Laboratory Work Risk Assessment

1. Introduction

The legislation governing **Hazardous Substances** and **Dangerous Goods** requires that all operations and experiments involving hazardous materials must have documentation showing an assessment of the risks involved and the implementation of controls to minimise exposure or chance of an emergency.

Applying the risk management approach to safety in the laboratory means completing a risk assessment of any research project or experiment before work begins. Every time a new experiment is to be carried out, a risk assessment must be performed and documented by the researcher in consultation with the supervisor. A risk assessment should identify potential hazards and determine the actions or controls required to eliminate or reduce any risks to the health of workers.

Carrying out a risk assessment for an experiment requires three simple steps:

* **IDENTIFY** the hazards and problems associated with the substances and tasks
* **ASSESS** the risk of exposure to the hazard
* **CONTROL** the risk by implementation of procedures and precautions

2. The Risk Assessment Protocol

Risk assessment involves considering the following steps when undertaking a research project:

- **Determine the scope of the project or experiment.**

  Define the purpose of the project, where, when and how will the work be done, and who will do the work. Ascertain the level of their knowledge, skills and expertise.

- **Identify the substances and processes/techniques**

  Include disposal of waste produced in this analysis.

- **Determine the potential hazards involved.**

  Gather information about the substances used and produced, whether they be solid, liquid, gas, vapour, dust, mist, or fume. Determine likely hazards by reading material safety data sheets (MSDS), label, or other technical reference. Are there other possible hazards associated with the project (electrical, radiation, ergonomic etc).

- **Evaluate the level of risk**

  Evaluation is based on your knowledge of the hazards involved and what can go wrong. Assess the risk to health associated with particular jobs or tasks using a hazardous substance. This involves considering the:-
  - nature of the potential health hazard
  - severity of the potential health hazard
  - degree of exposure, including:-
    - route of exposure (inhalation, absorption, ingestion, inoculation),
    - level of exposure
    - adequacy of control measures in minimising exposure

- **Determine the actions and controls to be taken**

  This may include precautions such as the use of special protective equipment, use of a fume cupboard, specific handling procedures, presence of a colleague whilst carrying out the procedure or any particular disposal method required.

- **Monitor and review**

The whole process should be monitored and reviewed to ensure that initial evaluation and controls were effective. Re-evaluation of the risks and controls will be necessary with changes in substances, processes and procedures.

3. Responsibilities

In a research laboratory, the School of Chemistry Laboratory Work Risk Assessment should be completed by the research worker for each new experiment undertaken. Completion of the risk assessment form plays an integral role in the preparation and design of an experiment.

The research worker should discuss the assessment with a supervisor or his/her nominated senior researcher**.** The laboratory worker must clearly print their name and the supervisor is required to sign the risk assessment form. Supervisors can be made individually liable for breaches of this requirement under the legislation. Senior research and academic staff performing experiments should discuss the risk assessment with a colleague and obtain their co-signature before proceeding.

If the risk assessment indicates that the procedure is **HIGH** risk, the Head of School must also sign the risk assessment form. If the procedure is assessed as an **EXTREME** risk both the Head of School and Dean must sign the risk assessment form.

In a teaching laboratory, the School of Chemistry Laboratory Work Risk Assessment should be completed by the course co-ordinator or the technical staff responsible for that subject. The subject course co-ordinator must approve and sign all risk assessments. Completion of risk assessments may be set as an exercise for undergraduate students, however course co-ordinators should also have completed a risk assessment archived for each experiment. The University OH&S Unit conducts a number of courses that can assist laboratory workers in risk management. These can be viewed at http://staff.uow.edu.au/ohs/training/

3.1. Definition of a "new Experiment"

A new experiment is defined as an experiment that has not been performed by the laboratory worker before in the laboratory. Initially, **all** experiments performed by the laboratory worker may be defined as **new**. However over time, minor modifications to procedures and repeated experiments will occur. These experiments can use the existing documentation or a photocopied, redated and re-initialised form.

Please note the following:

- Any modification that introduces a **new** hazardous substance constitutes a **new** experiment.
- Any modification involving a new variable bringing different risks and precautions (eg high temperature, pressure) also constitutes a **new** experiment.
- Scaling up (or a major change in the scale) the experiment does not necessarily involve the same risks and will be considered to be a new experiment.

