
Hazardous Chemical Safety Manual



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1. Related Policy

[Work Health and Safety Policy](#)

[Work Health and Safety Management System](#)

[Hazardous Chemical Safety Procedures](#)

2. Introduction

This manual sets out the best practices when obtaining, storing, handling, using, and disposing of hazardous chemicals. This manual has been written to support the [Hazardous Chemical Safety Procedures](#)

3. Definitions

ADG Code	The Australian Code for the Transport of Dangerous Goods by Road and Rail,
Competent person	A person who has acquired through training, qualification or experience the relevant knowledge and skills.
GHS	The Globally Harmonized System of Classification and Labelling of Chemicals, published by the United Nations
Hazardous chemical register	A hazardous chemical register is a list of all chemicals used, handled, and stored in the workplace with a corresponding SDS for each listed chemical.
Hazardous chemical manifest	A hazardous chemical manifest is a summary of hazardous chemicals used, handled, and stored in the workplace with acute toxicity and physical hazards. A manifest is required when threshold amounts are exceeded, Schedule 11, Work Health and Safety Regulations 2012.

4. Emergency Information

University Security for all Emergencies (24 hours) 8201 2880

If Security cannot be contacted:

Ambulance, Fire or Police 000 (from fixed or mobile phone; and certain VoIP and satellite services)
112 (from digital mobile)
106 (Relay service for hearing or speech impaired - this service operates using a text phone (TTY))

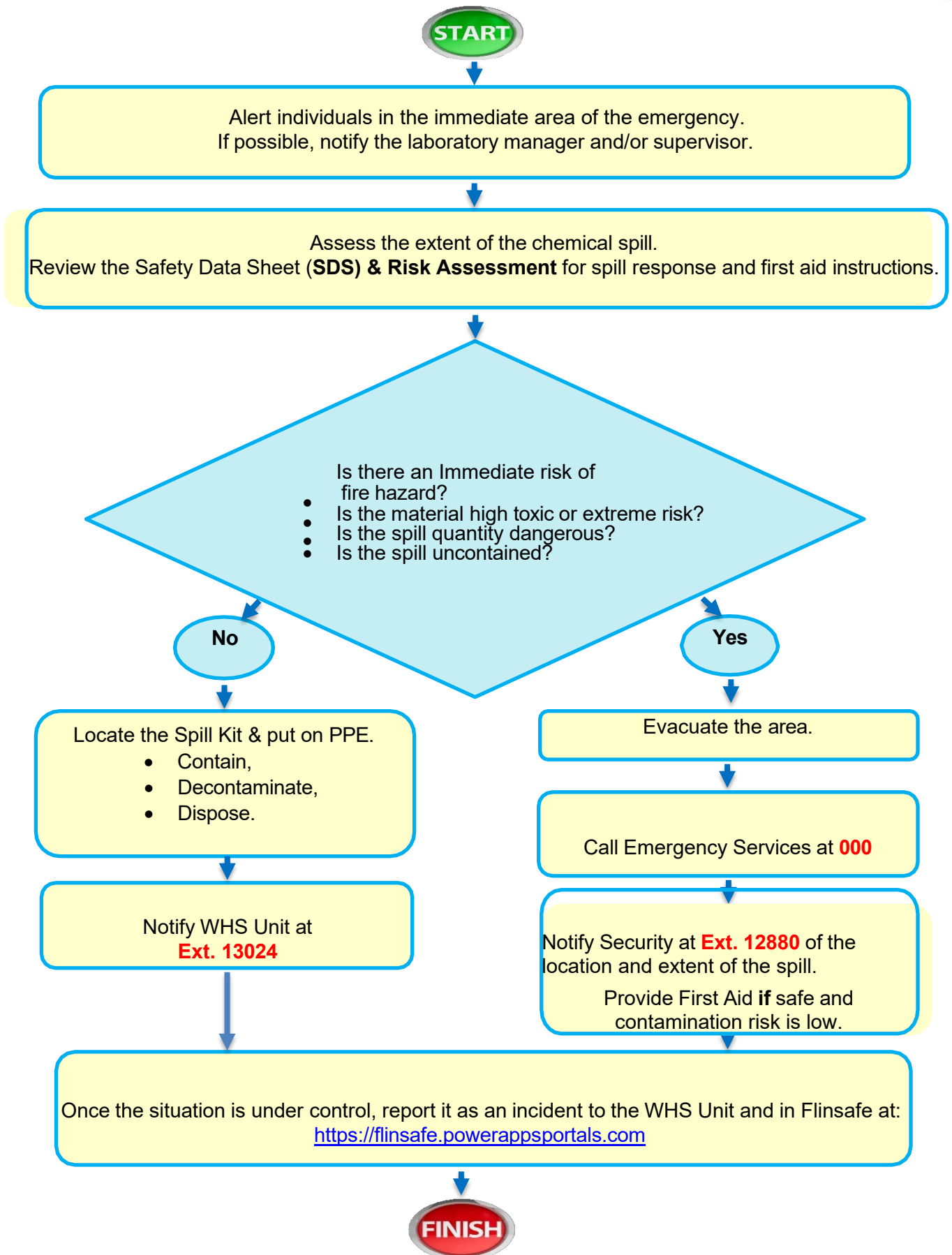
Flinders University contacts

Emergency Control Coordinator (ECC) 0421 584 470
(Team Leader, Security & Parking)

Flinders University contacts	
Security Supervisor	0431 500 861
Manager, Maintenance	0478 402 130
Assoc. Director, Work Health and Safety	0414 190 024
External Emergency Contacts	
Poisons Information	13 11 26
EPA	1800 623 445
SafeWork SA	1800 777 209

Emergency information/ procedure is also available on the University web site.

Chemical Spill Emergency Response



4.1. Chemical Spill on a Person

- **Call for help**
- **Start First Aid** - If the spill is on your body / eyes- immediately find the nearest safety shower/ eye station or drench hose and start flushing the affected part of the body.
- **Ring the Emergency Services (0) 000.** Provide the following information:
 - Your contact number
 - Location
 - Nature of Substance
 - Identify yourself
- If possible get someone to locate the Safety Data Sheet (SDS) so it can be provided to the treating medical staff.
- Ring University **Security 8201 2880** to provide back up support

4.2. Chemical Spill on floor/ fire or another emergency where not safe to use a spill kit

Remain calm. Don't panic

Stop - Access - Act

- 1 Alert people nearby and request assistance
- 2 **Ring the Emergency Services (0) 000.** Provide the following information:
 - Your contact number
 - Location
 - Nature of Substance
 - Identify yourself
3. If you need to evacuate the building then operate the nearest Break Glass Fire Alarm
- 4 Ring University **Security 8201 2880**
- 5 Keep people away from spill area if safe to do so (do not put yourself in danger)
- 6 Exit the building to your Assembly Area, or as directed by a Warden. Do not use lifts.

7. If possible get someone to locate the Safety Data Sheet (SDS) so it can be provided to the treating medical staff / Emergency Services.

8 Remain in Assembly Area until advised otherwise by a Warden.

5. Emergency Preparedness

5.1. Emergency plans

The University has an Emergency Plan that outlines the response that will be taken in an emergency.

5.2. Emergency Response Procedures

Information is available on page University web pages - [Emergency Procedures and see section 4.1, 4.2 of this manual](#)

5.3. Local Emergency Practices

Processes and equipment must be in place in the event of an emergency. Please see the [Hazardous Chemical Safety Procedures](#) for further information.

Areas which use hazardous chemicals must provide local emergency practices and training to be followed in the event of a spill or leak of a hazardous chemical, fire, explosion or other emergency:

Training for staff and students should cover:

- Location of evacuation/ exits.
- Emergency power, gas and electrical shut off buttons (where available).
- Location of spill kits and how to use them
- Location of safety showers and eye wash stations or drench hoses
- First aid facilities
- Fire extinguishers and blankets

5.4. Emergency and safety equipment

- Emergency and safety equipment must be available and have appropriate signage, including for containing and cleaning up spills.
- Equipment must be readily accessible for all workers/ students if an emergency arises.
- Equipment must be inspected and maintained in accordance with the manufacturer's instructions and relevant Australian Standards.

6. Incidents Involving a Chemical Spill

6.1. Minor spills not requiring use of spill kit.

- Sometimes minor spills will not necessitate the use of chemical spill kits i.e. they are small in nature, have not spread far and do not pose a significant risk to health or safety (refer to SDS if not sure). If these criteria are met then the worker (wearing appropriate PPE) can contain and soak up the spill with paper towels or if a solid, sweep up any loose material and transfer it to the chemical waste bag.
- Wipe the area down with damp paper towels and discard them in a waste bag or container and label with the chemical details.

6.2. General Use of a Spill Kit

Areas using chemicals in quantities where a chemical spill could occur must have access to a spill kit. There are several types of spill kits across the University, most are universal kits that can be used on a range a chemical. If a special type of spill kit is required then this must be identified in the risk assessment and that kit purchased and stored in the lab. Some chemicals require specialised treatment please see sections 34-49

Spill Kits

- When a spill is large enough to warrant the use of a chemical spill kit, - the principles are **encircle- cover and absorb - clean up and dispose**
- Call for assistance to help with the spill
- Put on PPE – including gloves, gown and safety glasses.
- If possible get someone to get a copy of the SDS from ChemWatch.
- Open the spill kit
 - Encircle the spill using absorbent booms, bags, or make a dam from powder.
 - Cover the surface and absorb with vermiculite, kitty-litter, or absorbent powder.
 - Clean-up the absorbed spill with a brush and shovel (or similar) place into the rubbish bags found in the spill kit.
 - Label the bags and dispose of as hazardous chemical waste
- **Other Considerations**
 - If broken glass is present, do not attempt to pick it up with your hands. Treat the chemical spill first before carefully cleaning up the glass with the chemical spill. The chemically contaminated broken glass should be securely wrapped in paper before being disposed of to ensure that the glass does not rip the waste bag.
 - If a flammable liquid is spilled, remove any sources of ignition from the area that can be removed safely or use the emergency shut off to cut the power. If you cannot remove some sources of ignition safely – then leave the area and follow the immediate emergency response procedure as in 4.2
 - If a fume hood is present – if possible turn on and open the sash if safe to do so to ventilate the area.

7. Incidents Involving Chemicals

- All incidents or accidents involving hazardous chemicals must be reported (in FlinSafe) and investigated in accordance with the [Accident, Incident and Hazard Reporting and Investigation Procedures](#).
- Note exposure to a chemical substance that results in the need for medical treatment within 48 hrs of exposure or an uncontrolled release, spillage or leak of a substance are considered as [Notifiable Incidents](#) and must be notified to the WHS Unit who will report this to the Regulator.

8. Hazardous Chemical Safety Duties

The University must eliminate risks arising from hazardous chemicals in the workplace, or if that is not reasonably practicable, minimise the risks so far as is reasonably practicable. Managing the risk includes ensuring the safety of all persons when using, handling, generating, storing, and disposing hazardous chemicals at the workplace. These duties include:

- correct labelling of containers, pipework, and waste
- maintaining a register and where relevant, a manifest, of hazardous chemicals and notifying the regulator of manifest quantities (see [Schedule 11 of WHS Regulations](#)) if required
- identifying risk of physical or chemical reactions of hazardous chemicals and ensuring the stability of hazardous chemicals, including any time sensitive chemicals.
- Identifying the risks to health and ensuring that where exposure standards are set, they are not exceeded.
- provision of information, training, instruction, and supervision
- accessing current Safety Data Sheets (SDSs) from the manufacturer, importer, or supplier of the chemical or via Chemwatch
- controlling ignition sources and accumulation of flammable and combustible substances
- provision of emergency and safety equipment, including spill containment and clean up systems.
- preparing an emergency plan if the quantity of a hazardous chemical exceeds the manifest quantity as specified in [Schedule 11 of WHS Regulations](#)
- stability and support of containers of hazardous chemicals
- obtaining appropriate licensing and permits where required
- provision of health monitoring to workers where relevant.

9. Risk Management

All users of chemicals need to be aware of the potential risks to their own and others' health and safety. This must be managed in accordance with the [WHS Risk Management Procedures](#), including;

- Before purchasing

- Before making, using, storing, transporting,
- generating waste, or disposing of chemicals and
- When dealing with emergencies that may arise from chemicals.

This requires that all users must:

- Identify and eliminate reasonably foreseeable hazards where reasonably practicable to do so.
- If it is not reasonably practicable to eliminate the hazard, then control measures must be implemented to minimize the risk so far as is reasonably practicable.

When identifying the risks and controls, relevant Legislation, Codes of Practice, Australian Standards, and the University [WHS Risk Management Procedures](#) and [Hazardous Chemical Safety Procedures](#) should be referred to.

10. Risk Assessment

Any chemical classified as a Hazardous Substance and/ or Dangerous Good (as detailed on the SDS), must have a completed [risk assessment](#).

The University has developed a range of [Hazardous Chemical Risk Assessment templates](#) or the risk assessment may be completed as part of a [Project risk assessment](#).

- Whichever risk assessment template is used, the assessment must determine the possible hazards of the chemical and how it will be used. The control measures required for its safe use, storage and disposal must also be considered.
- Information should be gathered from the SDS, the label, applicable legislation and Codes of Practice, licenses and permits, regulatory guides and any other relevant sources.
- If the chemical is a Non-Hazardous Substance and/ or a NON-Dangerous Good, and it is being used as per the manufacturer's instructions and controls specified in the Safety Data Sheet, are used, then no formal risk assessment is required. – Please see section for Consumer Products.

