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## **Faculty of Engineering**

# **Laboratory Safety Guidelines 2009**

## **CIVIL & MINING ENGINEERING LABORATORIES**

# **Safety Induction Manual**

CME Safety Committee

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## **1. OH&S Induction Acknowledgement**

I understand that there are University of Wollongong OH&S rules, Faculty of Engineering rules, Civil and Mining Engineering laboratory rules and regulations that I must follow. I have been shown where safe work procedures and safe operating procedures are located and how to use them. I agree to consult the relevant MSDS before using any substance.

I have read, and understand this document, consisting of the Laboratory Safety Manual for the Civil and Mining Engineering laboratories in the Faculty of Engineering and the University of Wollongong's OH&S Laboratory Safety notes and understand I must abide by them.

I will wear a laboratory coat, suitable footwear and safety glasses, as warranted.

I will not work in the laboratories after hours without the approval of my academic supervisor. I will not work after hours unless a second, competent person is present. When working after hours in the laboratory, I, and the person accompanying me, will sign on and off in the attendance book at the entrance of Highbay Laboratories.

I agree to seek instruction on any new procedures and practices. I agree to seek instruction in the safe use of all equipment and to follow the directions given to me by staff. I agree to report any unsafe items or practices.

I understand the term 'duty of care' and understand I have legal responsibilities under the Occupational Health and Safety Act.

A risk assessment must be completed before any thesis or research experiment is undertaken. Some SWPs are available from the Civil and Mining Engineering Technical Staff and must be filled in by the student and discussed with the Academic Supervisor. The Academic Supervisor must sign the form that is then returned to the Civil and Mining Engineering Technical Staff. No laboratory work will be permitted without a completed risk assessment. I understand I must fill in this form before beginning my laboratory and research work.

## OH&S Induction Acknowledgement

- Must be completed and signed before any work is carried out in the Civil and Mining Engineering Laboratories
- After hours access will not be considered if this form is not complete

1. I've read, and understand this document. I agree to follow the guidelines set out in this document.
2. I have completed the required induction for this laboratory/area.
3. I agree to complete a risk assessment before any experiment is undertaken.

This form is to be signed by the student, Technical staff (inductor) and the Academic Supervisor with one copy handed to the Faculty office and another to the Civil and Mining Engineering Technical Staff before using the laboratory/area.

Staff Name:.....

Staff Signature.....

Date:.....

Student/ Staff Name:.....

Student Number.....

Student/Staff Signature.....

Date:.....

Induction Date.....

Trainers Signature.....

Trainers Name.....

Academic Supervisors Name.....Date:.....

Academic Supervisors Signature.....

Student Contact Telephone Number:.....

*Copies: Lab/Workshop files*

## 1. Introduction

Occupational Health and Safety is an issue that is closely regulated by legislation in NSW under the Occupational Health and Safety Act 2001. The act obliges the University of Wollongong, through the Faculty of Engineering to:

1. Secure the health, safety and welfare of all persons in the Faculty
2. Protect all persons in the Faculty against risks to health
3. Promote an occupational environment for persons to work in which takes into account their particular physiological and psychological needs.

This legislation imposes a 'duty of care' on the employer and the employer's representatives to ensure the wellbeing of all those who come under the umbrella of the organisation. The Occupational Health and Safety Act gives the responsibility for safety to both employer and employee (the definition of 'employee' includes all students and visitors to the Faculty) to ensure that safe practice is followed at all times. This requires that the employee must co-operate with the employer to ensure that any reasonable requirements are observed and implemented in the interests of safety.

The specific means whereby the above aims are achieved include:

- Provision or maintenance of equipment and systems of work that are safe and cause no risk to health
- Ensuring the safe use, handling, storage and transport of equipment and substances
- Provision of information, instruction, training and supervision necessary to ensure the health and safety of all persons in the Faculty
- Maintaining the places of work under the Faculty's control in a safe condition and provision of safe entries and exits.
- Making available adequate information about relevant tests and research concerning substances used at the place of work.

The Act also binds those persons who comprise the total of the Faculty (staff, students and visitors) to take reasonable care of the health and safety of others. **Therefore the obligation to provide a safe workplace is the responsibility of all the people in it.** Section 19 of the OH&S Act 2001 states that every employee (staff, students and visitors) shall 'take reasonable care for the health and safety of all persons who are at this place of work and who may be affected by their acts and omissions at work'. This act further requires all those present in the Faculty to co-operate with the Faculty's requirements that have been imposed in the interests of the health, safety and welfare of all those present in the workplace, be they staff, students or visitors.

In addition, Section 20 of the act requires that 'a person shall not intentionally or recklessly interfere with, or misuse anything provided in the interests of health, safety and welfare in pursuance of this act'. In other words, it is a violation of the law to interfere with or render inoperative any safety protection devices, first aid kits, notices, or any items supplied or installed by the Faculty in the interests of safety of any of the other people in it.