If there is doubt fill out a new form - it only takes a short time and is time well spent, as part of the experimental planning process.

4. Filling out the Risk Assessment form

4.1. Preliminary Investigation using MSDS

Before starting an experiment, gather all the necessary information about the experiment, its design and importantly the MSDS for ALL hazardous substances involved (if possible). Remember that the product in a reaction may be both unknown and hazardous – treat it with caution, if the hazards are unclear.

A number of different avenues exist as far as locating MSDS information:

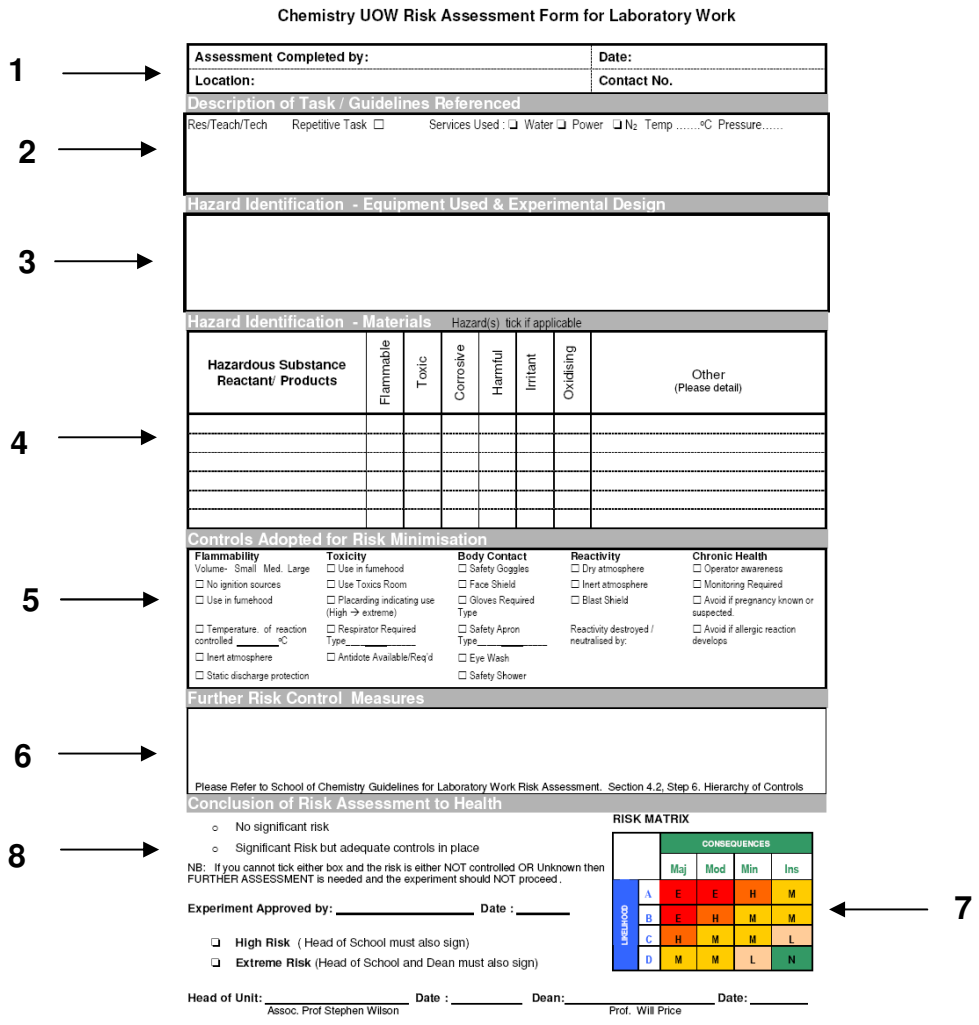
- ChemAlert - the ChemAlert system located via https://chemalert.rmt.com.au/uow/
- or from the School of Chemistry OHS webpage.
- MSDS FILE - located in each laboratory

- SUPPLIER - Many MSDS are now available on Supplier on-line databases. If a hardcopy MSDS is provided by a supplier, groups should be filing the MSDS in MSDS folders within the laboratory.