10.1. Assessing the risk

- Risk Assessments must consider both the health and physical risks associated with chemicals.
- Risk assessment and safe work procedure **must be completed before working** with hazardous chemicals referencing the SDS.
- In all cases consider;
 - Where possible **eliminate** the use of the hazardous chemical where it is not essential, or
 - **Substitute** for a less potentially hazardous material.

Use the SDS to assess the risk and complete a risk assessment with reference where applicable to the following factors:

- The nature and hazard of the chemical – health and physical risks.
- How the chemical(s) is used in the task/ process and the causes of risk.
- The quantity of chemical being used
- Who will be exposed – staff, students, cleaners etc.
- Frequency of exposure and who may be exposed
- Possible exposure routes e.g., air borne, eye/ skin contact, and any exposure standards that might apply
- Unstable physical or chemical properties
- Safe storage requirements, including quantities stored
- Foreseeable failures – e.g. loss of power
- Spills and emergency procedures
- Disposal and waste management
- If using after hours or alone or in isolation.

10.2. Controlling the risk

- Identified risks should be controlled as far as is reasonably practicable. Controls must be implemented in line with the [Hierarchy of Controls](#) and any legislative requirements.
- These controls need to be checked they are effective and documented in the Risk Assessment.
- When Risk Assessments are reviewed the controls must also be reviewed to make sure they are still effective.
- Please see section 9- Identifying and Implementing Controls for additional information.

10.3. Completing risk assessments

- Completed hazardous chemical risk assessments, including proposed risk control measures, must be authorised (signed) by the manager/supervisor (or nominee) of the person completing the risk assessment.
- The manager /supervisor or Academic supervisor must confirm by signing the Risk Assessments that they are satisfied that all reasonably foreseeable risks associated with the hazardous chemicals and processes have been identified and risks eliminated or minimised to **as low as reasonably practicable** (ALARP).
- Where there is no supervisor, then the Academic staff member responsible for the project must sign the risk assessment.

-
- Controls identified in the risk assessment must also be reflected in any associated Safe Work Procedure (SWP).
 - Risk Assessments must be reviewed every **5 years** or if there is any change in the process, controls or other factors that may change the risk.
 - Risk Assessments must be kept by the local area as per the [WHS Record Keeping](#) requirements (hard copy or electronic) and must be available to all workers or students who will use the hazardous chemicals.

10.4. Consultation

Throughout the risk assessment process, managers and supervisors must consult, so far as is reasonably practicable with:

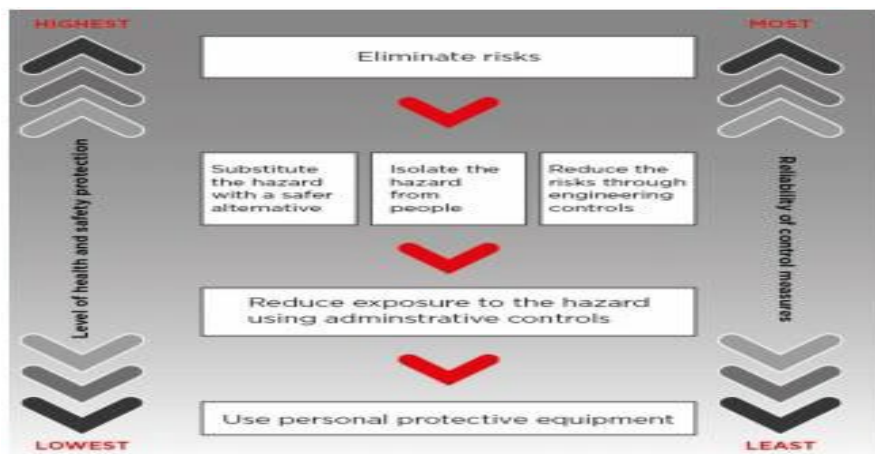
- workers who use, or are likely to use the hazardous chemical(s)
- health and safety representatives (HSR's),
- where relevant, students and other persons (e.g., University controlled entities, tenants, co-tenants, landlords).
- Consultation, cooperation, and coordination must also occur with other businesses or organisations involved with hazardous chemicals at a university workplace (for example, those who carry out deliveries or cleaning) or who share the workplace with the University (for example, in joint research or teaching facilities).

11. Identifying and Implementing Controls

The WHS Regulations require duty holders to work through the hierarchy of control measures when managing risks and further guidance can be found in the *Managing Risks of Hazardous Chemicals in the Workplace* [Code of Practice](#).

- You must always aim to eliminate the risk, which is the most effective control.
- If this is not reasonably practicable, you must minimise the risk by working through the other alternatives in the **hierarchy of controls**

The hierarchy ranks control measures from the highest level of protection and reliability to the lowest. (Refer to [Work Health and Safety Risk Management Procedures](#)):



Risk assessment and safe work procedure (SWP) must be completed before working with all hazardous chemicals and in the risk assessment you should document your control measures that you will implement. When selecting controls consider;

- Can the hazardous chemical be **eliminated** for a less hazardous chemical?
- Can the chemical be **substituted** for a safer option or a safer process e.g., wipe instead of spray?
- Can the chemical process be **isolated** e.g., glove boxes, dedicated rooms?
- What **engineering** controls can be used e.g., fume cupboard, local ventilation, automatic samplers?
- What **administrative** processes are needed e.g., Information, training, supervision, labelling, signage, air monitoring and safe work procedures?
- Provision of **personal protective equipment (PPE)** e.g. gloves, glasses, lab coats, enclosed shoes.

In many instances adequate management of the risk may require numerous levels of controls to be implemented together.

The control measures identified in the risk assessment must be checked, maintained, reviewed and if required changed to ensure as far as reasonably practical a safe work environment is maintained.

Other factors that must be considered when selecting controls are:

- Legislative and University requirements.
- Effectiveness and availability.
- Maintenance requirements.
- That additional risks are not introduced.
- Risks associated with any plant or equipment are also considered.
- Storage and disposal requirements.

- Any exposure standards are not exceeded

12. Induction, Training and Supervision

- The supervisor must provide a new worker (including students and visitors) with a Local [Work Health and Safety Induction](#) relevant for the laboratory and processes they will use in undertaking their work/ study or research.
- This induction provides an opportunity to identify any additional training that may be required.
- Adequate supervision must be provided to workers, students, and visitors to enable them to work safely with hazardous chemicals.
- Information, training, and instruction should include the following:
 - how to access Safety Data Sheets and what information they provide
 - the nature of the hazardous chemicals
 - the control measures and how to use and maintain them.
 - how to deal with emergencies, including evacuation procedures, spills and first aid provisions
 - use of personal protective equipment (PPE) and its limitations
 - any health monitoring required where relevant
 - labelling of containers of hazardous chemicals and the information the labels provide
 - Current information on risk assessments and how to complete new risk assessments
 - the work practices and safe work procedures (SWP) to be followed.
- The local area must keep training records in accordance with [WHS Record Keeping](#).
- Training must be provided by a competent person who has acquired through training, qualification or experience the relevant knowledge and skills.

13. Safety Data Sheets

Before using any chemical, a current SDS must be obtained. This can be provided directly from the supplier/ manufacturer at the time of first purchase or;

- The Chemwatch system can be used to provide access to supplier and manufacture Safety Data Sheets as well as those produced by Chemwatch.
- SDS's must be available for every hazardous chemical purchased, stored, transported, or used in university activities, including off site locations and in field work.
- SDSs must be readily accessible to workers and where relevant, students or others who use the hazardous chemicals.
- SDS sheets must be available to the Emergency Services (Fire and Ambulance) or anyone else who may be exposed or need to treat anyone working with hazardous chemicals.
- SDS sheets can be provided as a hard copy (but must no older than 5 years old) or via the Chemwatch database.

- If only electronic copies are used via Chemwatch, then all workers and students in the area must know how to access and use the system and there must be a backup means of providing the SDSs in the event of a computer, or power failure.
- The 24/7 Emergency phone number **Chemwatch is 1800 039 008** and can be used to access an SDS in the event of an emergency.

An SDS must contain certain information to comply with the WHS Regulations. The below table outlines the informational sections that are found in an SDS.

Section 1	Chemical Identification Contains the chemical identifier, contact details, manufacturer/importer details.
Section 2	Hazard(s) Identification Provides details on the potential health and physical hazards of the chemical. This information can be used to assess the risks to users, other and the environment. The SDS may present more information than the label on occasion.
Section 3	Composition and information on Ingredients This section will provide the identity and proportions of any hazardous ingredients in the mixture.
Section 4	First Aid Measures Describes the minimum first aid measures that need to be taken in case of an accident.
Section 5	Fire Fighting Measures Specific information for firefighting measures involving the chemical, including appropriate extinguishing media and protective measures.
Section 6	Accidental Release Measures Actions that need to be taken in the event of a spill or accidental release
Section 7	Handling and Storage Information on minimizing the risks for safely handling and storing the chemical.
Section 8	Exposure Controls and Personal Protection Provides information on appropriate control measures to reduce exposure, such as engineering controls or PPE.
Section 9	Physical and Chemical Properties Information provided on the physical and chemical properties such as appearance, odour, flash point and other relevant information.
Section 10	Stability and Reactivity Information on hazardous reactivity that may occur if the chemical is used under certain circumstances or used with incompatible materials.
Section 11	Toxicological Information This section mostly used by medical professionals and toxicologists outlines the toxicological properties of the chemical.
Section 12	Ecological Information Information on the ecological hazard properties of the chemical
Section 13	Disposal Considerations Information on any special requirements for disposal
Section 14	Transport Information

	Basic transport classification information such as UN number, packing groups and transport hazard classes.
Section 15	Regulatory Information Information on national regulatory information specific to the chemical such as Poisons Scheduling or any other applicable Australian prohibition, notification or licencing requirement.
Section 16	Any Other Relevant Information Relevant information to the preparation of the SDS: date of preparation, legend of abbreviations and acronyms.

14. Chemwatch GOLD FFX

Chemwatch is an online chemical database and management program. Chemwatch allows both the access and storage of Safety Data Sheets (SDS) and a means of compiling a chemical register for each area (e.g. Lab).

- [Chemwatch](#) has two levels of access: general access and a login access.

14.1. General access

Allows students and staff to access all the information within an SDS, CREDO and print labels without a login.

14.2. Login access

allows additional functions on top of the general access functions, including:

- Adding volumes and weights
- Finding inventory locations
- Printing register
- Creating and printing labels for existing chemicals or mixtures
- Using CREDO, a module that allows for mini SDS and labels to be created for mixtures or substances not common in the database.

Each area is responsible for managing their register including adding and deleting chemical SDS's (either a vendor SDS or a Gold SDS), weights/volumes, maximum quantities associated with that area's chemicals.

- Additional information on obtaining a log in or using Chemwatch is available on the [University portal](#) or by contacting the WHS Unit.

15. Safe Work Procedures

Where control measures have been identified in the risk assessment, a [Safe Work Procedure](#) (SWP) must be developed for the relevant task/ activity involving the hazardous chemical.

- The SWP should specify the controls identified in the risk assessment and details of how they are used.

- The SWP should cover use, storage, spills, transport, disposal, and any emergencies associated with the task/ process or refer to other SWP where this information may be covered.
- SWP should be reviewed every **5** years or when there are changes along with the risk assessment.
- SWP should be used in conjunction with training workers, students and others how to undertake the task safely and a record that the SWP has been read should be kept (electronic or hard copy) as per the [WHS Record Keeping](#).

16. Consumer Products

- Consumer products (e.g., household cleaners, dishwashing liquids, whiteboard cleaners) that are used in the workplace only in ways and quantities consistent with household use;
 - do not require a SDSs or risk assessments; and
 - do not need to be listed in a hazardous chemical register.
- Safety information on labels must still be present on the container and be followed.
- Labels must have sufficient information about safe use, handling, and storage of the chemical and must be available to workers, students, others, and emergency services.
- Where domestic chemicals are used in a manner or quantity different to normal household use, then these procedures must be adhered to, including obtaining SDSs to determine the level of risk to workers and the appropriate controls that need to be implemented.

17. Facility and Safety Equipment

17.1. Facilities

The requirements for laboratories/studios/workshops when working with chemicals are defined in Australian Standards for laboratory design and construction (AS/NZS 2982) and Safety in Laboratories series (AS/NZS 2243).

- Laboratories, studios, workshops, and other areas where chemicals are used must display appropriate signage at the entrance(s) stating the hazards and restricted access.
- Hand washing facilities must be provided in each laboratory.
- Personal storage and places for preparation and consumption of food and drink must be provided outside of the laboratory as **NO food or drink is to be stored or consumed inside** laboratory/ workshop areas.
- Adequate facilities to hang or store PPE in a clean and usable manner (such as adequate hooks for lab coats) must be available.
- If a new laboratory/studio/workshop is built or the facility is upgraded, it must be brought into compliance with AS/NZS 2982.1 and the AS/NZS 2243 series.

17.2. Safety Showers/ Eye Wash

- Safety shower and an eye wash station must be accessible for areas that use hazardous chemicals in a type or quantity that poses a risk.
- Safety showers and eye wash stations need to be flushed and checked regularly. Frequency can be determined by a risk assessment developed by the lab supervisor or nominee staff in each laboratory area.
- The requirements for checking and testing are covered in the [First Aid Procedures](#).

17.3. Fume hoods/ cupboards

- Fume cupboards or local exhaust ventilation must be used when working with volatile chemicals, and some other categories of hazardous chemicals.
- Where volatiles chemicals cannot be used in a fume hood then other adequate controls must be in place, and this is to be noted in the risk assessment.
- Fume cupboards must have a label on them to indicate that they have been serviced and tested and found to be working and compliant within the last 12 months.
- Fume cupboards are to be used appropriately i.e. not as storage location, air flow must not be restricted and must be appropriate type for the work – i.e. with / without a scrubber.
- Fume hoods must be used and designed in line with the Australian Standards.