All staff and students who undertake work in the civil and mining engineering laboratories must take reasonable care of their own health and safety, and the health and safety of others by:

- Taking action to avoid, eliminate or minimise hazards of which they are aware;
- Complying with all occupational health and safety instructions, policies and procedures in the safety manual;

- Making proper use of all safety devices and personal protective equipment;
- Complying with the instructions given by emergency response personnel such as building wardens and first aiders;
- Not willfully placing at risk the health and safety of any other person;
- Seeking information or advice where necessary before carrying out new or unfamiliar work;
- Maintaining dress standards appropriate for the work being done. Appropriate protective clothing and footwear must be worn at all times;
- Only consuming food and drink in designated areas;
- Being familiar with emergency and evacuation procedures and the location of, and if appropriately trained, for the use of emergency equipment;
- Reporting all incidents, hazards and 'near miss' incidents on the online SafetyNet [Hazard and Incident Report form.](#)

## 2. Responsibilities

The responsibility for implementation of these procedures rests with the Dean and Heads of School.

The Faculty of Engineering Workplace Advisory Committee will provide advice and feedback to the Dean and Heads on actions needed to comply with these procedures. This group will be able to seek advice from the Occupational Health and Safety Unit.

### 2.1. Dean and Heads of School

Heads of cost centres have overall responsibility for ensuring that occupational health and safety standards and practices are implemented and maintained in the teaching facilities, laboratories and studios by their respective supervisory staff.

To achieve compliance, the Dean and Heads of School should:

- Ensure that staff and students receive the appropriate information, instruction and training necessary for them to perform work safely.
- Ensure that all staff and students receive an induction that includes information pertaining to emergency response procedures and personnel.
- Ensure that local occupational health and safety procedures are developed, documented and issued to staff and students as appropriate.
- Ensure that facilities and equipment provided for staff and students are safe and suitable for the types of work to be carried out.
- Ensure that adequate financial provisions are made for occupational health and safety equipment and materials and the maintenance of occupational health and safety standards.
- Ensure that hazard identification and risk assessment procedures are developed, documented and maintained for the use, handling, storage, transport and disposal of equipment, materials and substances and that appropriate risk controls are implemented and maintained.

### 2.2. Supervisors and Subject Coordinators of Honours and Postgraduate Students

As honours and postgraduate research is a major aspect of work undertaken in laboratories, it is essential that adequate supervision is provided to maintain safety. Supervisors and subject coordinators are to:

- Actively practice and develop in their students proper attitudes towards occupational health and safety matters.
- Control the risk associated with the work that they supervise using a risk assessment form.
- Ensure that safe work practices are developed and maintained at all times.
- Arrange for their staff and students to be instructed in safe and healthy work procedures, and ensure that they are fully informed about particular hazards, and how to eliminate, avoid or minimise them.
- Ensure that good housekeeping standards are developed and maintained in the areas under their control.
- Ensure that staff and students under their control use safety equipment provided in a correct manner.
- Ensure that all students understand the disciplinary procedures that will be invoked for non-compliance with occupational health and safety instructions, policies and procedures.

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- Ensure that all incidents, hazards and 'near-miss' incidents that occur are reported on the hazard and incident report form.

### **2.3. Staff and Students**

All staff and students who undertake work in the laboratories must take reasonable care of their own health and safety and the health and safety of others by:

- Taking action to eliminate, avoid or minimise hazards of which they are aware.
- Comply with all occupational health and safety instructions, policies and procedures including local safety manuals
- Making proper use of all safety devices and personal protective equipment.
- Complying with instructions given by emergency response personnel such as emergency wardens and first aiders.
- Not willfully placing at risk the health and safety of any other person.
- Seeking information or advice where necessary before carrying out new or unfamiliar work.
- Maintaining dress standards appropriate for the work being done.
- Appropriate protective clothing and footwear must be worn at all times.
- Only consuming or storing food and drink in designated areas.
- Being familiar with emergency and evacuation procedures and the location of, and if appropriately trained, the use of, emergency equipment.
- Reporting all incidents, hazards and 'near-miss' on the hazard and incident report form.

### 3. General Information

#### 3.1. Emergency Telephone Numbers

University telephones require the prefix '0' to be dialed for an external connection.

Emergency Services – Police, Fire Brigade, Ambulance (0) 000

Wollongong Hospital (0) 4222 5000

NRMA Road Service (0) 132 132

#### 3.2. Location of Emergency Telephones

Emergency telephones are located:

Outside the Southern front door of Building 8

In the main foyer of Building 4

In the corridor adjacent to the laboratory in Building 4

In front of Building 1

#### 3.3. Location of First Aid Boxes

- I) G14. Technical Staff Office.
- II) G21. Light Structure Lab. (South-West corner).
- iii) G22. Mining Laboratory. (South-West corner).
- iv) G23. Soils Research Lab. (South-West corner).
- v) G24. Rock Mechanics Lab. (South-West corner).
- vi) G28. Highbay 1. (As you enter from the hallway).
- vii) G29. Soils Teaching Lab. (Western Wall).

