OHS604

Information Sheet – Chemical Risk Assessments

The Risk Management Program (hyperlink) provides detailed information on how to conduct risk assessments. This supplementary guide focuses exclusively on factors that need to be taken into account in the risk assessment if chemicals are included in the task or activity.

In undertaking a risk assessment for a task involving hazardous substances/dangerous goods, you are trying to find out:

- How is the substance hazardous? eg. is it hazardous if :
    - swallowed or
    - breathed in, or
    - absorbed through skin, or
    - ingested.
- What are the immediate or short term health effects? (watery eyes, coughing, nausea, shortness of breath etc.)
- What are the long term health effects? (cancers, brain damage, nerve damage etc.)
- What are the target organs the substance could attack? (eg. liver, lung etc.)
- What level of exposure is hazardous? (how much of the substance over what period of time);
- What form the substance is in? (liquid, powder, pellets etc.)
- What precautions and control measures should be used?

We have seen in the risk management program that the key step in the process is to identify the hazards.

1. IDENTIFY THE HAZARD

<u>First let's look at the chemicals</u>

The first question is: 'Is your substance a hazardous substance or a dangerous good?"

Check on the following:

- the label of the container. Look for signal words such as harmful or toxic. Look for the dangerous goods class (hyperlink) symbol.
- the Material Safety Data Sheet (MSDS). The MSDS will state whether the product is "Hazardous" or "Not Hazardous" in accordance with the 'Australian Safety and Compensation Council' (formerly the National Occupational Health and Safety Commission (NOHSC)). If the product is a dangerous good it will list the dangerous goods class (hyperlink), the packaging group (except gases which don't have packing groups) and United Nations (UN) number. UN numbers are assigned by the United Nations Committee of Experts for the Transport of Dangerous Goods. They are used worldwide for the quick and consistent identification of dangerous goods and to enable prompt action in emergency situations.

Other resources for providing further information on the hazardous nature of chemicals include:

- the Hazardous Substances Information System (HSIS), a database produced by the Australian Safety and Compensation Council (ACSC)
- in NICNAS evaluations (National Industrial Chemical Notification and Assessment Scheme)

Material Safety Data Sheets (MSDS) provide the information needed to allow the safe handling of hazardous substances used at work. Valuable information such as:

- the properties of the substance;
- the toxicity;
- reactivity;
- precautions for safe use (eg. segregation from incompatible materials);
- procedures for handling;
- transporting;
- first aid and emergency;
- ventilation and
- personal protective equipment to be used

is included in the MSDS.

It is the supplier's duty to ensure that the MSDS meets the standard laid down in the latest edition of the Code of Practice for the Completion of a Material Safety Data Sheet [NOHSC:2011].

Manufacturers and importers have the responsibility for producing MSDS for all hazardous substances which they supply. Any overseas MSDS provided for use in Australia must include the relevant Australian information eg. supplier contact details and relevant occupational exposure limits.

If you are obtaining chemicals from overseas and the MSDS is from that country then forward the MSDS to the OHS unit who can arrange for it to be converted to an Australian format. It will then be made available on the Chemalert database.

Where a hazardous substance is 'manufactured' on site, the person manufacturing it becomes a supplier of that product and is required to produce an MSDS for that hazardous substance if it is supplied outside the immediate workplace.[National Code of Practice for the control of Workplace Hazardous Substances NOHSC:2007]. It is not necessary to produce a MSDS for hazardous substances which are produced and used within the workplace (eg. reaction intermediates), or for by-products, wastes or fugitive emissions. For the purposes of this program 'within the workplace' does not include unit to unit transfer within UNSW.

Employees and students (and their supervisors) must have ready access to current MSDS for the hazardous substances used. Access to MSDS may be provided by paper copy or computerised MSDS database. If you are using an electronic system for maintaining MSDS's you must be satisfied that it can cater for this ready access need. You must have a back up plan in the event of a computer or server failure.

Employees must be trained in how to access MSDS.

Suppliers are required to review and update MSDS's every five years. If you are keeping paper copies of MSDS then ensure that you re-print every 5 years.

Second: Let's inspect the workplace.

You're trying to find out:

- How are the substances used?

- How could exposure to people occur i.e. are the substances released into the work area as vapour, fumes or dust, for example; could hands or face become contaminated; could the substance be swallowed or enter the body through the skin or eyes?;
- How much of the substances are people exposed to and for how long?
- Are existing control measures being used correctly, and how well do they work?

