipment or process to make it less hazardous. Ensure e-tagging
5	Administrative	Adopt safe work practices. Provide appropriate training, instruction or information. Use safe work procedures and ensure training is carried out by a qualified, experience trainer. Allow regular breaks for repetitive work or re-organise a work area. Have a contact list/procedures for power outages.
6	Personal Protective Equipment	Use of lab-coat, gloves, safety glasses, safety footwear, dust masks, face shields, goggles etc.

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Controls and processes should be monitored and reviewed. Are the controls implemented effective?  
Once a year, as part of the workplace inspections, equipment management should be reviewed.

**5.2.3. Evaluate the level of risk**

Evaluation is based on your knowledge of the hazards involved and the likelihood of something going wrong. Assess the severity risk to health and environment associated with processes and materials involved in using the equipment. Complete a risk matrix.

The Risk Matrix is a summary of the hazardous material risks involved in any process. To use the risk matrix:

1. Consider the consequences

Consequence	Personal Damage	\$ Damage	Process Interruption	Environmental Impact
<b>Major</b>	Extensive Injury or death	> \$100K	> 1week	Community alarm
<b>Moderate</b>	Medical Treatment	\$50 - \$100K	1day – 1 week	Off site impact
<b>Minor</b>	First Aid Treatment	\$5-\$50K	1 hour – 1day	On site impact
<b>Negligible</b>	No treatment	<\$5K	< 1 hour	Potential impact

2. Consider the likelihood
  - A** The event is expected to occur in most circumstances
  - B** The event could occur at some time
  - C** The event could occur, but only rarely
  - D** The event may occur, but probably never will
3. Take step 1 rating and select the correct column on the matrix
4. Take step 2 rating and select the correct row on the matrix
5. The calculated risk score is where the two rating cross on the matrix  
**H= High M= Medium L= Low I = insignificant**

**RISK MATRIX**

		CONSEQUENCES			
		Maj	Mod	Min	Ins
LIKELIHOOD	A	H	H	H	M
	B	H	H	M	M
	C	H	M	M	L
	D	M	M	L	L

**5.3. Complete a task assessment**

- Identify the operational and safety knowledge and skill requirements of your staff and students for operation of the equipment.
- Determine the complexity of these tasks required for the operation of the equipment, taking into account the existing knowledge and skills of the new users of the equipment.

#### 5.4. Required Training

Based on the risk and task assessment determine the category of the equipment.

<p><b>Category 1</b></p>	<p><b>This is high risk or complex equipment and includes such instruments as the NMR, Mass Spectrometers and ICP.</b></p>	<ul style="list-style-type: none"> <li>• These instruments require specific training to be carried out by an authorised trainer.</li> <li>• A display of competency is necessary, meeting set criteria, before access is granted.</li> <li>• Training records detailing competency should be kept.</li> <li>• A list of current users should also be maintained.</li> <li>• Those responsible for equipment should also develop SOP (standard operating procedures) and SWP (safe work procedures).</li> </ul> <p>Alternatively these may be service instruments where there is no general access and samples are submitted. Further assistance in method development can also be given by the technical manager.</p>
<p><b>Category 2</b></p>	<p><b>This equipment has medium complexity or risk such as UV-Vis spectrophotometers , HPLC.</b></p>	<ul style="list-style-type: none"> <li>• Basic training on these instruments is provided by a nominated trainer.</li> <li>• The trainer may develop a standard operating procedure -simple instructions of use and carry out basic training.</li> <li>• Logbooks are used to monitor who has undertaken training and usage.</li> <li>• Further method development is the responsibility of the supervisor or researcher experienced in the use of this instrument.</li> </ul>
<p><b>Category 3</b></p>	<p><b>These are low risk simple instrumentation such as hotplate stirrers, rotary evaporators.</b></p>	<ul style="list-style-type: none"> <li>• This category of equipment requires minimal training to operate and has no formalised training procedure.</li> <li>• It may include items such as hotplates, rotary evaporators.</li> <li>• Training will generally be carried out by another experienced user within the laboratory.</li> <li>• There may or may not be logbooks to monitor use.</li> </ul>

#### 5.5. Nominate a person in charge of the equipment

Each piece of equipment identified as category 1 or 2 equipment should have a person nominated to carry out training. Their name should be entered onto the Equipment register. Complex equipment may also need a regular maintenance plan and someone nominated to carry out maintenance.

Nominated trainers need to be made aware of their duties such as:-

- Ensuring logbooks are present and completed by users.
- Listing those who are trained or authorised to use the instrument.
- Noting in logbooks the whereabouts of the Manufacturers manuals/ software.
- Being aware of equipment updates (including software).
- Knowing OHS issues associated with the equipment and initiating review of documentation.

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Writing and reviewing documentation for the instrument such as safe work procedures or standard operating procedures should be carried out in collaboration with/ or by a supervisor. Safe work procedures alongside standard operating procedures constitute an important addition to any equipment training.

For trainers of category 1 equipment completion of a training needs analysis is recommended to help develop a training and assessment program. Refer to OHS Unit Training Guidelines.

If maintenance support is also required there may also be:-

- A maintenance logbook detailing any maintenance or repairs undertaken.
- The establishment of a routine maintenance plan including function checks. Written procedures for the equipment outlining maintenance checks, troubleshooting guide.
- Kept supply of spare parts, warranty information and repair contacts.

For postgraduate students/ research assistants nominated as trainers it needs to be ascertained for how long they should have this responsibility and how much will it impact on other duties. There may need to be a rotation of responsibilities amongst a research group. If staff/students involved in the technical support are leaving, prior plans need to be made as to who will be the next nominated to support and train.

### 5.6. Write a safe work procedure

Guidelines for writing safe work procedures can be found at:

[http://staff.uow.edu.au/ohs/workingsafely/OHS152-developmentof\\_safework\\_procedures.pdf](http://staff.uow.edu.au/ohs/workingsafely/OHS152-developmentof_safework_procedures.pdf)

Safe work procedures can be useful in training new users and should be easily available or posted by the instrument. For simple pieces of equipment the SWP should be included, and easily identifiable, in the Standard Operating Procedures (SOP - instructions for use).

## 6. Reference Personnel

All changes to this document shall be referred to the Departmental Safety Committee prior to implementation.

## 7. Documentation

	Equipment register	
OHS031.6	Risk Assessment Form	<a href="http://staff.uow.edu.au/ohs/managingrisk/index.html#3">http://staff.uow.edu.au/ohs/managingrisk/index.html#3</a>
OHS160.1	Safe Work procedure template	<a href="http://staff.uow.edu.au/ohs/workingsafely/index.html">http://staff.uow.edu.au/ohs/workingsafely/index.html</a>

## ***Department of Chemistry - Equipment Register Entry***

Building No. 18/41/41a

Room No \_\_\_\_\_

Laboratory Name: \_\_\_\_\_

Academic in Charge: \_\_\_\_\_

Alternative Contact: \_\_\_\_\_

No equipment in this Laboratory (tick if applicable)

Asset Number*	Equipment Name (include manufacturer)	Model	Person in Charge Training, Maintenance	Risk Rating (circle)	Risk Assessment	SWP
				I / L / M / H	___/___/___	___/___/___
				I / L / M / H	___/___/___	___/___/___
				I / L / M / H	___/___/___	___/___/___
				I / L / M / H	___/___/___	___/___/___
				I / L / M / H	___/___/___	___/___/___
				I / L / M / H	___/___/___	___/___/___
				I / L / M / H	___/___/___	___/___/___
				I / L / M / H	___/___/___	___/___/___

\* If more than one asset number, include what you can.