#### 3.4. Security and Patrol Staff

Campus Security – all hours Extension: 4900

Campus Security – Shift Leader's mobile Extension: 6555

Campus Security – Mobile Ph: 0407 287 750

#### 3.5. First Aid Officers

Mr Bob Rowlan Extension: 3168 Room: 4.G24

Mr Ian Bridge Extension: 5953 Room: 4.G27

If you require first aid, please see the Technical Staff. Please report any accidents or incidents to the staff and ensure an accident/incident report form is submitted on SafetyNEt.

### **3.6. Building Wardens – Top Floor Building 4**

Ian Laird Extension: 3021 Room: 4.G27

Leonie McIntyre Engineering – Extension: 5875 Room: 4.114

Roma Hamlet Engineering – Extension: 3062 Room: 4.109A

Des Jamieson Engineering – Extension: 4463 Room: 4.123C

Pam Burnham Engineering – Extension: Room: 4.3040

Peter Turner Engineering – Extension: 3032 Room: 4.123C

Stacey Smith Engineering – Extension: 3038 Room: 4.109

If you are asked to leave the building by the building wardens or another member of staff, you must do so immediately.

### **3.7. After Hours Contact (For Emergency Only)**

Please contact Security Extension: 4900

### **3.8. Manager – University Occupational Health and Safety**

Manager Darren Smith Extension: 3204

OH&S Coordinator Ellen Manning Extension: 3528

### **3.9. Building Maintenance**

Buildings and Grounds Call Centre (Office Hours only) Extension: 3217

Security Extension: 4555

Security (Emergency Only) Extension: 4900

#### 4. Emergency Procedures

### Standard Fire Orders

#### Actions to be considered on discovering a fire

**R**

**Rescue - Any person/s in immediate danger**



**A**

**Alarm - Raise the alarm. Contact the emergency services on 0 000. Contact University Security on Extension: 4900. Activate Break Glass Alarm**



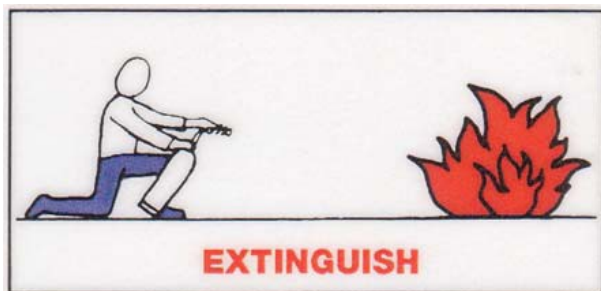
**C**

**Contain - Close doors to contain the fire.**



**E**

**Extinguish - Attempt to extinguish the fire only if you are trained and it is safe to do so.**



Leave the building immediately by the nearest exit.

Proceed to the assembly area – Area B between Building 1 and 8

Remain in the assembly area until advised the emergency is over

Do not re-enter the building until advised it is safe to do so by the building warden or security staff.

## Emergency Evacuation Procedures

If you hear a continuous alarm bell or are requested, by a Building Warden, or a member of staff, to evacuate the building you must:

- Leave the building immediately by the nearest exit;
- Proceed to the assembly area indicated in the map below;
- Remain in the assembly area until advised the emergency is over;
- Do not re-enter the building until advised it is safe to do so by the building warden or by security staff.



**The Assembly area for the Civil and Mining Engineering laboratories is Assembly Area B**

## 5. Laboratory Rules

### 5.1. Attire

Every person working in the Civil and Mining Engineering laboratories must ensure that they are correctly attired before undertaking laboratory work.

It is mandatory that all students working in the Civil and Mining Engineering laboratories wear suitable non-slip enclosed footwear (e.g. Safety footwear with steel capping) and safety glasses at all times. Long hair should be tied back. Singlets, tank tops or similar clothing are not suitable for wearing in laboratory.

### 5.2. Behaviour

Apply commonsense in the laboratories, avoid reckless behaviour and never indulge in practical jokes or unauthorised experiments. Indulging in 'horseplay' and practical jokes in the laboratories is strictly prohibited.

Running is also prohibited and care should be taken when opening and closing doors and entering or leaving the laboratory.

Smoking is not permitted in any University building or vehicle.

Eating and drinking are not permitted in the laboratory. Do not store food or drink in a refrigerator, which is used to store laboratory materials.

Persons under the influence of, or affected by alcohol or other substances, both legal and illegal are prohibited from working in the laboratory.

### 5.3. Safe Conduct

The following recommendations detail the standard behavior for all personnel working within a laboratory.