Consider the following in your risk assessment:

THE ENVIRONMENT	THE PHYSICAL NATURE OF THE TASK
➢ Space provided: ➢ Bench & floor surfaces: ➢ Traffic: ➢ Temperature & ventilation: ➢ Lighting: ➢ Housekeeping:	➢ Repetitive actions or long duration of task ➢ Physical exertion ➢ Bending, reaching or twisting ➢ Sustained or uncomfortable posture(s)

Exposure Standards

The Australian Safety and Compensation Council (formerly NOHSC) has developed 'exposure standards'—maximum recommended concentrations in air—for a range of substances. These standards are a guide only and should only be used by qualified and experienced people. As a general rule, exposure to hazardous substances should be kept as low as possible. See *National Exposure Standards*[NOHSC:1003(1995)], along with a *Guidance Note* on their interpretation [NOHSC:3008(1995)].

2. ASSESS THE RISK

When assessing the risk...

Remember that you're assessing the risk associated with the substance *as it's actually used* (including the potential for accidents or misuse).

For example, the likelihood of suffering ill effects from using a substance which emits strong fumes (eg. Ammonia) in a well ventilated area (or inside a fume cupboard) is lower than using the same substance in a small unventilated space.

The consequences of being exposed to a hazardous substance depend on the nature of the hazard (how serious the potential health effects would be) and the number of people exposed at the same time.

Whilst the information on the MSDS caters for worst case scenario, it is the risk assessment that can provide the true picture. If you are diluting corrosive substances often they can reduce from the hazard category 'corrosive' to the less harmful 'irritant' category. Whilst elbow length PVC gloves might be identified as appropriate PPE on the MSDS for, say Phenol, your risk assessment can take into account the fact that you are using small vial size quantities and disposable nitrile gloves could well be an acceptable option.

So your risk assessment needs to consider the concentration of the substance you are using as well as the volumes being used.

The risk might be:

- *not significant* (it is unlikely that people will be harmed through exposure to the substances);

- *significant* (it is likely that people will be harmed, and control measures are needed to eliminate or minimise the risk).

A relatively simple assessment based on the MSDS is enough if the inspection shows that any risk can be, or is already, controlled in accordance with the information on the MSDS.

A more detailed assessment is required if:

- you are uncertain about the risk;
- the risk is significant;
- complex chemical processes and/or exposures are involved.

3. CONTROL THE RISK

Risk control options should be selected using the following hierarchy (ie starting with the most effective option):

1. Options which eliminate the hazard

The best option is not to use a hazardous substance at all. For example, ultrasound might be used for cleaning rather than a chemical process; or clips used as fasteners instead of an adhesive. Where substances are rarely used, but are being stored for possible future use, the school, centre or work unit should consider reducing its risk by organising for disposal of such hazardous substances.

2. Options which minimise the risk

Substitution:

⇒ Use a less hazardous substance (eg. replace chromic acid with Decal 90 for cleaning glassware; use toluene instead of benzene);
⇒ use a less hazardous process (a brush rather than aerosol);
⇒ use a less hazardous form (paste or pellets rather than a dusty powder);
⇒ Use a packing group III flammable liquid instead of a Packing group II substance;
⇒ Vacuuming dust instead of sweeping.

Isolation: Separate the process from people by distance or barriers - examples

- ❑ Have a secure facility with only authorized access;
- ❑ Separate flammable materials from sources of ignition;
- ❑ Allow remote operation of a process;
- ❑ Separate incompatible materials during storage;
- ❑ Have a designated work area within facility;
- ❑ Spill tray and/or absorbent bench coat for bench work
- ❑ Secondary containment for any transport outside facility

Engineering controls would include plant or processes which minimise the generation of hazardous substances, suppress or contain them, or limit the contamination from spills or leaks. For example:

- using fume cupboards in laboratories;
- providing a totally enclosed process for the flow of toxic gases;
- using ventilation booths for spray painting;
- having a hazardous substance weighing chamber for weighing out toxic powders.

Fume Cupboards

With regard to Fume Cupboards, 6 monthly smoke tests and face velocity testing is necessary to ensure that the fume cupboard can effectively exhaust the fumes away from the breathing zone of the operator. This testing is coordinated by UNSW Facilities Department. The test results are given to the head of the work unit and an inspection sticker is displayed on the front panel of the fume cupboard. The inspection concentrates on three major factors:

1. Overall safety inspection to ensure fume cupboard meets Australian Standard design specifications (eg. with respect to ducting, electrical components, emergency shut down etc.);
2. A smoke test (a qualitative test to provide a visual check on the operating efficiency of the exhaust system by observing the pattern of airflow);
3. A face velocity test (a method to quantitatively determine the efficiency of the exhaust system by measuring the flow rate of air passing through the fume cupboard sash opening).