The precautions given on the MSDS should be noted on the Risk Assessment Form. These should include any specific procedures to be followed in case of spillage or accident as well as particular risk controls, precautions and equipment used. Note that the use of Class 1 carcinogens is only allowed in specially designated isolated carcinogen labs and will require approval from WorkCover.

4.2. HOW to fill out a Risk Assessment Form

The work with the hazardous substance should be divided into jobs, tasks, experiments or processes, to make the assessment process/protocol/task specific. In the School of Chemistry a single form is used to assess a laboratory experiment. It is designed to make you think about more than just the hazardous substances regulations, although this is a major part of it.



Chemistry UOW Risk Assessment Form for Laboratory Work

1 → **Assessment Completed by:** | **Date:**
Location: | **Contact No.**

Description of Task / Guidelines Referenced

2 → Res/Teach/Tech Repetitive Task ☐ Services Used : ❑ Water ❑ Power ❑ N_2 Temp .....°C Pressure.....

Hazard Identification - Equipment Used & Experimental Design

3 →

Hazard Identification - Materials Hazard(s) tick if applicable

4 →

Hazardous Substance Reactant/ Products	Flammable	Toxic	Corrosive	Harmful	Irritant	Oxidising	Other (Please detail)

Controls Adopted for Risk Minimisation

5 →

Flammability	Toxicity	Body Contact	Reactivity	Chronic Health
Volume- Small Med. Large	☐ Use in fumehood	☐ Safety Goggles	☐ Dry atmosphere	☐ Operator awareness
☐ No ignition sources	☐ Use Toxics Room	☐ Face Shield	☐ Inert atmosphere	☐ Monitoring Required
☐ Use in fumehood	☐ Placarding indicating use (High → extreme)	☐ Gloves Required Type	☐ Blast Shield	☐ Avoid if pregnancy known or suspected.
☐ Temperature. of reaction controlled _____ °C	☐ Respirator Required Type_____	☐ Safety Apron Type_____	Reactivity destroyed / neutralised by:	☐ Avoid if allergic reaction develops
☐ Inert atmosphere	☐ Antidote Available/Req'd	☐ Eye Wash		
☐ Static discharge protection		☐ Safety Shower		

Further Risk Control Measures

6 →

Please Refer to School of Chemistry Guidelines for Laboratory Work Risk Assessment. Section 4.2, Step 6. Hierarchy of Controls

Conclusion of Risk Assessment to Health

8 →

- ○ No significant risk
- ○ Significant Risk but adequate controls in place

NB: If you cannot tick either box and the risk is either NOT controlled OR Unknown then FURTHER ASSESSMENT is needed and the experiment should NOT proceed.

Experiment Approved by: _____ **Date :** _____

- ❑ **High Risk** (Head of School must also sign)
- ❑ **Extreme Risk** (Head of School and Dean must also sign)

Head of Unit: _____ **Date :** _____ **Dean:** _____ **Date:** _____
Assoc. Prof Stephen Wilson Prof. Will Price

RISK MATRIX

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

7 →

Step 1.

Assessment Completed by:	**Date:**
Location:	**Contact No.**

Enter:

- your name and location of Experiment.
- the date when the assessment was completed and if possible an out of hours and/ or work contact number.

Step 2. Description of Task / Guidelines Referenced

Res/Teach/Tech *Circle appropriate work area Research, Teaching or Technical*
Include Subject number and experiment title where appropriate

Repetitive Task ☐ *Is the same task going to be repeated? If so the same RA form can be used. However any changed in experimental conditions such as volume, temperature etc a new RA should be completed.*

Services Used : ❑ Water ❑ Power ❑ N_2 Temp …….^oC Pressure…… *Check all the services used in the task.*

- Include an abbreviated description of all processes along with the conditions of the experiment and any further services and equipment to be utilised.
- List any School Guidelines, UOW OH&S Guidelines, Legislation, Australian Standards, Codes of Practice that have been significant in the design of this experimental process. Appendix A contains some OH&S documentation with a code. This code can be entered into the risk assessment.

Step 3. Hazard Identification – Equipment Used & Experimental Design

Under this section please include all equipment used in the experiment.