- (a) Do not carry out any work in isolation in a laboratory; ensure that at least a second person is within calling distance.
- (b) Regard all substances as hazardous unless there is definite information to the contrary.
- (c) Before any work is carried out in the laboratory, permission must be obtained from the officer in charge. Never undertake any work unless the potential hazards of the operation are known as precisely as possible, and the appropriate safety precautions are adopted. Any flame producing activity is not to commence until the immediate area has been cleared of dusts. Many materials, which are nonflammable in a lump state, become quite volatile when in powdered or dust cloud form.
- (d) All materials coming into the laboratory are to be accompanied by MSDS documentation detailing the material source, type, quantity and any known characteristics. Particularly those relating to hazardous materials. This documentation is to be stored in a file specifically for this purpose and is to be readily available to all staff. All material is to be kept in suitable containers, which are to be clearly labeled with a number from a drum register book, which in turn is to contain details of the material, its source and ownership. Labeling is required by Hazard substances guideline
- (e) At the conclusion of testing of any material, proper arrangements are to be made for the safe disposal of that material, either to acceptable conventional waste depots, or returned to the client, depending on the nature of the material and what was agreed with the client prior to commencement of testing.
- (f) If, during the testing or handling of materials, spillages occur for any reason, correct clean-up procedures must be followed as per the Material Safety Data Sheet that accompanied the material on its arrival.

- (g) If a material is found to be on fire (e.g. inside a bin or on the ground), then under no circumstances should the combustibles be disturbed in any way. Otherwise, a dust cloud and explosion could occur. Special procedures are required to deal with such situations depending on the material and circumstances. (e.g. careful/gentle inerting of fire; special 'muck sucker' with water mixing nozzle at entrance of suction hose; water mist/spray gently quenching combustibles; sealing off combustion process and allowing 'fire' to burn itself out) depending on the material and circumstances.
- (h) Take additional care when carrying or moving any potentially hazardous substance.
- (i) Never store mutually reactive substances in the same area. (See relevant State authority guidelines.) and MSDS
- (j) Keep only the minimum required quantities of hazardous substances in the laboratory work area.
- (k) Warning signs and barriers are to be erected at entrances to the laboratory before any testing is carried out when using materials of an excessively dusty nature, or are toxic or otherwise unpleasant.
- (l) Wash skin areas, which come in contact with chemicals, irrespective of concentration as per MSDS.
- (m) Label all safety equipment and maintain it in good operating condition. Check and inspect safety equipment for correct operation in accordance with the manufacturer's instructions and report, in writing, any requirement for maintenance.
- (n) Ensure that all safety equipment remains accessible to the laboratory personnel at all times.

#### 5.4. Housekeeping

Housekeeping is an important component in laboratory safety to ensure risk of injury from potential hazards in the environment are controlled. The following precautions are to be taken to ensure the safety of personnel within laboratories:

- Work areas should be kept well organised and good housekeeping practice should always be followed when using chemical laboratories to reduce the risks of spillage and other accidents.
- Aisles, exits, and all emergency equipment must be easily accessed and kept free of obstruction.
- Disposal of wastes should be in the appropriate containers.
- Overnight experiments must carry a notice which shows: name of responsible person, name of academic supervisor, date, emergency contact numbers, special instructions if required e.g. DO NOT TURN OFF – EXPERIMENT IN PROGRESS.
- Floors are to be kept tidy and dry
- Benches are to be kept clean and free from chemicals and apparatus that are not being used.
- Aisles and exits are to be kept free from obstructions.
- Bottles and glassware are to be kept off the floor.
- Access to all emergency equipment (fire extinguishers, first aid kits and eyewashes) are to be kept free from obstruction.
- Work areas and equipment are to be thoroughly cleaned after use.
- If last to leave the laboratory, make sure equipment is turned off and Laboratory locked.

- If contractors are working in your area, make known to them any hazards that may exist in your area, i.e. flammable liquids, dusts.

### 5.5. Instruction

It is the responsibility of students to ensure they have been fully instructed in, and understand the use of equipment before operating it. No equipment of any type may be operated unless the person is authorized to do so. Authorisation is obtained by participation in a process of induction, which means obtaining instruction from the appropriate technical or academic staff in its use. This also applies to the safe use of substances. Students must be approved as competent to use equipment.

Assume all substances are hazardous unless there is definite information to the contrary. Each of the laboratories has a copy of the material safety data sheets (MSDS) relevant to all of the chemicals used in the laboratory. These sheets **must** be consulted **before** carrying out any laboratory work involving the use of chemicals. The MSDS gives details of the characteristics of the chemicals, any hazards associated with their use, including toxicity, known carcinogenic behaviour, disposal restrictions, spillage clean-up procedures, personal protective equipment required, and any other relevant safety instructions.

### 5.6. Use of Equipment

It is the responsibility of students to ensure they have been fully instructed in, and understand the use of equipment before operating it. No equipment of any type may be operated unless the person is authorized as competent to do so. Never undertake any work unless the potential hazards of the operation are known as precisely as possible and the appropriate safety precautions are adopted.

Any defect found during operation of equipment must be reported to the Civil and Mining engineering technical staff, preferably in the form of a written notification. Equipment must not be used for purposes other than that for which it was designed. If personal protective equipment is required for the operation of the equipment, it must be used.