Each fume cupboard will be required to be empty to safeguard the personnel involved in the testing, the integrity of the fume cupboard, as well as to ensure the accuracy of the test.

For laminar flow cabinets see the biological safety procedure. However responsibility for the inspection and testing of laminar flow cabinets remains the responsibility of the school rather than the Facilities department.

Fail Safe Design

Plant and equipment should incorporate features that prevent excessive heating or pressure or overfilling with product (eg. dewers of liquid Nitrogen). Any shut down should be to a 'fail-safe' condition. This is particularly critical with bulk tank storage. The suppliers of bulk storage tankers have a responsibility to conduct annual inspections of the tanker and make the testing certificate available to UNSW representatives. (These certificates are normally stored in a steel tube bolted to the side of the tanker).

Administrative controls

Administrative controls include having safe work procedures and safe work practices. They require people to work in safer ways. Examples of administrative controls include:

Procedures:

⇒ Having safe, standard operating procedures;	
⇒ Providing appropriate supervision;	
⇒ Providing hazardous substances training for project personnel;	
⇒ Providing local induction training and orientation;	
⇒ Having a list of authorized personnel who are allowed work in the facility;	
⇒ Excluding access for unauthorized persons;	
⇒ Having spill clean-up kit and procedures;	
⇒ Making sure hazardous waste is properly collected & disposed of;	
⇒ Providing the means for safe storage and disposal of hazardous substances;	Practices
⇒ Keeping records;	
⇒ Having hazard signposting at entry to facility;	
⇒ Making sure all containers are properly labeled;	
⇒ Providing ready access to MSDS;	
⇒ Implementing the after hours procedure to prevent lone working with high risk substances.	
⇒ Prohibiting eating, drinking and smoking in areas where hazardous substances are used or stored;	
⇒ Keeping lids on containers when not in use and when transporting within and between laboratories;	
⇒ Cleaning and decontaminating work surfaces after use;	
⇒ Removing lab coat & gloves before exiting facility;	
⇒ Hand washing before exiting facility;	
⇒ Keeping work benches and under benches and passageways clear of clutter.	

Personal Protective Clothing and Equipment (PPCE)

Where engineering controls are not a practical option or where they are insufficient on their own in reducing personal exposures to safe levels, then PPCE should be considered. It should be noted that when PPCE is required to be used, the hazardous exposure has not been controlled to safe levels.

PPCE could include:

❑ Laboratory coat or gown, closed at the front.
❑ Closed footwear
❑ Disposable, impervious gloves
❑ Respiratory protection
❑ Eye or face protection
❑ Eye wash and safety shower

The supervisor needs to make sure that the PPCE:

- is properly selected for the individual and task;
- is readily available;
- is clean and functional;
- is correctly used when required;
- meets the requirements of the Australian standards (see the list in appendix 1 of this document).

Keeping records of assessments

If there is not a significant risk to health, a note should be made in the hazardous substances register indicating that an assessment has been made.

If there *is* a significant risk, a report must be made of the assessment and kept for at least five years. If monitoring or health surveillance is required, the record of the assessment, as well as the results of the monitoring and health surveillance, must be kept for 30 years.

References

1. Useful Weblinks

The following two web sites provide useful information on hazardous substances:
The first is a link to the Australian Safety and Compensation Council (ASCC) [formerly (NOHSC)] which provides a range of useful information including many of the references used in the production of this guide eg.

- National Code of Practice for the Control of Workplace Hazardous Substances [NOHSC:2007].
- National Code of Practice for the Labelling of Workplace Substances [NOHSC:2012]
- Approved Criteria for Determining and Classifying a Hazardous Substance [NOHSC:1008]
- Exposure Standards for Atmospheric Contaminants in the Occupational Environment
- Guidance Note for the Assessment of Health Risks Arising from the Use of Hazardous Substances in the Workplace

The second is a link to the NSW Workcover site which has links to legislation and guidance notes.

2. Australian Standards

The following is a list of Australian Standards for Personal Protective Clothing and Equipment

AS/NZ 1336: Recommended Practices for Occupational Eye Protection.
AS 3765 1990:Clothing for Protection Against Hazardous Chemicals.
AS/NZS 2161: Occupational Protective Gloves.
AS/NZS 1715: Selection, Use and Maintenance of Respiratory Protective Devices.
AS/NZS 2210: Occupational Protective Footwear.

Australian Standard Series AS 2243 (1 to 10) Safety in Laboratories