- Consider what hazards are posed by, both the equipment and the experimental design. What harm can happen to people or equipment?
- What controls are already in place?
- Do you need a safe work procedure and/or standard operating procedure for the experiment or equipment?

This may also include:-

- **Hazards/First Aid/Emergency Action:** This includes special comment on whether the material is carcinogenic (known, suspected etc.), mutagenic etc. ARE SPECIAL FIRST AID MEASURES REQUIRED?
- **Complex Processes:** This includes basic as well as more technically difficult manipulations such as vacuum distillation, working under inert atmosphere, transfer of pyrophoric materials etc.

Step 4. Hazard Identification – Materials

Determine which substances are hazardous.

- An MSDS should be consulted for each of these substances to identify the associated hazards: Flammable, Corrosive, Toxic, Harmful, Irritant, Oxidising or Other.
- Hazard Ratings (Min, Low, Mod, High, Extreme) and Dangerous Goods Classifications are given on ChemAlert MSDS.
- A substance may have more than one classification.
- Include all solvents, reactants, drying agents etc.
- An experienced laboratory worker should consider the reaction mixture/products as an entity as well.
- The laboratory worker should tick or score the reagents and the chemicals.

Step 5. Controls Adopted for Risk Minimisation

In this table check the boxes, circle or comment as appropriate. In general, this section should be closely checked by your supervisor or other nominated competent person.

- **Flammability** Vol S M L This represents the volume of material being used S= Small <50 mL, M= Medium 50-500 mL and L= Large > 500 mL
- **Toxic** The lab worker should be aware of the way in which the material needs to be taken up to exhibit toxic behaviour i.e. orally, skin absorption etc.
- **Body Contact** includes materials, which are toxic through skin absorption, and materials, which are corrosive etc. The user(s) need to be aware of the different possibilities
- **Reactivity** user(s) needs to be aware of any particular reactive hazards i.e. Reacts violently with water etc.
- **Chronic Effects** relates to any potential long-term health effects. The user(s) need to be aware of all known long-term health effects.

Step 6. Further Risk Control Measures

List any control measures implemented, which are not listed above. This section can detail control measures adopted for instrumentation or equipment. This may include items such as use of instrument guards.

This section also allows for review of current controls. Are the controls implemented effective? 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
4	Engineer	Redesign an experiment, piece of equipment or process to make it less hazardous.
5	Administrative	Adopt safe work practices. Provide appropriate training, instruction or information.
6	Personal Protective Equipment	Use of lab-coat, gloves, safety glasses, safety footwear, dust masks, face shields, goggles etc.

Step 7. The 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
Major	Extensive Injury or death	> $100K	> 1week	Community alarm
Moderate	Medical Treatment	$50 - $100K	1day – 1 week	Off site impact
Minor	First Aid Treatment	$5-$50K	1 hour – 1day	On site impact
Insignificant	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

E= Extreme **H**= High **M**= Medium **L**= Low **N**=negligible

Step 8. Conclusion of Risk Assessment to Health

In consultation with the supervisor/senior colleague, the laboratory worker should make a judgement as to level of risk. The assessment may conclude one of two general things:

Simple and Obvious

If your assessment concludes that either:

(i) there are **no significant risks; or**

(ii) **there are some risks but that adequate controls are in place,**

then the experiment may be signed and authorised, and may proceed. By signing this, it is a statement that YOU and your supervisor think that the hazardous substances are already or can be readily controlled in accordance with the MSDS and there is not a significant risk to health. Fill in the details of any emergency action and list the equipment used in the experiment. The assessment is then complete.

Complex – High, Extreme or Unknown Risks that are not Controlled

If your assessment leads you to believe that either

(i) the risk of significant exposure to the hazardous substance(s) cannot be adequately controlled then you should go back and look at your experimental design, alter it and engineer such controls necessary to minimise exposure ; or

(ii) the hazards of particular substances are unknown and that you do not have sufficient information to make a judgement; then you should NOT have the experiment approved AND further assessment of the risks, and information gathering and experimental re-design is necessary.

If you are dealing with something of this nature, then you will have to carry out a detailed risk assessment, and have it submitted to the school safety committee for assessment and approval.

(iii) If the experiment is assessed as HIGH risk, the Head of School will also have to sign the risk assessment form, before commencement.