### 5.7. Risk Assessments

**Risk assessments must be completed before any thesis experiments are undertaken. No laboratory work will be permitted without a completed risk assessment.** Forms are available online. Chemical risk analysis may also be necessary. This can be determined from the relevant MSDS. If the material is classified as hazardous, a chemical risk assessment will be required. The risk assessment forms must be completed by the student and discussed with, and approved by the academic supervisor. The academic supervisor must sign the form that is then returned to the civil and mining engineering technical staff. A copy of the completed risk assessment is also forwarded to the Faculty of Engineering office. If the supervisor determines the activity to be hazardous, they may call in an expert from the University of Wollongong OH&S unit or consultant for advice. In this case, no work can be undertaken until a full investigation has taken place and the recommendations adopted and acted upon.

### 5.8. After Hours and Working Alone Policy

The Faculty of Engineering has established rules that ensure the safety of staff and students who work on University property outside normal working hours or alone.

After hours work may be classified according to risk:

Category 1	Category 2	Category 3
<p>Work that can be done at any time as it poses minimal risk.</p> <p>You may work alone</p>	<p>Work which should only be done between 6.30am and midnight on weekdays and between 8.00am to 10pm on weekends</p> <p>You <u>must not</u> work alone</p>	<p>Work that should not be carried out under any circumstances after 5.30pm or before 8.00am on any day.</p> <p>You <u>must not</u> work alone</p>
<p>General Office Work: reading, writing, use of instrumentation which is considered to pose no risk</p>	<p>Any laboratory work that does not involve toxic, radioactive, corrosive, explosive, bio-hazardous or flammable substances.</p>	<p>Laboratory work involving toxic, radioactive, corrosive, explosive, biohazardous or flammable substances.</p>

## After Hours Access

Normal working hours are weekdays 8.00 – 5.30pm. The laboratories are open from 8.00am – 4.00pm. Laboratory staff should be consulted if work in the laboratory after hours is required

For safety reasons after hours work requires:

1. Signed Authority –It is a general rule that undergraduate students **do not** have after hours access. Undergraduate students requiring after hours access for a specific time or a specific purpose must apply to the Dean of Engineering on the appropriate form. The form must be authorised by the relevant Academic supervisor and a copy of the OH&S Induction Acknowledgement form (page 5) must be attached. Staff and postgraduate students must also have an approved after hours access form authorised by the Dean of Engineering and if necessary, Academic supervisor. This authority and University ID card must be carried when working after hours.

2. Signing In – All staff, students and accompanying persons should sign in on the sign in book located at the entrance of Highbay laboratory. When the work is complete they should sign out.

3. Rules of access

- Ensure that the doors to buildings are securely closed and locked after entering and leaving the building
- Ensure that doors to internal areas are secured on leaving
- Ensure that you are familiar with safety rules and emergency contact numbers
- Report to University Security any breaches of security or suspicious behaviour on 4900
- You will not lend keys, access cards or security codes to another person
- You must not provide access to buildings to unauthorised persons

4. Operation of Equipment – No equipment may be operated unless

- Two persons are present
- The operator has received training in its use
- You have permission and have been deemed competent to use the equipment

It is the supervisor's responsibility to ensure their student has been trained to use any equipment.

5. Accompanying Persons – all accompanying persons must be over 18 years of age and be inducted by the staff member to ensure they are familiar with emergency procedures and contact numbers.

6. Any breach of the conditions will result in after hours access being immediately cancelled. Any future request for after hours access will require personal consultation with the Dean of Engineering.

## Working Alone

Working alone refers to situations where people may be exposed to risks because:

- The area they are working in is remote from others or isolated from the assistance of others because the nature, time or location of their work; or
- It involves the operation or maintenance of equipment, or the handling of a hazardous substance; or
- The work is dangerous for a person to perform alone.

1. Staff and students may work alone in office environments, however they must have completed the After Hours access permission forms.

2. Staff and students must not work alone in laboratories where chemical substances are handled or housed or where high risk equipments with radioactive isotopes are handled i.e. the Civil and Mining Engineering laboratories.

3. Working alone off campus – fieldwork involves performing research, teaching or instruction outdoors, at a location off campus. Prior to undertaking fieldwork, possible hazards must be identified and appropriate risk management strategies employed. Students should not undertake fieldwork without the permission of their supervisor. Fieldwork should not be carried out alone, students and staff should be accompanied by their supervisor, another staff member or appropriate adult. Students must ensure that a University employee knows when and where they are undertaking fieldwork and what time they are expected back. They must have some means of communication. A more detailed set of rules for fieldtrips is covered in the fieldwork section of this manual.

4. Emergency assistance – a means of communication to gain assistance in an emergency is available. The telephones in the Civil and mining engineering laboratories can be used to contact the emergency services. If this is necessary, security should also be informed and can meet the emergency vehicle at the front gate.

### 5.9. Safety Equipment

Laboratories at the University are equipped with a number of safety features.