17.4. Spill Kits – General Content

Chemical Spill Kit Contents.

Most general spill kits contain:

- packaged absorbent materials or loose material like vermiculite or kitty litter
- absorbent booms or pads
- chemical gloves
- dust pan and broom
- rubbish bags for disposing of the items used during the spill clean-up.

17.5. Other controls for air borne contaminants

- Controls required to be present in the facility, where identified by Risk Assessment, must be maintained, and tested as per the manufacturer requirements.
- Examples of other engineering control to manage / detect airborne contaminants include but are not limited to;
 - Local exhaust
 - Glove boxes
 - Spray booths
 - Air Monitoring / alarms e.g., Oxygen or gas monitors.

18. Personal Protective Equipment (PPE)

- PPE is anything used or worn by a person to minimise risk to the person's health and safety. PPE includes overalls, aprons, footwear, gloves, chemical resistant glasses, face shields, respirators.
- If PPE is to be used at the workplace, you must ensure that the equipment is:
 - selected to minimise risk to health and safety,
 - ensure that the equipment is suitable for the type of work (e.g. correct type of glove).
 - Is of suitable size and fit and reasonably comfortable for the worker.
- PPE must be maintained, repaired and replaced so that it continues to minimise risk to the worker who uses it, including by ensuring that the equipment is **clean and hygienic, and in good working order**.
- Information, training and instruction in the proper use and wearing of PPE must be provided.
- In most circumstances, PPE should not be relied on as a control measure. It should be used only as a last resort, when all other control measures have been used and the risk has not been eliminated or reduced as far as reasonable practicable, then PPE should be used in combination with other control measures or as interim protection until higher level controls are implemented.

19. Hygiene

Irrespective of a chemical's hazardous properties, personal hygiene is an important part of controlling exposure when handling or storing chemicals.

- Hands must be washed after using or storing chemicals and before leaving laboratory/workshop areas.
- No eating, drinking or application of cosmetics is permitted in areas where chemicals are present.
- Hair and other loose items of clothing must be kept away from chemicals.
- Avoid touching hair, face, mouth, eyes, and nose while handling chemicals.
- PPE must be kept clean – e.g. laundered lab coats.

20. Family Planning, Pregnancy and Breast Feeding

Workers/ students who are either pregnant, considering pregnancy or breast-feeding are encouraged to:

- Read these procedures and seek out any other relevant information provided on Safety Data Sheets and other sources.
- It is recommended that people inform their supervisor of their pregnancy at the earliest possible time, on the understanding that the matter will be kept as confidential as possible.

- The worker concerned is also strongly encouraged to seek advice from their health professional if they have concerns.
- In general these workers should minimise their exposure to hazardous chemicals as much as possible (especially those identified as reproductive toxins or teratogenic) and cooperate fully in any effort made to fairly and sensibly modify their duties to minimise these risks.
- They should report immediately any suspected exposure to their supervisor, WHS Staff and seek medical advice.

21. Hazardous Chemical Register

A hazardous chemical register is a list of **all hazardous chemicals** used, handled, or stored in the area.

- All areas that use hazardous chemicals **MUST** maintain a hazardous chemical register along with the current Safety Data Sheet (SDS) for each chemical using Chemwatch.
- The Register must be up to date and contain the following information:
 - Name of the chemical
 - Container size for each chemical
 - Maximum quantity
 - Supplier

The exceptions are:

chemicals that are consumer (household) products in consumer quantities or chemicals in transit.

- If Chemwatch is not accessible by workers and students in that area, then a register must be kept as hard copy. If in a hard copy format, then that hard copy should be kept in the location where chemicals are mostly used.
 - Chemical stocks and their associated registers must be reviewed and updated to make sure that any new, out of date, discontinued or unwanted chemicals are disposed of and these changes are reflected in the register. This review should occur a minimum of every **12 months**.
 - Contractors who use hazardous chemicals must keep on site at a convenient location, a copy of their register of the hazardous chemicals being used.
 - Chemical registers must be available for Emergency Services if requested.

22. Manifest

- A Chemical manifest is different from a register. A manifest is only required when specific chemicals (schedule 11 Chemicals as specified in WHS Regulations 2012) reach prescribed quantities.
- A manifest is a listing of chemicals on site and used mainly for Emergency Services.
- It is unlikely that individual areas (labs) will reach manifest quantities unless they operate a large lab with storage area. Each area with large quantities of chemicals should check with the WHS Unit to see if a manifest is required.
- Where there are manifest quantities of hazardous chemicals then the University must prepare and maintain a manifest of such hazardous chemicals and make it available to Emergency Services.

23. Purchasing Chemicals

- Before purchasing chemicals through the appropriate channels as set by the individual Colleges, workers must obtain the SDS, and prepare a risk assessment covering required controls that will be needed to handle the chemical safely. e.g. will a fume cupboard or intrinsically safe electrical equipment be needed.
- Anyone who purchases chemicals is responsible for checking if they are classified under any of the following categories, which require specific permits to be held and have regulatory and record keeping requirements that must be met.
 - Controlled Substances
 - Dangerous Substances
 - Prohibited and Restricted Carcinogens
 - Chemicals of Security Concern, including Security Sensitive Ammonium Nitrate
 - Prescribed or Precursor Chemicals
 - Safeguards Materials

Chemicals in the above list must not be purchased or obtained via personal means but must go through the relevant College's/ University purchasing procedures.

24. Permits and Licences

24.1. Storage licence

The University holds a licence for the storage of Class 3, 6 and 8 Dangerous Substances on the Bedford Park and Tonsley site. Local areas must notify the WHS Unit if there is any change to the storage location or a significant change in the quantities of these goods. See section 27 (Storage) for information.

24.2. Export and import of chemicals

Areas which import or export chemicals (including Nano materials) may be required to obtain a licence and must check with the [Australian Industrial Chemicals Introduction Scheme](#) (AICIS).

24.3. Register of permits and licences

- Where permits or licences are required for certain types of hazardous chemicals, controlled substances or explosive materials, staff must advise the WHS Unit.
- The WHS Unit maintains a register of permits issued to the University and its staff, detailing the permit number, expiry date and staff approved to use the substance(s) concerned.

25. Labelling

All hazardous chemicals, including those produced either directly or as a by-product in the University, must be classified and labelled in accordance with the following;

- [Code of Practice *Labelling of Workplace Hazardous Chemicals*](#)
- [Globally Harmonised System \(GHS\) of classification and labelling of chemicals](#)
- University's [Hazardous Chemical Safety Procedures](#).
- Manufacturers and suppliers must only supply chemicals that are correctly labelled in English, have an Australian supplier or manufacture identified, with all required hazard statements and pictograms present and correct for the classification of the chemical.
- When a hazardous chemical is transferred or decanted from a supplier's container and is not used immediately, the container must be labelled in accordance with the [Code of Practice](#).
- Labels with appropriate hazard statement and hazard signage (pictogram) can be generated by Chemwatch for decanted materials.
- Re-used containers must have the old label removed or totally covered with the new label.
- Food and beverage containers (e.g., drink bottles, jars) must **NEVER** be used for chemical storage.
- Hazardous chemicals contained in an enclosed system (e.g., a pipe or piping system) must be identified by a label, sign, or markings on the pipework in accordance with *AS 1345-1995 Identification of the contents of pipes, conduits, and ducts*.
- Waste containers containing hazardous chemicals must have appropriate labels including:
 - Written in English.

- Product identifier (name or CAS number)
- Required hazard statements and pictograms.

(See section 31 for further information on waste management)

26. Globally Harmonised System (GHS) versus Australian Dangerous Goods (ADG) classification systems

Hazardous chemicals need to be labelled in accordance with two classification systems. These systems and the conditions they apply to are outlined below:

Australian Dangerous Goods (ADG) classification applies to road and rail transportation of dangerous goods. The ADG Code is referred to in the *WHS Regulations 2012*, for manifests and placarding purposes.

Globally Harmonised System (GHS) classification applies to the use, handling, and storage of hazardous chemicals in the workplace. At the point delivery has been accepted into the workplace, GHS labelling is required for all applicable containers. GHS labels can be generated via Chemwatch.

27. Storage

27.1. Dangerous Goods

The University holds a licence for the storage of Class 3, 6 and 8 Dangerous Substances on the Bedford Park and Tonsley site.



- Dangerous Good Class helps identify how chemicals need to be segregated during storage and transport.
- The University has strict limits and quantities of each Dangerous Goods class that it can hold within each area and its sites overall. These limits are imposed under its license conditions.
- Local areas must notify the WHS Unit if there is any significant change to the storage location or quantities of these goods from what is indicated on their Chemwatch register.
- Refer to the Guidelines for the [Storage](#) and [Segregation](#) of Hazardous Substances in Laboratories and Workshops for storage volumes.

27.2. General Storage Principles

All chemicals must be stored in accordance with the requirements specified in the SDS and, where applicable, with any other highlighted conditions such as permit stipulations.

- Chemicals are NOT to be stored in offices.
- Chemicals should not be stored on the floor. Where this cannot be avoided, the chemical must be stored in a bunded tray and in a manner so as not to pose a risk.
- Chemicals should not where possible be stored above 1.5m high.
- Quantities of chemicals in storage should be kept to a minimum and chemicals no longer required should be disposed of promptly.
- All out-of-date chemicals must be disposed of periodically to reduce the overall risk potential and stocks should be reviewed on an annual basis to prevent build-up of chemicals in areas.
- All chemicals stored must be maintained in Chemwatch, the chemical register (except Consumer Products).
- Fume cupboards should not be used to store chemicals.
- Ensure all containers are of good condition and labelled.
- To reduce the risk of contamination, liquids of any kind should not be stored above solids.
- Liquids should be stored as low as possible on shelving to reduce the risk of breakage and spillage.

27.3. Dangerous Goods Cabinets

General

- Do not store bottles on floor of the cabinet, the bottom shelf must sit level with the top of the bund.
- Cabinets used for storage shall be compatible with the chemical per class type i.e., toxic, flammable, corrosive, oxidising.
- Signage shall be displayed on cabinet door as per class type.
- Cabinets must be in good condition including, but not limited to, self-closing doors, close fitting doors, free from rust that compromises integrity of cabinet etc.

Cabinet Locations

- Should be a minimum of 3m away from emergency exits.
- Should not be closer than 3m to ignition sources.
- If the above cannot be met then a risk assessment must be completed to determine appropriate controls to be in place.

Ventilation

- Cabinet ventilation should not normally be required unless determined as an essential risk control measure.
- Cabinet ventilation is not an alternative to vapour tight closure of all stored containers.
- If ventilation is an essential risk control measure (such as could be in the case for volatile, extremely toxic, or corrosive substances), the cabinet shall be vented in accordance with the type of cabinet Class and Australian Standards.



CLASS 4 DANGEROUS GOODS STORAGE CABINET 100L 2 DOOR, 1 SHELF

PRODUCT CODE: 5535AC4

27.4. Maximum Quantities in Chemicals Store

Stored quantities must not exceed permissible amounts. Refer to the Guidelines for the [Storage](#) and [Segregation](#) of Hazardous Substances in Laboratories and Workshops for permitted volumes of 'in use' and 'in storage.'

- Local areas must maintain a record of their maximum quantity amounts they hold in their labs in their Chemwatch register.

27.5. Placarding

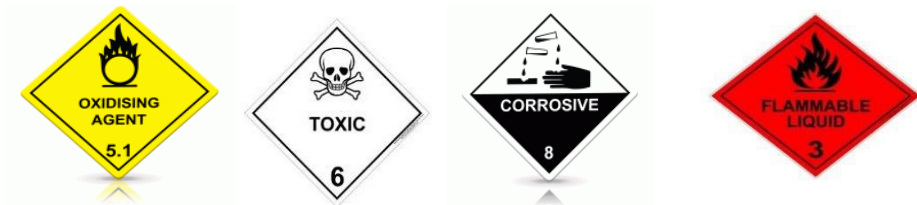
Placarding is a sign or notice displayed in a prominent place, or next to a container or storage area for hazardous chemicals at a workplace, that contains information about the hazardous chemical stored in the container or storage area

Placarding must be displayed when an area has hazardous chemicals amounts that are above placard quantities as specified in WHS Regulations or [Code of Practice](#).

28. Incompatibility and Segregation of Chemicals

Hazardous chemicals should be physically separated from any chemicals or other things (such as ignition sources) that may be incompatible and may result in an uncontrolled dangerous situation. This can often be achieved by distance, barriers, or a combination of both.

Chemicals must be adequately segregated as per the University's. Guidelines for the [Storage](#) and [Segregation](#) of Hazardous Substances in Laboratories and Workshops.



Summary information about Incompatibility & Segregation

28.1. Flammables

- With flammables the possibility of fire or explosion being caused by an ignition source must be managed.
- When storing flammables in refrigerators/freezers/cold-room, it is required that an intrinsically safe laboratory refrigerator/freezer/cold-room be used.
- Flammable solids (DG Class 4) are generally non compatible with flammable liquids, the SDS must be consulted.
- Temperature can affect the hazards associated with flammables- especially those with lower explosive limits (LEL).
- Information on safely storing and segregating flammable liquids is available in *AS 1940: The storage and handling of flammable and combustible liquids*.