(iv) If the experiment is EXTREME risk, the Head of School and Dean will also have to sign the risk assessment form, before commencement.

Summary – Filling out the Laboratory Work Risk Assessment Form

- Fill out the introductory part of the form and the hazard identification section using the information from MSDS and other sources.
- Look at the risks identified and decide using the information available (and your chemical experience) what control measures and precautions you need to have in place in order to minimise any risks to health.
- Enter these precautions and any other notes in the appropriate sections

5. What do I do with the completed form?

On completion of the form, the original form is placed in the risk assessment holders located on the door of each laboratory. The risk assessment forms should be clearly identifiable as to whom they belong to when in the holders.

It is recommended that a copy of the original form be attached to the research worker's laboratory note-book. In this way the risk assessment form is a part of a record for that experiment. The laboratory notebook is an important record and in many cases needs to be kept by the University for archiving. Note that if the experiment poses serious risks such as high temperature or pressure then an "Experiment in Progress" sign must be located with the experiment.

If you repeat an experiment (within five years of the original assessment) you do not need to complete another risk assessment form, photocopy the original from your notebook and place in the risk assessment holder on the door.

6. Archiving and Access to assessment records

After the experiment has been completed, the original risk assessment form needs to be placed in the Risk Assessment Folder, which is located in the laboratory. Risk assessment forms are archived quarterly. Archived forms are kept in the Chemistry OH&S filing cabinet located in 18.G01.

According to Clause 171(1) of the 2001 OH&S Regulations "An employer must retain the following, as a record….

(a) all risk assessment reports indicating a need for atmospheric monitoring or health surveillance, and records of the results of any atmospheric monitoring or health surveillance – for at least 30 years after the date of the last entry in them, ……

(e) All risk assessment reports indicating that atmospheric monitoring and health surveillance is not required – for at least 5 years after the date of the last entry in them,"

The following people may have access to the assessment records: the employer; the employee; the employee's representative, which may include, a union representative, or medical practitioner; emergency personnel, and relevant public authorities; and the OH&S Unit.

7. Standard Operating Procedures and Safe Work Procedures

Standard operating procedures (SOPs) are primarily instruction sheets. If you have tasks that you or your group do regularly, involving instrumentation or equipment such as rotary evaporation then you should consider writing brief (1-2 pages) SOP for these tasks and have them available by the equipment.

Safe Work Procedures (SWPs) are an outline of the hazards and level of risk for each activity in a process. They also focus on controls that can be put in place to reduce a hazard. Templates and guidelines for writing an SWP can be found at:
http://staff.uow.edu.au/ohs/workingsafely/safeworkprocedures/index.html

The SOP and SWP can be incorporated into the same document (i.e. SWP template) if it is a simple process. A copy should be sent to the School of Chemistry OH&S Committee as these are archived on the OHS web page:
http://www.uow.edu.au/science/chem/ohs/UOW026689.html

APPENDIX A : OH&S Documentation

HAZARD OUS SUBSTANCES		
AS:337(6)		Occupational Health and Safety (Commonwealth Employment) (National Standards), 1995 No. 337, Part 6 - Hazardous Substances.
NOHSC:1008		ASCC, Approved Criteria for Classifying Hazardous Substances, 008, March 1994.
RISK ASSESSMENT & MANAGEMENT		
OHS106.8	Risk Management Guidelines	http://staff.uow.edu.au/content/groups/public/@web/@ohs/documents/doc/uow016948.pdf
	Risk Management	http://staff.uow.edu.au/ohs/managingrisk/riskmanagementprinciples/index.html
OHS060.4	Resolving an OH&S Hazard or Issue	http://staff.uow.edu.au/content/groups/public/@web/@ohs/documents/doc/uow019781.pdf
NOHSC:3017		ASCC, Guidance Note for the Assessment of Health Risks Arising from the Use of Hazardous Substances, NOHSC:3017, March 1994.
NOHSC:1005		ASCC, Control of Workplace Hazardous Substances, NOHSC:1005, 2007, March 1994.
GENERAL LAB SAFETY		
NOHSC:2012		ASCC, National Code of Practice for the Labelling of Workplace Substances, NOHSC:2012, March 1994.