#### 5.9.1. Eye Wash Sprays

There is an eye spray and shower situated in the Civil and Mining Highbay (No2) In the event of chemicals splashing in the eyes, the stream of water from the spray should be directed into the eye for a period of 15 minutes before seeking medical attention. It is up to you to familiarize yourself with the location of this eye wash spray, shower before commencing work and seek medical help.

#### 5.9.2. Fire Extinguishers

This equipment is provided in all laboratories to extinguish minor fires only. If there is any risk from the fire the building should be evacuated. Before using a fire extinguisher read the instructions ensuring that it is appropriate on the type of fire. Persons should only use fire extinguisher if they are competent to do so.

*Water Type Extinguisher* - Colour coded red. For use on solids fires only. Not to be used on electrical or chemical fires.

*Carbon Dioxide Extinguisher* - Colour coded red with a black band. For use on electrical and flammable liquids fire - It should be noted that this extinguisher can be safely used on all types of fires, however when gas dissipates re-ignition can take place.

### **5.10. Personal Protective Equipment**

Personal protective equipment such as eye protection, gloves, ear protection and dust masks can be obtained from the civil and Mining engineering staff. As a general rule, students will be expected to provide their own laboratory coat and safety glasses. A small supply of these is available for emergencies. Gloves are single use, disposable and available in each laboratory. Ear protection and dust masks will be issued on request.

Personal protective equipment specified in the material safety data sheets must be used at all times.

### **5.11. Reporting incidents, accidents, injuries and near misses**

All events that fall into the above categories should be reported to a member of the Civil and Mining engineering staff and on the Hazard and Incident Report Form. This is extremely important, as the University will not cover injuries that are not documented. Forms can be obtained from the Civil and Mining engineering staff or are available on the University OH&S website. Any injury that requires first aid must be documented. Students will suffer no penalty for reporting of accidents, incidents and near misses.

### **5.12. Sample Storage**

Storage of samples should be minimized. However, if it is necessary to store samples for future use the following rules apply:

1. Samples must be stored in appropriate containers to prevent spillage
2. Clear label must be attached to the Samples
3. It is an offence to store samples in food or drink containers and samples stored in these will be removed and discarded
4. Approval to store any hazardous material should be sought from the Civil and Mining engineering technical staff. Samples of hazardous material should be clearly labelled to this effect and comply with the dangerous goods and hazardous substance legislation. This information is contained in the relevant MSDS. The following information **must** be written clearly on the sample container – the name of the substance; the UN number (if any); the dangerous goods class (if any); the potential hazards and the relevant risk and safety phrases. An additional label with the name of the student, academic supervisor, contents, hazards and date of storage and disposal is also required.
5. Non-hazardous samples should be labelled with the labels issued by the Civil and Mining engineering technical staff.
6. Storage of samples must comply with the Australian Dangerous Goods Code and as such, hazardous samples must be segregated into their respective classes.
7. Flammable liquids must be stored in an approved flammable liquid storage facility. Please see the Civil and Mining engineering technical staff.
8. Incorrectly labelled samples will be discarded by the laboratory staff.

### 5.13. Manual Handling

Lifting and carrying excessive weights is hazardous and can cause injury, which may immediately be present. To avoid this:

1. Employ correct methods of lifting, do not over-reach and ensure stable footing at all times.
2. If heavy lifting, or pushing and pulling is involved, seek help from staff.
3. If working at heights is necessary, ensure that a second person is present, take particular care with footing and ensure that supports are strong and reliable.

### 5.14. Fieldwork Guidelines

Staff and students should be aware that the field is a workplace of the University of Wollongong and that they are expected to maintain appropriate standards of workplace behaviour. Fieldwork is like any experimental work, before it is undertaken, a complete risk analysis must be completed and submitted to the supervisor. Before undertaking any major fieldwork, first aid training should be considered.

The University of Wollongong has a comprehensive field work policy which must be adhered to. All relevant paperwork must be completed and authorised before any fieldwork is undertaken. These forms are available through the University of Wollongong's web page. These forms include the field activity participant acknowledgement, field activity plan and field activity risk assessment form.

1. Fieldwork involves performing research, teaching or instruction outdoors, at a location off campus. Prior to undertaking fieldwork, possible hazards must be identified and appropriate risk management strategies employed. Students should not undertake fieldwork without the permission of their supervisor. Fieldwork should not be carried out alone, students and staff should be accompanied by their supervisor, another staff member or appropriate adult. Undergraduate students must be supervised by their academic supervisor, at all times. Students must ensure that a University employee or appropriate staff knows when and where they are undertaking fieldwork and what time they are expected back. They must have some means of communication.
2. Communication – the persons undertaking the fieldwork must be able to contact someone who can provide or send assistance.
3. Risk Analysis – prior identification of the hazards involved in the field trip should be addressed in the risk analysis. Control and minimisation of these hazards should also be considered.

## 6. Gas Cylinders - Compressed & Liquefied Gasses

Compressed, liquefied or dissolved gases are categorised as Class 2 dangerous goods and sub-categorised as:

Class 2.1	Flammable gases identified by a red dangerous goods diamond (e.g. butane)
Class 2.2	Non-flammable and non-toxic gases identified by a green dangerous goods diamond (e.g. helium)
Class 2.3 ammonia)	Poisonous gases identified by a white dangerous goods diamond (e.g.