28.2. Oxidising

- Oxidisers (DG Class 5) are generally not compatible with any other Class and in some cases may not be compatible with its own Class; the SDS must be consulted and storage.
- Chemical oxidisers can also react violently and unexpectedly with many other materials such as organic material (for example, wood, paper, cellulose products) and many common hydrocarbon solvents.

28.3. Toxics

- Storage areas shall be secured against unauthorised entry where toxic chemicals (DG Class 6) are stored.
- Schedule 2, 3, 4, and 7 substances must be stored in locked cabinets.

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- Toxic gases in cylinders must also be secured.

28.4. Corrosives

- Corrosive substances and mixtures can be either alkaline or acidic and these two categories are incompatible and should never be stored together due to the potential for harmful reactions.
- Some reactions of acids and alkaline chemicals can be highly exothermic and rapidly generate large amounts of gas, causing an explosion risk.
- Eyewash and safety showers should be readily accessible where corrosives are handled or transferred.

28.5. Temperature Sensitive Chemicals

- Must be stored in a refrigerator/freezer connected to back up power. Please consult the SDS for further information on storage requirements.

28.6. Time Sensitive Chemicals

- Some 'time sensitive chemicals' stored for prolonged periods of time may develop hazards that are not present with newer chemicals if e.g., picric acid; these must be risk assessed and controlled. Date of purchase and use must be maintained.

28.7. Cytotoxic Chemicals

- Cytotoxic drugs/chemicals must be stored in an area with limited access. These storage areas, including refrigerators, must be clearly marked and identifiable to users.
- Storage locations should minimise the chance of breakage and contamination.

28.8. Intrinsically Safe Fridges/Freezers

It is essential that when storing flammables in refrigerators/freezers, that they are intrinsically safe.

Intrinsically safe refrigerators/freezers can be purchased.

- Domestic refrigerators/freezers are not designed to be intrinsically safe as they include thermostats, lights, and electric fan motors.
- Internally intrinsically safe: means that any ignition sources are removed from the internal component of the refrigerators/freezers and located on the outside of the unit.

- Domestic refrigerators/freezers may be modified. If modification occurs, a **certificate of compliance** must be provided and kept on record and the refrigerators/freezers must have a sign stating that it has been modified.
- Fully intrinsically safe: means that both the internal and external ignition sources are removed. This is required when the external atmosphere may be explosive.
- Signage: refrigerators/freezers must clearly indicate whether they are modified and therefore appropriate for flammable storage or not appropriate for flammable storage.

28.9. Miscellaneous - Security

- Most licensed, prohibited, and restricted carcinogens, schedule chemicals or those classified as chemicals of security concern must be stored in a secure and lockable storage unit.
- Registers of use and disposal must also be kept.

29. Record Keeping

The following records must be maintained and kept up to date for work with hazardous chemicals by the local area using the chemicals:

- Risk Assessments
- Safe Work Procedures
- Licences as applicable
- Use and disposal records where required by licensing conditions.
- Records must be kept in accordance with [WHS Record Keeping](#)
- Records must be made available to the WHS Unit upon request

30. Health Monitoring

Health monitoring occurs to identify changes in workers' health as a precaution when the worker may be exposed to certain hazardous chemicals that they are working with.

Health monitoring is not a replacement for control measures and safe work practices that need to be in place.

- Health monitoring must be provided to a worker or student carrying out ongoing work that involves using, handling or storing hazardous chemicals and where a significant risk to the worker's or student's health has been identified because of potential exposure to hazardous chemicals specified in the WHS Regulations – see [WHS Regulations 2012 \(schedule 14\)](#):

- Health monitoring may also be required for other [Hazardous Chemicals Requiring Health Monitoring](#) in addition to those above in point 1.
- To determine if health monitoring is required there needs to be a significant risk to health with the availability of an appropriate and valid test method. Your General Practitioner should be consulted if you have concerns.
- To determine whether there is a significant risk to the health of a worker, student or other, the following factors should be considered and recorded via the risk assessment:
 - the level of toxicity (classification of chemical e.g., carcinogen, the form of the substance e.g., dust or fume and the route of entry e.g., inhalation, absorption)
 - the likely level and frequency of exposure during work activities
 - the types of processes used to handle the chemicals at work.
 - the control measures in place.
- Colleges/Portfolios are responsible for the costs relating to the health monitoring of a worker or student in their area.

31. Waste Management

- Areas should regularly review their chemicals and make sure that any unwanted or out of date chemicals are disposed of.
- The correct method of disposal of any chemical waste generated must be included in the relevant Safe Work Procedure (SWP).
- When a staff member, visitor or research higher degree student leaves the University permanently, they must ensure that all chemicals under their control are disposed of correctly, unless transference to another staff member has been agreed.
- All changes of chemical stock held on site due to disposal must be updated on the Chemwatch chemical register to reflect the disposal or new transferred location.
- Any materials purchased under a scheduled licence must be disposed of when the licence holder leaves the University and a record kept of that disposal.

31.1. Disposal

Responsible staff must ensure that:

- a. Chemical waste is labelled and stored as appropriate for the hazard, including hazard warnings on labels and segregation.
- b. Chemical waste is removed by an operator licensed by the relevant authority (EPA).
- c. The licensed operator is provided with a waste manifest.
- d. The licensed operator must provide the University with a waste transport certificate (WTC).
- e. A copy of the WTC is kept by the University via the electronic EPA tracking system or a hard copy is to be provided.

32. Chemical Use on Field trips

32.1. Field Work

Staff and students must make sure that all chemicals used on field trips are transported, stored, used, and disposed of in a safe manner. This may require extra care in packing, instruction and/

or training, the use of bunding, carrying a spill kit and PPE and making sure the chemical is label with appropriate signage.

Quantities used in the field must be kept to a minimum and an SDS for the chemicals must be available in the field and during transport.

This information must be included in the field trip risk assessment and Safe Work Procedures (SWP). Information should be sourced from the Safety Data Sheet (SDS).

32.2. Transport

Transporting of hazardous chemicals by vehicle is not recommended. If chemicals need to be transported then it is recommended that a courier company specialising in transporting chemicals is used.

Note - There are legislative requirements around the transporting of chemicals – see *Australian Code for the Transport of Dangerous Goods by Road and Rail* and there may also be Insurance implications.

Some hazardous substances must not be transported in domestic vehicles, such as:

- Liquid nitrogen
- DG Class 1 explosives and 2 compressed gasses
- Regulation 25 or
- Prohibited and restricted carcinogens.

32.3. Transporting cryogenic

Transporting of cryogenic substances in a vehicle must be risk assessed.

A generic risk assessment and SWP for the *Transport Of Cryogenic Substances By Vehicle/ Road* can be referred to and modified for the activity that is been undertaken – see [Hazardous Chemical Safety web page](#).

33. Chemicals Requiring Special Permits

Certain chemicals require additional controls in storage, handling, security and disposal due to their hazardous nature. This information is to be included in the hazardous chemical risk assessment.

33.1. Chemicals Schedule 2, 3, 4, and 7

University Research Instruction, Training or Analysis Permit

The University has a *Research Instruction, Training or Analysis Permit* which allows the University to manufacture, produce, possess, and use Schedule 2, 3, 4, and 7 substances. The permit is site (campus) specific.

The permit requires the University to comply with the following conditions:

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- The poisons must not be re-sold or supplied to any other person.
 - The University holder shall store these poisons, when not in use, in suitable containers, appropriately labelled, in a locked receptacle or enclosure.
 - The poisons shall not be kept elsewhere other than at the premises specified.
 - Access to the poisons shall be restricted to the permit holder who is University staff, or students under their supervision.
 - The poisons shall be used in accordance with guidelines prepared by or under the direction of the University.
 - A record indicating the quantity of each poison manufactured, produced, received, used, or destroyed during the currency of this permit must be kept by the area that obtained the chemical and made available to the WHS Unit when requested.
 - The University must comply with the Department of Health ***Suspected Theft or Loss of Drugs or Substances from Licence or Permit Holders***
Staff using these substances must comply with these conditions. To breach the conditions of the University's licence is an unlawful act, which would result in a loss of licence and the University's ability to purchase and hold these types of substances.
 - Scheduled chemicals are outlined by the Poisons Standard (SUSMP) but can also be identified by the SDS either under Section 2 - Poisons Schedule or by Section 15 Regulatory Information.

33.2. Controlled Substances (scheduled drugs and poisons) and Regulation 25

- Scheduled drugs and poisons require special permits for possession and use.
- Determination of a scheduled drug or poison can be sought by reviewing 'Poisons Schedule' under Section 2 Hazard Identification of the SDS or via SA Health's, Standard for the Uniform Scheduling of Medicines and Poisons.
- All Regulation 25 poisons must be registered with the WHS Unit as these are reported on annually to SA Health with the permit renewal.

33.3. Individual Permits for Schedule 8 and 9 Substances

- Any staff member requiring Schedule 8 and 9 Substances for research purposes must apply for an individual permit from SA Health. This permit allows the holder to purchase specified substance(s) in specified amounts and may include (if requested by permit holder) other persons that are allowed access to the named substance(s).
- A copy of the permit and any variation and annual renewals must be provided to the WHS Unit.
- A permit issued to a person is not transferrable. Where a staff member or a research higher degree student leaves the University and the substance is not disposed of, a new permit must be applied for by the new person responsible for that substance.
- Permit conditions must be followed- including any security, storage, record keeping and disposal requirements.

-
- All processes of storage, handling, disposal, and record keeping can be audited by the WHS Unit to ensure compliance.

33.4. Chemicals of Security Concern

Chemicals of Security Concern are a list of chemicals that can be used in the making of homemade explosives and toxic weapons. There are ninety-six chemicals that have been assessed as a potential security concern and fifteen chemicals that are assessed as being a high-risk security concern. These chemicals are listed in the [Chemicals of Security Concern](#)

Where areas have any of the chemicals identified by the Australian Government as chemicals of security concern, the [Chemicals of Security Concern](#) whilst a voluntary code, it addresses minimum measures for safe handling, managing or storing of such chemicals and each area should consider the requirements under this code and implement any necessary controls.

Any loss or theft should be reported immediately to the WHS Unit who will inform the area Manager, SafeWork SA and the South Australian Police Department.

SPECIFIC CHEMICAL HANDLING INFORMATION



34. Specific Chemical Information

The below chapters provide more detail and specific advice on a range of chemicals that pose high physical or health risks if not handled appropriately.

35. Cryogenics e.g., liquid nitrogen and Dry Ice

Cryogenic substances are liquefied or solidified gasses that are kept in their liquid or solid state at very low temperatures. Some associated hazards include asphyxiation, cold contact burns (both touch and vapour) and explosion from expanding vapours.

35.1. Liquid nitrogen

- **Training/documentation**
 - Users must be trained, by a competent person, in procedures for safe use of material including the transferring of liquids between Dewar's.
 - Safety training checklist must be signed off by trainee and trainer.
 - Training provided should reflect the needs of the individual user and the exposure to risk. Consideration should be given to:
 - Role and Previous experience and level of education of user
 - Specific responsibilities and handling
 - Training should cover safe use, handling, storage, and disposal.

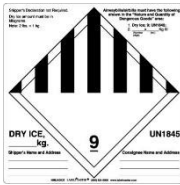
- **First aid**
 - Cold burns – flush affected area with tepid water, apply non-stick dressing and seek medical attention.
 - Remove clothing that liquid nitrogen has come into contact with BUT Do not remove clothing that has frozen to skin, but flush with tepid water.
 - If a person displays abnormal responses in breathing, pulse, blood pressure, cognitive function, or level of consciousness, move to fresh air if it is safe to do so - seek first aid and call Emergency services.

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- Asphyxiation – it is not safe to enter an oxygen-deprived space. Call emergency services for immediate assistance.
 - **Handling (signage, PPE)**
 - PPE must be available and used whenever working with liquid nitrogen or within a room containing large liquid nitrogen Dewar's – insulated cryogenic gloves, eye protection (or face shield), enclosed shoes, lab coat.
 - Never use in confined spaces – including inside closed vehicle cabins.
 - In laboratories where there is minimal ventilation, only small quantities may be used.
 - Ventilation should be utilised when working with significant amounts of nitrogen gas.
 - Never place cryogenic substances in a sealed container where gases cannot escape – as the substances warms, it reverts to its gaseous state, causing expansion and a build-up of pressure within the container. This pressure could result in an explosion.
 - Only use containers designed to hold cryogenic substances (e.g., use Dewar flasks – do not use domestic thermos flasks)
 - Use the appropriate containers and tools designed for use with liquid nitrogen, such as cryogenic vials for storage of samples (NOT standard or screw-cap Eppendorf tubes).
 - Filling tasks should be undertaken only by trained and competent persons.
 - **Spillage**
 - In the event of a spill, evacuate and ventilate the room, allowing the gas to dissipate. Do not re-enter until it is safe to do so.
 - A small spill may result in oxygen deprivation – do not enter an oxygen-deprived space. Call emergency services for immediate assistance.
 - A large spill in an enclosed room with no ventilation poses a serious risk of asphyxiation. The room must not be entered, evacuate immediately and emergency services and Security must be called.
 - **Storage**
 - Where large amounts of liquid nitrogen are stored or used indoors, a risk assessment must be conducted and documented to ascertain requirement for low oxygen alarm and any other safety measures that may be required.
 - **Transporting**
 - The hazards of transporting liquid nitrogen include asphyxiation due to oxygen depletion.
 - Liquid nitrogen must never be transported inside closed vehicle cabins. A utility or vehicle with a separate cab must be used.
 - Transport requires the goods to be packaged in accordance with [Australian Code of Transport for Dangerous Goods](#) and this includes making sure that the containers are appropriate for the content and labelled.
 - Lift use – people must not travel in lifts where Dewar's are being transported. Signage and protocols must ensure that the lift is 'locked out of service' while transporting liquid nitrogen.
 - **Disposal**
 - Unused liquid nitrogen should be allowed to dissipate in a fume hood.