In instances where the gas presents multiple hazards additional diamonds indicates the subsidiary risks. For example, Chlorine Class 2.3 (toxicity) and Class 5.a (oxidising agent)

## 6.1. Moving Cylinders

The majority of accidents involving gas cylinders occur while moving them from one location to another. The following control measures should be used to reduce the potential for an accident:

- The use of purpose-built trolleys or other suitable devices for gas cylinder transportation.
- Securing the gas cylinder's valve, disconnecting and removing associated distribution equipment.
- Shutting the cylinder's valve, disconnecting and removing associated distribution equipment.
- A requirement that only properly trained personnel are permitted to move cylinders.
- Laboratory procedures preventing the manual movement of larger gas cylinders.

## 6.2. Storage of Gas Cylinders

The guidelines for the storage of gas cylinders are detailed in AS 4332 The Storage and Handling of Gases in Cylinders. For more information please refer to the AS 4332.

The following table outlines the quantities described as 'minor storage' of gases in cylinders.

Class of Gas	Maximum aggregate water capacity, litres
2.1	500
2.2	2000
2.2, with class 5.1 Subsidiary risk	1000
2.3	50

Where gases of mixed classes are kept in minor storage, the aggregate quantity of all gases shall not exceed 2000 litres and the quantity of each subclass shall not exceed that given in the table above.

The following precautions shall be observed for minor storage and handling of gas cylinders:

- Gas cylinders are to be kept away from artificial sources of heat, i.e. radiators, boilers or steam pipes; and kept clear.
- Gas cylinders shall be provided with adequate ventilation at all times.
- Classes of gas cylinders shall be segregated within the store, but need not be separated.
- Outdoor storage of Class 2 cylinders shall be separated from other dangerous goods by 3 metres. They shall not be less than 1m from any door, window, air vent or duct.
- All gas cylinders are to be secured in the upright position by chain or other means to prevent falling

Indoor storage of gas cylinders should be avoided wherever possible. However where it is not reasonable to have an outdoor cylinder and reticulation system, the keeping of gas cylinders shall incorporate a risk management approach. Specific precautions, to be included in a risk assessment; would be:

- The total capacity of gas in cylinders allowed for any particular indoor location shall include cylinders in use, spare cylinders not in use, and used cylinders awaiting removal.

- The total capacity of the gases kept shall not exceed one minor storage quantity per 200 m<sup>2</sup> of floor area. Where the floor area exceeds 200m<sup>2</sup> any arrangement which results in an excessive concentration of cylinders shall be avoided.
- Indoor minor stores of gases in cylinders shall be separated from other minor stores of gases or other dangerous goods stores by a minimum distance of 5 m.
- Except for Class 2.2 gases having no subsidiary risks, there shall be no minor storage in basements.
- Where cylinders are kept inside a building or a confined area, e.g. a vehicle tray/trailer a shipping container, that building or area shall be adequately ventilated by natural air movement or equivalent.

## **7. Chemical Aspects**

### **7.1. Storage**

Chemical storage is governed by the Australian Dangerous Goods codes, and the NSW Hazardous Substance Regulation.

1. Never store mutually reactive substances together. The easiest way to ensure this happens is to segregate each dangerous goods class. Appropriate storage containers should be used. Be aware that there may be often a primary and a secondary dangerous goods class.
2. Keep only the minimum required quantities of hazardous substances in the laboratory work area.

### **7.2. Gas Cylinders – Dangerous Goods Class 2 – Compressed and liquefied gases.**

Gas cylinders represent a potential hazard due to the high pressure involved and also because of their contents.

Never use compressed gas without appropriate knowledge of the nature of the gas and the hazards associated with it

All cylinders should be secured in an upright position so it is impossible for them to fall. (If the tap is damaged on a high-pressure cylinder the escaping gases and cylinder can cause violent damage to people and property.) It is illegal to store gas cylinders in a laboratory – gas bottles must be connected to equipment.

Cylinder keys (if used) must be in place when the gas is being used to allow the cylinder to be turned off at any time. Appropriate measures are required if the gas is toxic or flammable, and oil and grease must never be used in fittings, pipe work connections and regulators.

High-pressure oxygen must never be allowed to come into contact with oxidisable materials.

Acetylene must be used with particular care due to the extreme hazard associated with 'burn back' which can happen if equipment is improperly used.

Always close the cylinder valve when the gas supply is not required. If possible, vent the pipes.

Gas cylinders are heavy and should only be moved with suitable trolleys or assistance. Only trained personnel are permitted to move, connect or disconnect gas cylinders.

### **7.3. Flammable Liquids – Dangerous Goods Class 3**

This includes solvents and glues. Always ensure adequate ventilation by working in a fume cupboard when volatile substances are being used. Wear gloves and eye protection particularly when using glues. Refer to the MSDS for safe handling requirements

Naked flames and other sources of ignition must not be used in any area where flammable liquids and solids are used.