- Liquid nitrogen must not be poured down sinks or drains.

35.2. Cryogenics - Dry Ice

- **Training/documentation**
 - Users must be trained, by a competent person, in procedures for safe use of dry ice.
- **First aid**
 - Cold burns – flush affected area with tepid water, apply non-stick dressing and seek medical attention.
 - Do not remove clothing that has frozen to skin, but flush with tepid water.
 - Asphyxiation – it is not safe to enter an oxygen-deprived space. Call emergency services for immediate assistance
- **Handling (signage, PPE)**
 - PPE must be available and used whenever working with dry ice – insulated cryogenic/thermal gloves, eye protection (or face shield), enclosed shoes, lab coat.
- **Spillage**
 - If spilled, dry ice will sublimate to carbon dioxide. Ensure appropriate ventilation until this has occurred.
 - Do not handle without appropriate PPE
- **Storage**
 - Never place cryogenic substances in a sealed container where gases cannot escape as the dry ice warms, it reverts to its gaseous state, causing expansion and a build-up of pressure within the container. This pressure could result in an explosion.
 - Only use containers designed to hold cryogenic substances (e.g., Styrofoam esky)
 - Always store in a well-ventilated area to minimize carbon dioxide build up.
- **Transporting**
 - The hazards around transporting cryogenics include asphyxiation due to oxygen depletion.
 - Large quantities of dry ice must never be transported inside closed vehicle cabins. A utility or vehicle with a separate cab must be used. Small quantities may be transported inside a vehicle if it can always be well ventilated.
 - Dry ice should be transported in a foam esky.
 - Consider using a portable oxygen monitor.
 - Transport requires the goods to be packaged as in accordance with Australian Code of Transport for Dangerous Goods and this includes making sure that the containers are appropriate for the content and labelled.
- **Disposal**
 - Let unused portions of dry ice sublime in a well-ventilated room or fume hood.



Example of Transport signage required

- More information about cryogenics can be found on SafeWork SA web page - [Dry ice and cryogenics | SafeWork SA](#)

36. Cyanides



Cyanides are highly toxic, preventing oxygen transfer from the blood to body tissue, causing damage to the heart and nervous system. Cyanide poisoning can occur via inhalation or ingestion.

- **Training/documentation**
 - Users must be trained, by a competent person, in procedures for safe use of cyanides.
 - Safety training checklist must be signed off by trainee and trainer.
 - Training provided should reflect the needs of the individual user and the exposure to risk. Consideration should be given to:
 - Role and Previous experience and level of education of user
 - Specific responsibilities and handling
 - Training should cover safe use, handling, storage, and disposal.
- **Handling (signage, PPE)**
 - Cyanides must only be used in a fume cupboard.
 - Signage must be placed at the entrance to the lab and on the fume cupboard to indicate that cyanide is in use.

- Ensure that any PPE used is in accordance with the SDS, including appropriate gloves and respirators, lab coat and closed shoes.
- Use a buddy system to ensure no one is working alone with cyanide.
- After use, all surfaces and equipment that were in contact with cyanide must be neutralised using a concentrated Sodium hypochlorite solution.
- **First aid**
 - You must be mindful that Cyanides require specific first aid, which includes but is not limited to:
 - **Immediately calling 000 and Security**
 - Flushing of contacted areas with large amounts of water
 - Removing the casualty from contaminated area, ensuring first-aider is not placed at risk.
 - If breathing stops, **do not use direct mouth to mouth** ventilation due to risk of contamination. Instead use a resuscitation bag and valve mask. The first aider must ensure that they do not inhale the expired air of the casualty.
 - No matter how fast the recovery, all casualties should be taken to hospital for further treatment and monitoring.
 - Mild symptoms can include irritation of nose and mouth, headaches, weakness, shortness of breath.
 - Severe symptoms can include gasping for breath, loss of consciousness, seizures, cardiac arrest, and fatality.

Note- Amyl Nitrate is not held on site – you must advise emergency services if you suspect Cyanide poisoning.

- **Spillage**
 - Consult the SDS for specific procedure for spill clean-up and use an appropriate spill kit as identified by the risk assessment.
 - Small spillages can be cleaned up using sodium hypochlorite.
 - Prevent spillage from entering drains including clean up material.
 - For large spills or for a spillage outside of the fume cupboard, evacuate the area **immediately and call Emergency Services on 000** and Security.
 - Full PPE must be worn to access area with the aim of
 - Preventing further release of cyanide
 - Attendance to casualties
 - Preventing spillage from entering drains
 - Treat spillage area with sodium hypochlorite solution which will deactivate any traces of cyanide.
 - All material from both the spill and clean up must be disposed of as hazardous waste.
- **Storage**
 - Cyanides must be stored in a locked toxic cabinet with minimal access.
 - Do not store near acids or oxidising agents.
 - Ensure minimal amounts are purchased and stored, with date of purchase written on container.
 - Packages must be inspected regularly, and any damaged or deteriorated containers segregated and disposed of immediately.
- **Disposal**
 - All cyanide waste must be neutralised so that free CN⁻ and/or HCN is not present.

- All waste containers must be labelled “Cyanide Waste” as containers may still present a chemical hazard/danger when empty.

37. Acetonitrile (Methyl cyanide)

Acetonitrile is a toxic, colourless liquid, aromatic, water soluble solvent that is very flammable as a liquid and vapour and produces cyanide vapour on acidification.

- **Training/documentation**
 - Users must be trained, by a competent person, in procedures for safe use of cyanides.
 - Training provided should reflect the needs of the individual user and the exposure to risk. Consideration should be given to:
 - Role and Previous experience and level of education of user
 - Specific responsibilities and handling
 - Training should cover safe use, handling, storage, and disposal.
- **Handling (signage, PPE)**
 - Must only be used in a fume cupboard.
 - Ensure that any PPE used is in accordance with the SDS, including appropriate gloves and respirators, lab coat and closed shoes.
 - After use, all surfaces and equipment that were in contact with acetonitrile must be neutralised using a concentrated Sodium hypochlorite solution.
- **First aid**
 - Before commencing work, you must be mindful that acetonitrile requires specific first aid. Please review section 36 on cyanides for further information on first aid.
 - If suspect exposure call **Emergency Services on 000 immediately**.
- **Spillage**
 - Consult the SDS for specific procedure for spill clean-up and use an appropriate spill kit as identified by the risk assessment.
 - Clean up immediately, ensuring all ignition sources have been removed.
 - Wear appropriate PPE, avoiding contact with skin and eyes or breathing in vapours
 - Contain and absorb small quantities with vermiculite or other absorbent material. Collect residues in a waste container, segregated as flammable
 - Wipe up.
- **Storage**
 - Must be stored in a locked toxic cabinet with minimal access.
 - Reacts violently with oxidising agents and is incompatible with acids.
 - Ensure minimal amounts are purchased and stored, with date of purchase written on container.
 - Packages must be inspected regularly, and any damaged or deteriorated containers segregated and disposed of immediately.
- **Disposal**
 - Empty containers may still present a chemical hazard when empty.
 - All waste containers must be labelled “**acetonitrile waste**” as containers may still present a chemical hazard/danger when empty.

38. Cytotoxic Chemicals



Cytotoxic drugs are highly toxic to cells, mostly inhibiting the ability of cell reproduction. Many are also considered to be carcinogenic, mutagenic, or teratogenic. Long term effects of prolonged or frequent exposure are unknown.

Note- Many cytotoxic are also Prohibited or Restricted Carcinogens and workers must be authorised before use.

The SDS can be used to determine cytotoxicity by the following sections:

- *Section 1 Identification of the substance: Relevant identified uses of substance or mixture and uses advised against by;* paragraph will begin with 'Antineoplastic agent'.
- *Section 7 Handling and Storage – Precautions for safe handling;* paragraph will contain 'Antineoplastic agent/cytotoxic'.

Additional information on use, storage and disposal can be sought from SA Health's [Cytotoxic Drugs and Related Waste](#)

- **Training/documentation**
 - Users must be trained, by a competent person, in procedures for safe use of cytotoxic chemicals.
 - Training provided should reflect the needs of the individual user and the exposure to risk. Consideration should be given to:
 - Role and Previous experience and level of education of user
 - Specific responsibilities and handling of cytotoxic chemicals.
 - Training should cover safe use, handling, storage, and disposal.
- **First aid**
 - Immediately flush skin and eyes with copious amounts of water if contact occurs.
 - Remove all contaminated clothing and PPE, disposing in a cytotoxic waste bin.
 - Seek medical review.
- **Handling (signage, PPE)**
 - PPE must include lab coat, nitrile, or latex gloves (double gloved), eye protection and closed shoes. Further guidance on PPE including preparatory protection to be obtained from the SDS.
- **Spillage**
 - Consult the SDS for specific procedure for spill clean-up and use an appropriate spill kit as identified by the risk assessment.
 - Spills must be dealt with immediately.

- People within the immediate vicinity should be warned to stay clear.
- Appropriate PPE must be worn when cleaning up spills.
- Seek first aid and Security assistance if required.
- All material from the spill and the clean-up must be disposed of in a designated **Cytotoxic waste bin**.
- **Storage**
 - Prevent unauthorised access to storage area.
 - Storage areas, including refrigerators, must be clearly marked and identifiable to users.
 - Storage locations should limit the chance of breakage and limit the risk of contamination.
 - Ensure minimal amounts are purchased and stored, with date of purchase written on container.
 - Packages shall be inspected regularly, and any damaged or deteriorated packages segregated and disposed of immediately.
- **Disposal**
 - All cytotoxic waste is hazardous to human and environmental health. Cytotoxic waste must be segregated from other waste streams.
 - Waste must be placed in designated **purple bags and/or containers, labelled 'Cytotoxic Waste'** and placed in a secure designated **purple cytotoxic bin**.
 - SDS and risk assessment must be consulted for safe disposal procedures.
 - Empty containers may still present a hazard so should be disposed of in Cytotoxic bin.

39. Explosives / Energetics



Explosives and energetics are reactive substances that contain a great amount of potential energy that can produce an explosive reaction under certain conditions.

- **Site Permit**
 - The University has a Site Licence for Premises to keep Explosives not exceeding **30g**.
- **Permitted users**
 - All users must also have a permit to purchase that must be renewed annually.
 - Personal permit copies must be provided to the WHS Unit where Register of users must be kept by the university.
 - A log of quantities purchased, used, and disposed of must be maintained.
- Risk assessment and safe work procedure must be completed before working with Explosives / Energetics referencing the SDS.
 - Where possible eliminate the use of the material where it is not essential, or
 - Substitute for a less potentially hazardous material
 - Ensure sure that static, if applicable, will also be controlled in the lab environment.

- **Training/documentation**
 - Users must be trained, by a competent person, in procedures for safe use of Explosives / Energetics.
 - Training provided should reflect the needs of the individual user and the exposure to risk with SWP to be signed by user. Consideration should be given to:
 - Role of user and Previous experience and level of education of user
 - Specific responsibilities and handling
 - Training should cover safe use, handling, storage, and disposal.
- **Handling (signage, PPE)**
 - Ensure that any PPE used is in accordance with the SDS.
 - Containers, tools, and equipment must be compatible for use with the substance.
 - SDS must be consulted for further information on reactivity to other substances.
- **Spillage**
 - Small spillages need to be cleaned up immediately and in accordance with the SDS.
 - If appropriate, use spill kit/sorbent to absorb the material, collecting all contaminated materials and placing in appropriate container, disposing of according to safe disposal procedures.
 - Never wash material down the drain
 - In the event of a larger spill, evacuate area immediately and call security and emergency services.
- **Storage**
 - Explosives / Energetics must be kept in a specialised locked explosive cabinet.
 - Unauthorised access to storage area must be prevented.
 - A log of quantities purchased, used, and disposed of must be maintained.
 - Ensure minimal amounts are stored.
 - Packages shall be inspected regularly and any damaged or deteriorated.
 - Any loss or theft should be reported immediately to WHS Unit and SAPOL.
- **Transporting**
 - As per regulations
- **Disposal**
 - Any unused amounts after projects are finalised must be disposed of according to permit conditions.
 - SDS and risk assessment must be consulted for safe disposal procedures.
 - Empty containers may still present a hazard so should be disposed of appropriately.

40. Gas Cylinders

There are various types and sizes of gas cylinders. Consult the SDS for the specific gas for control measures.

Asphyxiant gases: Some gases such as nitrogen, carbon dioxide etc. can displace oxygen in a room. Appropriate ventilation must be ensured and recorded in a risk assessment. Contact the WHS Unit for guidance on oxygen depletion calculations.

Storage compatibility: Ensure minimum separation distances between incompatible gases such as Class 2.1 Flammables i.e., methane and Class 2.2 Oxidisers i.e., oxygen. See Section 27

The class of gas defines its physical properties which may define additional requirements for storage, handling, use and transport. Refer AS 4332:2004 for specific details on storage and handling requirements.