Flammable liquids & solids must be stored in an approved flammable liquid storage facility.

As solvents may also be carcinogenic i.e. cancer causing, less hazardous substances should be substituted where possible. If this is not possible, health monitoring may be required. Students should discuss this with their supervisors. Extreme care must be taken when using these substances – gloves and eye protection are required and a fume cupboard must be used as per the MSDS.

#### **7.4. Corrosives – Dangerous Goods Class 8**

As a general rule, acids and alkalis are classified as corrosives. Other chemicals such as ferric chloride are also corrosive. Always check the label or MSDS for the dangerous goods class and handle safely as per the MSDS.

When handling corrosives, gloves and eye protection must be worn. Alkalis, particularly sodium hydroxide are extremely dangerous to the eye and extreme care must be taken when using this substance.

As a general rule, add acid to water (NEVER water to acid). Acetic acid and nitric acid must be stored separately.

Safety carriers are available for carrying chemicals in glass or plastic containers with a capacity of 2 litres or greater. Never carry mutually reactive substances at the same time. If you need a carrier, see the laboratory staff.

#### **7.5. Oxidisers – Dangerous Goods Class 5**

In general, oxidizing chemicals present no risk to people. The reason they are segregated is that they will add fuel to any fire that may occur. Some oxidizers have a secondary dangerous goods class and this must also be considered by referring to the MSDS

#### **7.6. Toxics and infectious substances– Dangerous Goods Class 6**

Class 6 chemicals are toxic to people. Toxicity varies and care should be taken when using any Class 6 chemical. It is mandatory to consult the relevant MSDS and use the personal protective equipment and administrative controls recommended.

#### **7.7. Spills**

Chemical spills must be cleaned up immediately. Inform staff if the spilled material is of a hazardous nature, which can be determined from the appropriate MSDS available in the laboratory or on ChemAlert. Specific information on spills clean-up methods should be obtained from the MSDS.

Prior to commencing the clean up ensure you are wearing the appropriate personal protective equipment.

It should be noted that even small spills of volatile materials in a confined space could generate significant concentrations of fumes and respiratory protection may be needed.

As a guide to spill clean up the following steps should be taken:

1. Containment – contain the spill by bunding around it.
2. Absorption – as a general rule:
  - Organics – use vermiculite as the absorbent
  - Acids or alkalis – first neutralise then absorb with paper towel, cloth or mop
  - Mercury – cover with sulphur then remove with a dustpan and broom before placing in a sealed container.
3. At the completion of the spill, clean up. All absorbent or contaminated material should be placed in sealed containers, labelled and disposed of as contaminated waste to the UOW waste store.

If chemicals are spilled on the skin wash skin immediately regardless of the substance involved by referring to the MSDS for first aid information.

## **8. Program Review**

As part of a continuous improvement system this program shall be reviewed on a regular basis or upon recommendation of the Faculty of Engineering WAS.

## 9. Related Documents

Australian Dangerous Goods Code  
Australian Government Press

Australian Standard AS2243:1:2005  
Safety In Laboratories Part 1: General  
Standards Australia

Australian Standard AS2243:2:2006  
Safety in Laboratories Part 2: Chemical Aspects  
Standards Australia

Australian Standard AS1940:2004  
The storage and handling of flammable and combustible liquids  
Standards Australia

Australian Standard AS2243:4:1998  
Safety In Laboratories Part 4: Ionising Radiation  
Standards Australia

Australian Standard AS2243:8:2006  
Safety In Laboratories Part 8: Fume Cupboards  
Standards Australia

Australian Standard AS2243:10:2004  
Safety In Laboratories: Storage of Chemicals  
Standards Australia

NSW Occupational Health and Safety Act (2000) and Regulations (2001)

NSW Government Press

NSW Radiation Control Act (1990) and Regulations (1993)

NSW Government Press

University of Wollongong Policy: Clothing and Protective Equipment Guidelines

University of Wollongong Policy: Emergency Management Procedures

University of Wollongong Policy: Field Activity Guidelines and Procedures

University of Wollongong Policy: Laboratory Safety Guidelines

University of Wollongong Policy: Radiation Safety Guidelines

University of Wollongong Policy: Working with Hazardous Substances Guidelines

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### 10. Final Assessment Page

It is a requirement of the civil and mining engineering laboratories that users clean up their work area, dispose of unwanted samples and chemicals and return any equipment or literature borrowed during the course of their work. This page must be signed by the Civil and mining engineering technical staff and submitted to the relevant Academic supervisor.

**Student Name**.....

**Date**.....

**1. Has the user cleaned up all work areas including benches, cupboards and storage areas?**

**YES/NO**

**2. Has the user removed or disposed of appropriately all samples, both solid and liquid?**

**YES/NO**

**3. Has the user returned all literature/equipment borrowed?**

**YES/NO**

**Signed**:.....

**Date**:.....