Class of Gas

2.1 Flammable gas

2.2 Non-flammable, non-toxic gas

2.2 Sub risk of 5.1 Oxidising gas

2.3 Toxic gas

- **Training/documentation**
 - Users must be trained, by a competent person, in procedures for safe use of gas, including securing gas cylinders, ventilation requirements, cylinder valves and regulator, moving cylinders etc.
- Risk assessment and safe work procedure must be completed before working with any gas, referencing the SDS. The risk assessment and SWP should consider the following.
 - Where possible eliminate the use of the gas where it is not essential, or
 - Substitute for a potentially less hazardous material. If not possible, consider higher order controls specific to the hazard profile of the gas such as gas detection sensors, appropriate segregation from incompatible chemicals or ignition sources.
 - Purchase the smallest gas cylinder that is adequate for the job.
 - A spark arrestor fitted in the flow line from a regulator may be considered as an extra layer of control against back flow of flame in the event that the gas ignites in the supply line.
 - Handling and transport of cylinders and correct PPE.
- **First aid**
 - Refer to SDS.
- **Handling (signage, PPE)**
 - Cylinder contents should be identified by the information on the affixed label including the Dangerous Goods class and not necessarily by the cylinder colour.
 - Cylinder valves and regulators must be in good working order and inspected regularly.
 - Ensure that the correct regulator type for the gas cylinder is selected and fitted and ensure the correct thread orientation before screwing onto cylinder.
 - Where indicated by a date tag or stamping, regulators and braided lines should be replaced on or before the date indicated or as per manufacturer's instructions and, in any case, for a period not exceeding 5 years (AS 4839.2001)
 - Valves should only be opened with a regulator attached and opened slowly. Valves should otherwise remain closed when the gas is not in use.
 - Do not use or allow oil, grease, sealants or dusts on cylinder valves.
 - Keep cylinders away from high heat sources.
 - Ensure adequate ventilation for the gas in use (consult the SDS)
 - A gas leak testing procedure must be in place when cylinders, regulators and line fittings are changed over. Other joints such as those at taps or junctions should be tested periodically. See AS 4839.2001 for a gas leak testing protocol.
 - Wear eye protection and enclosed shoes must always be worn.

- Consider additional appropriate PPE as stated by the SDS and SWP.
- **Accidental Release**
 - Immediate evacuation must occur, informing security and emergency services.
 - Refer to the SDS for further information for emergency procedures.
- **Storage**
 - Storage of cylinders inside a building should be avoided wherever possible.
 - Most gas cylinders are designed to be stored in an upright position.
 - Gas cylinders should be restrained/chained securely to a wall, including when empty.
 - Gas cylinders should not be stored on trolleys.
 - Ensure flammable gas cylinders are stored away from ignition sources.
 - Store in location where physical damage to the cylinder is unlikely to occur.
 - Close off the valve to the cylinder when not in use.
 - Ensure minimal numbers of gas cylinders are purchased and stored, and empty cylinders or those no longer required returned to the supplier promptly.
 - Store empty cylinders separate from full cylinders. Where possible, full cylinders should be stored outside of the room until changeover.

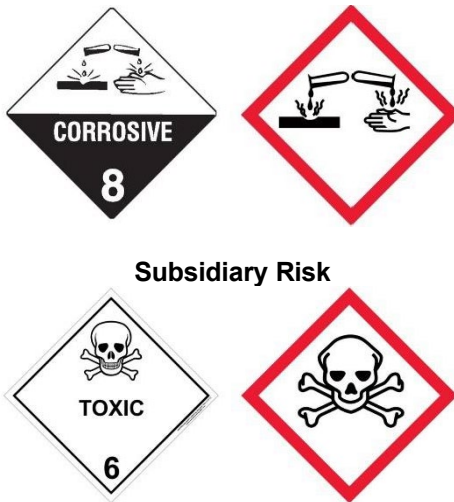


- **Transporting cylinders on site**
 - Do not lift or carry cylinders.
 - Gas cylinders should be moved upright, using an appropriate trolley with a restraining strap.
 - Valve protection should be in place. Valve should be closed when transporting.

41. Hydrofluoric acid

Hydrofluoric acid (HF) is a liquid or gas which is a corrosive and toxic acid that can cause serious burns and even death. The fluoride in HF enters the bloodstream, trapping calcium and magnesium, which leads to heart, muscle, and nervous system damage. Breathing in HF can damage lung tissue, causing swelling and fluid accumulation in the lungs. Where possible, eliminating the use of HF or substituting it with a less hazardous substance is preferred.

Primary Risk



- **HF Emergency Kit:** Due to the hazardous nature of Hydrofluoric acid, a specialised kit that covers both spillages and first aid must be kept in the work area. The contents must include no less than:
 - Neoprene gloves
 - Calcium gluconate gel (must not be past expiry date)
 - Calcium carbonate powder
 - Brush and scoop
 - Plastic bags labelled HF waste.
 - Goggles
 - HF safety data sheet
 - Spill procedure



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- Risk assessment and safe work procedure must be completed before working with HF, referencing the SDS.
 - Where possible eliminate the use of HF where it is not essential, or
 - Substitute for a less potentially hazardous material.
 - Training/documentation
 - Users must be trained, by a competent person, in procedures for safe use of HF.
 - Safety training checklist must be signed off by trainee and trainer.
 - Training provided should reflect the needs of the individual user and the exposure to risk. Consideration should be given to:
 - Role of user
 - Previous experience and level of education of user
 - Specific responsibilities and handling
 - Training should cover safe use, handling, storage, and disposal.

- **First aid**

There is strong evidence that HF can cause serious injury by inhalation, swallowing once or minor contact to skin/eyes, causing irreversible damage to organs. As pain may be delayed for up to 24hrs, treatment must occur immediately, no matter how minor the contact is.

A first aid plan must be organised before commencing work with HF, which includes, but is not limited to, the following:

- **Immediately call 000** to ensure transport to hospital and call university Security.
- Flush contacted areas with large amounts of water for at least 15mins and apply Calcium gluconate gel which must be readily available.
- Contaminated clothing and/or contact lenses must be removed and not put back on.
- Remove the casualty from contaminated area, ensuring first-aider is not placed at risk.
- Appropriate PPE must be worn in accordance with the SDS, including appropriate elbow length gloves, chemical goggles, a full-face shield, and respirators due to inhalation exposure.
- If breathing stops, do not use mouth to mouth ventilation due to risk of contamination. Use a resuscitation bag and valve mask.
- All incidents involving HF must be reported via the University WHS incident reporting system FlinSafe.

- **Handling (signage, PPE)**

- HF must only be used in a designated work area which excludes non-essential workers from using the space.
- The work area must have a fume cupboard.
- Ensure there is a safety shower and eye wash in the laboratory where being used.
- HF should be used in a fume cupboard and never in an open laboratory.
- HF should be purchased in less concentrated forms to avoid handling concentrated acid.
- Ensure that any PPE items are in accordance with the SDS, including appropriate elbow length gloves, chemical goggles, and a full-face shield if there is the risk of being splashed and wearing of trousers or overalls outside of boots, to avoid spills entering boots.

-
- Double Neoprene or Nitrile gloves must always be worn whilst handling HF. Latex gloves are not to be used. See SDS for further information on suitable gloves for differing concentrations.
 - Never work alone or after hours whilst handling HF.
 - To avoid violent reaction, always add material to water, never water to material.
 - Ensure signage is placed to indicate that HF is in use. Sign must indicate 'dangerous' and 'warning'.
 - Neutralise equipment and surfaces with saturated calcium carbonate before leaving the laboratory.
 - HF reacts with glass so must never be stored in glass vessels and equipment. The use of chemically compatible containers such as those made from polyethylene or Teflon are to be used.
 - SDS must be consulted for further information on reactivity to other substances.
 - A record of use must be maintained.
- **Spillage**
 - Consult the SDS for specific procedure for spill clean-up and use an appropriate spill kit as identified by the risk assessment.
 - Spills must be dealt with immediately.
 - Small spillages in a fume cupboard may be managed by a competent person wearing suitable PPE.
 - People within the immediate vicinity should be warned to stay clear.
 - Seek first aid and Security assistance if required.
 - HF can be neutralised by covering with calcium carbonate, leaving for 24hrs to allow for a reaction then using absorbent materials to clean up. Ensure appropriate safe disposal methods are followed.
 - All material from the spill and the clean-up must be disposed of as hazardous waste.
 - Large spills (greater than 50ml) should be contained using a spill kit, then the area evacuated, and the alarm raised **call 000 for emergency services/Security**.
 - **Storage**
 - HF reacts with glass so must never be stored in glass vessels and equipment. The use of chemically compatible containers such as those made from polyethylene or Teflon are to be used.
 - HF should sit in secondary containment and bunding.
 - HF must be stored in a secure, locked, cool, dry, and well-ventilated location away from sources of heat.
 - Storage incompatibility includes:
 - Most metals, glass, and other siliceous materials
 - Oxidisers
 - Organics
 - Acids
 - Ceramics
 - Alkalis
 - Various other materials: consult the SDS for further information.
 - Ensure minimal amounts are purchased and stored.
 - Packages shall be inspected regularly with any damaged or deteriorated packages segregated and disposed of immediately.
 - Storage areas, including refrigerators, must be clearly marked and identifiable to users.
 - Storage locations should limit the chance of breakage and limit the risk of contamination.

- **Transporting**
 - As per SDS,
 - Transport between store and facility must be in a double contained vessel, with appropriate controls in place inclusive of a spill kit.
- **Disposal**
 - Disposal should be in line with training.
 - Materials used for neutralization of HF with saturated calcium carbonate solution must always be collected in closable plastic containers with signage and labelling of contents and disposed of as HF hazardous waste.
 - Empty containers may still present a hazard so should be disposed of as HF hazardous waste.
 - HF waste should never be disposed of down the drain and only placed in appropriate containers.
 - Any contaminated items e.g., PPE must be double bagged and labelled before being disposed of via the chemical waste system.

42. Nanomaterials

Nanomaterials, which is the precise engineering of materials at an atomic, molecular, and super molecular scale has in recent years raised concerns for possible health and safety implications.

Whilst the effects of nanomaterials are largely unknown there is supporting documentation that highlights concerns that nanomaterial can get into the body via skin, lungs and digestive system affecting nervous systems, suppressing immunity and possible long-term damage to the lungs and brains.

When working with nanomaterials read the literature on the material to be used. If there is limited information, adopt a precautionary principle where health implications are not yet known.

Further information can also be found in Safe Work Australia's [Engineered Nanomaterials – an update on the Toxicology and Work Health Hazards 2015](#)

Risk Control:

- Where possible eliminate the use of nanomaterials where it is not essential
- Substitute for a less potentially hazardous material
- Review current literature and risk assess the nanomaterial and the effects it can have on health; some nanomaterials such as carbon nanotubes are potentially more dangerous than others with research suggesting they may have carcinogenic properties.
- Minimize exposure by wearing PPE, such as respirators, gloves, and eye protection, and by using a fume cupboard.

43. 2-Mercaptoethanol (β -Mercaptoethanol)

Is a clear, colourless liquid with an unpleasant odour (like that of gas) that acts as an enzyme reactivator in inhibited systems and is used to dissociate proteins. 2-Mercaptoethanol is corrosive, flammable, and toxic. It can be fatal if inhaled or ingested and will rapidly absorb through skin.



- Risk assessment and safe work procedure must be completed before working with 2-Mercaptoethanol, referencing the SDS.
 - Where possible eliminate the use of 2-Mercaptoethanol where it is not essential, or
 - Substitute for a less potentially hazardous material
- **Training/documentation**
 - Training should cover safe use, handling, storage, and disposal.
 - Training provided should reflect the needs of the individual user and the exposure to risk. Consideration should be given to:
 - Role of user and previous experience and level of education of user
 - Specific responsibilities and handling
- **First aid**
 - Eyes - eyes must be irrigated for at least 15 minutes then medical treatment must be sought.
 - Skin – Quickly but gently wipe material off skin with a dry clean cloth. Immediately remove all contaminated clothing. Flush area for at least 15 minutes then medical treatment must be sought.
 - Inhalation – remove from contaminated area. Breathing may be affected, seek medical treatment without delay.
 - Ingestion – Do NOT induce vomiting. Rinse mouth with water and seek medical attention.
 - Review the SDS for additional first aid procedures.
- **Handling (signage, PPE)**
 - Never allow clothing that is wet with material to stay in contact with skin.
 - Fume cupboards should always be used to aid ventilation.
 - When equipment is used, careful design and assembly must occur to ensure gases to not leak out. Refer to the SDS for further information.
 - Containers should be kept closed as much as possible when not in use.
 - PPE is specified by the SDS but includes chemical protective gloves, safety glasses with side shields or chemical goggles, lab coat and enclosed shoes. A risk assessment may identify other required PPE to be worn such as full-face shield.
 - If splashes occur on gloves, they should be immediately changed.
 - The SDS must be consulted for further information on reactivity to other substances such as leather and contact lenses which may absorb and concentrate irritants.
- **Spillage**

- Never use dry, powdered hypochlorite or other strong oxidizer for mercaptan spills as auto-ignition can occur.
 - Consult SDS for specific procedure for spill clean-up and use an appropriate spill kit as identified by a risk assessment.
 - Small spills – remove ignition sources, clean up immediately, avoid breathing vapours, contact with skin and eyes.
 - Large spills - evacuate area, raise the alarm, and wait for emergency services/Security. Full body PPE and breathing apparatus is required for large spill clean-up.
 - Never allow material to enter drains as it is very toxic to aquatic life.
 - All material from the spill and the clean-up must be disposed of as hazardous waste.
 - Seek first aid and Security assistance if required.
- **Storage**
 - Storage incompatibility includes – alkali metals, strong oxidisers, strong acids, hydrogen sulphide.
 - Store in a sealed secondary container in a well-ventilated area
 - Packages shall be inspected regularly with any damaged or deteriorated packages segregated and disposed of immediately.
 - Storage locations should limit the chance of breakage and limit the risk of contamination.
 - **Transporting**
 - As per SDS,
 - Transport between buildings must occur in secondary containment, preferably a polyethylene or other non-reactive acid/solvent bottle carrier.
 - **Disposal**
 - SDS and risk assessment must be consulted for safe disposal procedures.
 - Empty containers may still present a hazard so should be disposed of appropriately including segregation and appropriate labelling.

44. Organic Peroxides (Class 5.2)



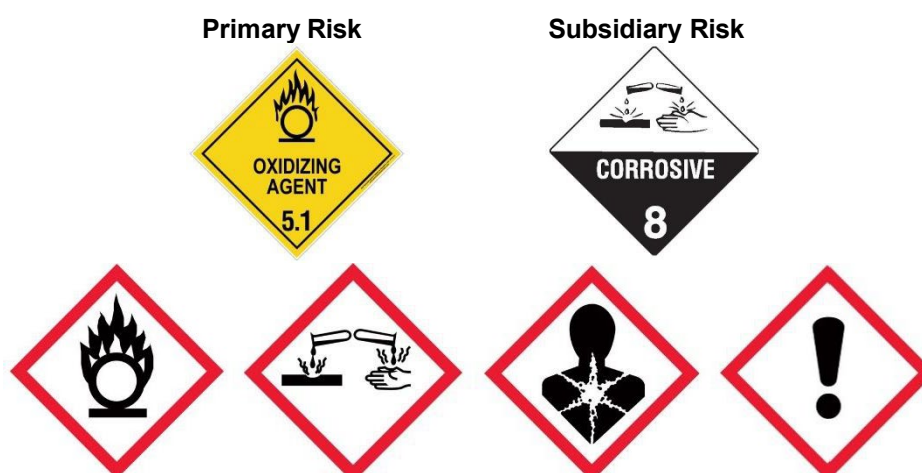
Organic peroxides can be extremely unstable, including thermally and sensitivity to impact or friction. This may result in exothermic self-accelerating decomposition. In addition, organic peroxides may be liable to explosion, burning, cause eye damage and react dangerously with other substances or heat. It is important to read the SDS for the substance intended to be used for specific information on its requirements for storage, use, disposal, and reactivity to other substances.

- **Training/documentation**
 - Users must be trained, by a competent person in identifying organic peroxides, their properties and hazards as outlined by the SDS.
 - Training should cover safe use, handling, storage, and disposal.

-
- Training provided should reflect the needs of the individual user and the exposure to risk. Consideration should be given to:
 - Role and previous experience and level of education of user
 - Specific responsibilities and handling
 - **First aid**
 - Eyes - organic peroxides can cause corneal damage after contact so eyes must be irrigated for at least 15 minutes then medical treatment shall be sought.
 - Review the SDS for additional first aid procedures specific to the substance in use.
 - **Handling (signage, PPE)**
 - Fume cupboards should be used to aid ventilation.
 - PPE will be specified by the SDS but may include PVC gloves, safety glasses or chemical goggles, lab coat and enclosed shoes. A risk assessment may identify other required PPE to be worn such as full-face shields or respirators.
 - Containers, tools, and equipment must be compatible for use such as glass, porcelain, and some grades of plastics. Incompatible materials may include steel, copper, brass, or alloy metals e.g., spatulas for weighing.
 - The SDS must be consulted for further information on reactivity to other substances.
 - Containers, tools, and equipment must be thoroughly cleaned leaving no residue.
 - Dilution of organic peroxides must occur as per the instructions in SDS to avoid violent reactions.
 - **Spillage**
 - Consult SDS for specific procedure for spill clean-up and use an appropriate spill kit as identified by a risk assessment.
 - Large spills - evacuate area, raise the alarm, and wait for emergency services/Security.
 - Spills must be dealt with immediately, as per the SDS and the risk assessment.
 - People within the immediate vicinity should be warned to stay clear.
 - Appropriate PPE must be worn when cleaning up spills.
 - All material from the spill and the clean-up must be disposed of as hazardous waste.
 - Seek first aid and Security assistance if required.
 - **Storage**
 - Organic peroxides should be stored at the correct temperature as outlined in the SDS.
 - Ensure minimal amounts are purchased and stored, with date of purchase written on container. Organic peroxides should not be stored for more than 1 year.
 - Segregate organic peroxides from all incompatible substances.
 - Where storage in a refrigerator is required, either to maintain chemical stability or for experimental requirements, the refrigerator must be intrinsically safe i.e., no internal ignition sources) and must be on backup power.
 - Storage areas, including refrigerators, must be clearly marked and identifiable to users.
 - Cabinet designs must be according to the AS 2714-2008 and shall include:
 - Self-closing and close-fitting door with either friction type or magnetic type lock to release pressure inside cabinet.
 - Non plastic (e.g., metal) catches and hinges.
 - Cabinets must be ventilated (AS 2714-2008: Clause 4.5.2).

- Packages shall be inspected regularly with any damaged or deteriorated packages segregated and disposed of immediately.
- Storage locations should limit the chance of breakage and limit the risk of contamination.
- **Transporting**
 - As per SDS,
 - Transport between store and facility must be in a double contained vessel, with appropriate controls in place inclusive of a spill kit.
- **Disposal**
 - Class 5.2 chemicals shall be packed separately, and temperature stability must be maintained whilst waiting for disposal.
 - Contact the waste organiser for the safest methods of storing organic peroxide waste until it is picked up.
 - SDS and risk assessment must be consulted for safe disposal procedures.
 - Empty containers may still present a hazard so should be disposed of appropriately.

45. Perchloric Acid and its Perchlorate salts



Perchlorates can be unstable and decompose explosively and may act as an oxidizer when heated and will react violently when water is added to concentrated acid.

- **Training/documentation**
 - Users must be trained, by a competent person, in procedures for safe use of perchlorates.
- **First aid**
 - Refer to SDS.
- **Handling (signage, PPE)**
 - Concentrated solutions above 73% and anhydrous acids are unstable. Perchloric acid in lower concentrations may behave as a strong but non-oxidizing acid, however, will become an extreme oxidant with elevated temperatures. Perchloric acids are not compatible with certain materials, including, but not limited to, wood, metals, alcohols. The SDS must be reviewed for all incompatible materials.

- PPE must be worn in accordance with the SDS.
- Perchloric acids **MUST ONLY** be handled in a fume cupboard that has been engineered for use of perchloric acid. Some vapours may form perchlorates in the ductwork which can be shock sensitive and potentially explosive and therefore need to have scrubbers.

See examples of fume cupboard labels below to look for:



- **Spillage**
 - Small spillages must be cleaned up immediately with avoidance of contact with any organic matter, fuels, solvents, sawdust, paper, or cloth as ignition may result.
 - Consult the SDS for specific procedure for spill clean-up and use an appropriate spill kit as identified by the risk assessment.
 - Spills must be dealt with immediately, as per the SDS and the risk assessment.
 - People within the immediate vicinity should be warned to stay clear.
 - Appropriate PPE must be worn when cleaning up spills.
 - All material from the spill and the clean-up must be disposed of as hazardous waste
 - Seek first aid and Security assistance if required.
- **Storage**
 - Perchloric acids must be stored in fireproof cabinet with no other classes as is unstable in the presence of incompatible materials.
 - Pressure may develop in containers, open carefully, check and vent 6 monthly.

- Do not allow to dry out.
- Perchloric acid that has darkened and formed crystals has a high potential of explosion and must not be touched as it is may be unstable and sensitive to shock.
- Ensure minimal amounts are purchased and stored, with date of purchase written on container.
- Packages shall be inspected regularly with any damaged or deteriorated packages segregated and disposed of immediately.
- Prevent unauthorised access to storage area.
- Storage areas, including refrigerators, must be clearly marked and identifiable to users.
- Storage locations should limit the chance of breakage and limit the risk of contamination.
- **Transporting**
 - As per SDS,
 - Transport between store and facility must be in a double contained vessel, with appropriate controls in place inclusive of a spill kit.
- **Disposal**
 - SDS and risk assessment must be consulted for safe disposal procedures including segregation and appropriate labelling.
 - Empty containers may still present a hazard so should be disposed of appropriately.

46. Peroxide Forming Chemicals

Peroxide forming liquid chemicals are susceptible to violent reactions when exposed to air and sometimes catalysed by light and heat.

- Risk assessment and safe work procedure must be completed before working with this substance, referencing the SDS.
 - Where possible eliminate the use of the material where it is not essential, or
 - Substitute for a less potentially hazardous material such as a material that does not form peroxides

There are three general categories of peroxide forming chemicals, each category has a level of risk for reaction and must be managed in a certain way. It should be noted that there are additional chemicals, other than these three categories, that are potential peroxide formers, and this information can be gained from the SDS or the manufacturer.

Class A - Severe Peroxide Hazard		
Spontaneously decompose and become explosive when exposed to water in the air		
Butadiene	Divinyl ether	Sodium amide
Chloroprene	Isopropyl ether	Tetrafluoroethylene
Divinyl acetylene	Potassium amide	Vinylidene chloride

Class B - Concentration Hazard Spontaneously decompose and becomes explosive upon concentration		
Acetal	Dicyclopentadiene	Methyl cyclopentane
Acetaldehyde	Diethylene glycol dimethyl ether	Methyl isobutyl ketone
Benzyl alcohol	Diethyl ether (ether)	4-Methyl-2-pentanol
2-Butanol	Dioxanes	2-Pentanol
Cumene	Ethylene glycol ether acetates	4-Penten-1-ol
Cyclohexanol	Furan	1-Phenylethanol
Cyclohexene	4-Heptanol	2-Phenylethanol
2-Cyclohexen-1-ol	2-Hexanol	Tetrahydrofuran (THF)
Decahydronaphthalene (decalin)	Methylacetylene (gas)	Tetrahydronaphthalene
Diacetylene (butadiene, gas)	3-Methyl-1-butanol	Vinyl ethers

Class C – Shock and Heat Sensitive Hazard Spontaneously decompose and become explosive when exposed to shock of heat		
Acrylic acid	Chlorotrifluoroethylene (gas)	Vinylacetylene (gas)
Acrylonitrile	Methyl methacrylate	Vinyladiene chloride
Butadiene (gas)	Styrene	Vinyl chloride (gas)
Chlorobutadiene	Tetrafluoroethylene (gas)	Vinyl pyridine
Chloroprene	Vinyl acetate	

- **Training/documentation**
 - Users must be trained, by a competent person, in procedures for safe use of these materials, including properties and hazards as outlined by the SDS.
 - Training should include how to safely handle, use, store and dispose of these materials and what must be done in the event of a spill.
- **Handling (signage, PPE)**
 - Visually inspect container for deterioration prior to use. Do not open container if there are signs of deterioration. Signs of deterioration include:
 - Crystallization
 - Cloudiness
 - Liquid stratification
 - String/wisp like formations



- Once used, wipe the top of the bottle to remove any remains of substance which has the potential to crystallize. If dry crystals are present in the thread of the screw top containers this may also present a detonation hazard.
- **Spillage**
 - Small spills must be dealt with immediately
 - Consult the SDS for specific procedure for spill clean-up and use an appropriate spill kit as identified by the risk assessment such as vermiculite.
 - If a large spill occurs, evacuate building and call emergency services.
 - People within the immediate vicinity should be warned to stay clear.
 - All material from the spill and the clean-up must be disposed of as hazardous waste, as per SDS and RA.
- **Storage**
 - Ensure minimal amounts are purchased and stored, with date of received and opened written on container. Label example below.
 - Always use a “first in, first out” method when using peroxide forming chemicals
 - Ensure peroxide forming chemicals has an inhibitor added wherever possible
 - Must be stored in dark coloured glass with airtight lids.
 - Must be stored dry as substance becomes highly unstable with moisture
 - Ensure inspection and testing of container and contents occurs regularly (3 monthly) to ensure there are no dried crystals, discolouration, or stratification present. Storage timeframes must be according to the schedule below.
 - Packages shall be inspected regularly with any damaged or deteriorated packages segregated and disposed of immediately.

Storage Timeframes		
Receiving and opening dates must be labelled on the container		
	Date Opened	Date Received
Class A	3 months	18 months
Class B	12 months	18 months
Class C	12 months	18 months

Label Example
Receiving and opening label to be placed on the container

CAUTION

Peroxide Forming Chemical

Date received: _____

Date opened: _____

	YES	NO
Inhibitor added?		
Test Date: _____	Result: _____	Tester: _____
Test Date: _____	Result: _____	Tester: _____
Test Date: _____	Result: _____	Tester: _____
Test Date: _____	Result: _____	Tester: _____

- **Testing**
 - Commercial testing dip strips are available for purchase. The instructions of use, as outlined on the packaging, should be followed.
 - It should be noted that testing strips may have limited shelf life and will have specific storage requirements
 - If there are any detected levels of peroxide, the chemical is unsafe and should be disposed of.
- **Transporting**
 - As per SDS,
 - Transport between store and facility must be in a double contained vessel, with appropriate controls in place inclusive of a spill kit.
- **Disposal**
 - Peroxide forming chemicals must be disposed of once the storage timeframes above have lapsed.
 - Peroxide forming chemicals must be disposed of by a **registered waste contractor experienced in the handling and disposal of explosive materials**. The disposal of these should be discussed with your college hazardous waste organiser or WHS Unit.
 - Empty containers may still present a hazard so should be disposed of appropriately including segregation and appropriate labelling.
 - SDS and risk assessment must be consulted for safe disposal procedures.

47. Picric acid (Trinitrophenol)



Picric acid when wet is a flammable solid however dried picric acid can form unstable crystals that are sensitive to shock, friction, or heat, creating an explosion. **Therefore Picric acid must not be allowed to dry out.** Wherever possible, the phasing out of picric acid is encouraged.

- **Training/documentation**
 - Users must be trained, by a competent person, in procedures for safe use of these materials, including properties and hazards as outlined by the SDS.
 - Training should include how to safely handle, use, store and dispose of these materials and what must be done in the event of a spill.
- **Handling (signage, PPE)**
 - Handle in a well-ventilated area such as a fume cupboard and ensure that appropriate PPE, in accordance with the SDS, is worn.
 - Do not use metal spatulas to remove picric acid.
 - Picric acid must never be allowed to dry out as dried picric acid is capable of explosion and must only be handled by a trained explosive handler if it does.
 - Once used, wipe the top of the bottle to remove any remains of substance which has the potential to crystallize. If dry crystals are present in the thread of the screw top containers this may also present a detonation hazard.
 - Unused substances must be disposed of to reduce amounts stored.
- **Spillage**
 - Spills must be dealt with immediately.
 - Consult the SDS for specific procedure for spill clean-up and use an appropriate spill kit as identified by the risk assessment.
 - Appropriate PPE must be worn when cleaning up spills.
 - Never allow spilled material to dry out and never sweep up dry material – clean up with a dampened pad and place spilled solids/pad in a suitable container of solution. The waste must be labelled with a “picric acid” warning.
 - If a large spill occurs, evacuate building and call emergency services.
 - People within the immediate vicinity should be warned to stay clear.
 - All material from the spill and the clean-up must be disposed of as hazardous waste, as per SDS and RA.
 - Seek first aid and Security assistance if required.
- **Storage**
 - Must be stored in dark coloured glass not metal containers.
 - Must **not be stored dry as substance becomes highly unstable.**
 - Must not be stored with oxidisers, reducing agents, nitric acids, alkalis, metals (metal salts). The full incompatibility list can be retrieved from the SDS.
 - **Ensure inspection of container and contents (liquid) occurs six monthly** to ensure it hasn't dried out and there are no dried crystals present.
 - Ensure minimal amounts are purchased and stored, with date of purchase written on container.
 - Packages shall be inspected regularly with any damaged or deteriorated packages segregated and disposed of immediately.

- Storage areas, including refrigerators, must be clearly marked and identifiable to users.
- Storage locations should limit the chance of breakage and limit the risk of contamination.
- **Transporting**
 - As per SDS,
 - Transport between store and facility must be in a double contained vessel, with appropriate controls in place inclusive of a spill kit.
- **Disposal**
 - Picric acid must ONLY be disposed of by a **registered waste contractor experienced in the handling and disposal of explosive materials**.
 - Picric acid containers being disposed of must have liquid in the container.
 - Any item that has encountered picric acid must be placed in water and stored in a suitable container and disposed of accordingly.
 - Empty containers may still present a hazard so should be disposed of appropriately including segregation and appropriate labelling.
 - SDS and risk assessment must be consulted for safe disposal procedures.

48. Prohibited and Restricted Carcinogens

WHS Regulations prohibit or restrict the use of certain chemicals including several carcinogens that are prohibited or restricted except for genuine research. These are listed in [Appendix C, Code of Practice: Managing risks of hazardous chemicals in the workplace](#)

Carcinogenic substances can also be cytotoxic chemicals. Further information on controlling cytotoxic hazards can be found section 38.

- Risk assessment and safe work procedure must be completed before applying to work with this substance, referencing the SDS.
 - Where possible eliminate the use of the material where it is not essential, or
 - Substitute for a less potentially hazardous material

Application and Permits

These carcinogens require authorisation and a permit issued by SafeWork SA (or equivalent in each State & Territory) before they can be purchased, used, handled, or stored.

Each application must include the following:

- Every worker or research higher degree student wishing to use a prohibited or restricted carcinogen must complete a [Prohibited or Restricted Carcinogen Worker Registration Form](#) including the following information:
 - amounts and location of the carcinogen(s), estimated frequency of exposure.
 - risk management procedures including risk assessment and safe work procedures.
 - approval of the details by the Supervisor who oversees the work involving the prohibited or restricted carcinogen.
 - The form must be signed by the relevant Dean of Research or Portfolio Head or delegate as a competent person, confirming that risk management processes are adequate and in place.

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- The form must be submitted to the relevant Vice-President and Executive Dean for signature also confirming that risk management processes are adequate.
 - The form must be submitted to Flinders University WHS Unit and approved by SafeWork SA.
 - All processes of storage, handling, training, disposal, and record keeping will be reviewed by the WHS Unit on a regular basis.
 - Any changes to the original information provided in the application must be advised as soon as reasonably practicable, in writing, to the WHS Unit who will notify SafeWork SA.
- **Health monitoring**
 - Health monitoring may need to be conducted. At the end of employment, a statement of exposure will be provided by the University upon request if Health monitoring has occurred.
 - **Training/documentation**
 - Users must be trained, by a competent person, in procedures for safe use of these materials, including properties and hazards as outlined by the SDS.
 - Training should include how to safely handle, use, store and dispose of these materials and what must be done in the event of a spill.
 - **First aid**
 - As per SDS and may need to seek medical advice.
 - **Handling (signage, PPE)**
 - Staff and students using these substances must comply with the measures (risk management strategies) for handling, storage and disposal as stated within the application. Failure to do so will see the authorisation cancelled.
 - A record indicating the quantity of each prohibited or restricted carcinogen, received, used, or destroyed during the currency of use must be kept by the area that purchased the chemical.
 - Ensure that any PPE used is in accordance with the SDS, checking if the carcinogen is also cytotoxic.
 - Containers, tools, and equipment must be labelled and dedicated for use with the substance – including labelling as a cytotoxic if it is in that category.
 - **Spillage**
 - Consult the SDS for specific procedure for spill clean-up and use an appropriate spill kit as identified by the risk assessment. Regard must also be given to whether the carcinogen is also cytotoxic.
 - People within the immediate vicinity should be warned to stay clear.
 - Appropriate PPE must be worn when cleaning up spills.
 - All material from the spill and the clean-up must be disposed of as hazardous waste, as per SDS and RA.
 - Any unexpected exposures must be reported as outlined by the [Accident, Incident and Hazard Reporting and Investigation Procedure](#)
 - Seek medical advice if there has been an exposure.
 - **Storage**
 - Access to the prohibited and restricted carcinogens shall be restricted to staff and students who are approved by SafeWork SA and registered with the WHS Unit.

- Ensure minimal amounts are purchased and stored, with date of purchase written on container.
- Storage areas, including refrigerators, must be clearly marked and identifiable to users as Carcinogens and/or cytotoxic if applicable.
- Storage must be in suitable containers, appropriately labelled as a prohibited or restricted carcinogen and/or cytotoxic if applicable, in a locked receptacle.
- Packages shall be inspected regularly with any damaged or deteriorated packages segregated and disposed of immediately.
- Any loss or theft must be reported immediately to the WHS Unit.
- **Transporting**
 - As per SDS,
 - Transport between store and facility must be in a double contained vessel, with appropriate controls in place inclusive of a spill kit.
- **Disposal**
 - SDS and risk assessment must be consulted for safe disposal procedures including segregation and appropriate labelling i.e., carcinogenic and/or **cytotoxic purple bins**.
 - Empty containers may still present a hazard so should be disposed of appropriately.

49. Security Sensitive Ammonium Nitrate



The Regulations subject to the University to a range of conditions outlined below.

Note there is some parts of the Regulations that University has a gazetted exemption from).

All purchase use and disposal of Security Sensitive Ammonium Nitrate must be recorded in an auditable format – e.g., register / log.

Each record being kept for a period of at least five years.

All processes of storage, handling, disposal, and record keeping may be reviewed by the WHS Unit on a regular basis.

- **Permitted users.**
 - Any staff member who is intending to use SSAN for research or educational purposes must contact the WHS Unit, prior to purchasing.
- **Training/documentation**
 - Users must be trained, by a competent person, in procedures for safe use of material.
 - Training should cover safe use, handling, storage, and disposal.
- **First aid**
 - As per SDS
- **Handling (signage, PPE)**
 - Avoid personal contact and inhalation of dust, mist, or vapours.
 - Provide adequate ventilation.

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- Ensure that any PPE used is in accordance with the SDS such as eye protection.
 - Do not wear cotton or leather gloves.
 - Containers, tools, and equipment must be compatible for use with the substance.
 - SDS must be consulted for further information on reactivity to other substances.
 - All purchase use and disposal of Security Sensitive Ammonium Nitrate must be recorded in an auditable format by the lab – e.g., register / log. Each record being kept for a period of at least five years.
 - All records will be made available to a gazetted Inspector of Explosives on request within 14 days.
 - **Spillage**
 - Consult the SDS for specific procedure for spill clean-up and use an appropriate spill kit as identified by the risk assessment.
 - Avoid all contact with any organic matter including fuel, solvents, sawdust, paper or cloth and other incompatible materials, as ignition may result.
 - **Storage**
 - **No more than 3kg of Security Sensitive Ammonium Nitrate is to be kept in any laboratory or other area of use at any time.**
 - All quantities of Security Sensitive Ammonium Nitrate must be kept in a secure manner (stored in a suitable container, appropriately labelled as SSAN, in a locked receptacle such as a cabinet) and accessible only by the registered person/s.
 - Ensure minimal amounts are purchased and stored, with date of purchase written on container.
 - Do not repack. Use containers supplied by manufacturer only.
 - Packages shall be inspected regularly with any damaged or deteriorated packages segregated and disposed of immediately.
 - Do not store near heat sources such as open flames, steam pipes, radiators, or other combustible materials such as flammable liquids.
 - Any loss or theft of Security Sensitive Ammonium Nitrate to be reported immediately to the WHS Unit who will inform the Manager, Dangerous Substances, SafeWork SA and the South Australian Police Department.
 - **Transporting**
 - As per SDS,
 - Transport between store and facility must be in a double contained vessel, with appropriate controls in place inclusive of a spill kit.
 - **Disposal**
 - SDS and risk assessment must be consulted for safe disposal procedures including segregation and appropriate labelling.
 - Empty containers may still present a hazard so should be disposed of appropriately.

50. Related Documents

[WHS Policy](#)

[WHS Risk Management Procedure](#)

[Hazardous Chemical Safety Procedure](#)

[First Aid Procedures.](#)

[Emergency Management Procedure](#)

51. Appendix A – Legislative Framework

South Australia

- [Work Health and Safety Act 2012](#)
- [Work Health and Safety Regulations 2012](#)
- [Controlled Substances Act 1984](#)
- [Controlled Substances \(Controlled Drugs, Precursors and Plants\) Regulations 20014](#)
- [Controlled Substances \(Poisons\) Regulations 2011](#)
- [Explosives Act 1936](#)
- [Explosives \(Security Sensitive Substances\) Regulations 2021](#)
- Code of Practice - [How to manage work health and safety risks](#)
- [Code of Practice: Managing risks of hazardous chemicals in the workplace](#)
- [Code of Practice: Labelling of workplace hazardous chemicals](#)
- [National Code of Practice for Chemicals of Security Concern](#)

Note- equivalent Act and Regulations exist in each State and Territory

52. Appendix B – Australian Standards

Users must refer to [SAI Global](#) for the latest version

AS/NZS 2243.1:2005

[Safety in Laboratories – Planning and operational aspects](#)

AS/NZS 2243.2:2006

[Safety in laboratories - Chemical aspects](#)

AS/NZS 2243.3:2010

[Safety in laboratories – Fume cupboards](#)

AS/NZS 2243.9:2009

[Safety in laboratories – Recirculating fume cabinets](#)

AS/NZS 2243.10:2004

[Safety in laboratories – Storage of chemicals](#)

AS/NZS 2982.2010

[Laboratory design and construction](#)

AS 4332: 2004

[Storage and handling of gases in cylinders](#)

AS 4332: 2004/Amdt 1-2005

[Storage and handling of gases in cylinders](#)

AS 1894:1997

[Storage and handling of non-flammable cryogenic & refrigerated liquids](#)

AS 1894:1997/Amdt no1 -1999
[Storage and handling of non-flammable cryogenic & refrigerated liquids](#)
AS 1940:2004
[Storage and handling of flammable and combustible liquids](#)
AS 1940:2004/Amdt 1 -2004
[Storage and handling of flammable and combustible liquids](#)
AS 1940:2004/Amdt 2 -2006
[Storage and handling of flammable and combustible liquids](#)
AS 4326:2008
[Storage and handling of oxidizing agents](#)
AS 2714:2008
[The storage and handling of organic peroxides](#)
AS 4452:1997
[The storage and handling of toxic substances](#)
AS 3780:2008
[The storage and handling of corrosive substances](#)
AS 3780:2008/Amdt 1 – 2009
[The storage and handling of corrosive substances](#)
AS 1216:2006
[Class labels for dangerous goods](#)
AS 1216: 2006/Amdt 1 – 2006
[Class labels for dangerous goods](#)
AS 2187.1:1998
[Explosives – Storage, transport & use – Storage](#)
AS 2187.1;1998/Amdt 1 -2000
[Explosives – storage, transport and use - storage](#)
AS 2187.2:2006
[Explosives – Storage and use – Use of explosives](#)
AS 1319 :1994
[Safety signs for the occupational environment](#)
AS 1345:1995
[Identification of the contents of pipes, conduits and ducts](#)