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Geography Department

# Safety Handbook

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*This is an uncontrolled document. Check the online version for the most up to date information.*



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This Safety Manual is for students, staff, and researchers working in the College of Science. Please read it carefully and follow the guidelines to protect your safety and the safety of others.

The manual is not intended as a complete guide on safety matters, and any exclusions are not excuses for unsafe practices.

In all cases, individual supervisors are ultimately responsible for site work practices.

When you have read this manual, complete the Sign-off form at the back of it, and return it to the departmental safety officer.

# Emergency Procedures (College of Sciences)

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## Emergency Phone Numbers

Fire, Ambulance, Police	111 (Remember to dial 1 for an outside line)
Campus Security (24 hours, 7 days a week)	6111
Campus Security from an external line	364 2111 or FREE PHONE: 0800 823 637
Doctor (Student Health) 8:30 am – 5:00 pm	6402
Defibrillator Service	7777
Works and Services	6400
University Safety Officers:	
Graham Hodgson	8795
Sharon Butt	6936

## Fire

Fire is one of the greatest potential hazards in the building and every effort should be made to avoid starting one. Examples of fire hazards include:

- ◆ bunsen burners left on
- ◆ water baths running dry
- ◆ self-igniting chemical mixture
- ◆ poorly maintained electrical equipment
- ◆ lack of precautions when handling flammable solvents.

The building is protected by an Automatic Sprinkler Fire Alarm System. A serious outbreak of fire will activate the ceiling sprinkler head above the fire, releasing a continuous spray of water. It will also activate the fire horns and automatically notify the Fire Brigade.

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## Be Prepared

How you react in a fire will depend on how well you have prepared yourself **before** it happens.

- ◆ Make sure you know:
  - where the exits from your work area are
  - where the nearest alarm is
  - where the assembly area is, and how to get there.
  - where the hose reels and extinguishers are, and how to use them.
- ◆ Know what to do if you discover a fire (on page 5).
- ◆ Be familiar with your department's evacuation procedure.
- ◆ Remember:
  - **Never** use a lift during a fire as it could stop at the floor where the fire is.
  - Close all doors behind you on the way out and do not re-enter the building until the Fire Service has told you it is safe to do so.
  - Before opening a door, feel it with the back of your hand. **If it is hot, leave it closed** and use another escape route. If it feels normal, brace your body against it and open it slightly. Be prepared to slam it shut if heat or smoke rushes in.
  - If you get trapped in smoke, crawl low at floor level where the clean air will be.

**Be prepared to raise the alarm.** People often have a natural reluctance to cause a disturbance, but serious fires have developed from a failure to inform the Fire Service quickly, and to evacuate the building while the opportunity existed.

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## If You Discover a Fire

Prompt action will often prevent a **small** fire from becoming a major disaster. Smother flames with a wet towel or even a notebook.

Call "Fire!" to alert other people in the area.

If the fire is small, use an extinguisher if it is safe to do so. If the fire is not going out, raise the alarm with the nearest fire alarm to begin evacuating the building.

**Note:** a small fire is defined as a fire that is smaller than one in an office wastepaper bin. For anything bigger, raise the alarm to begin evacuating the building.

**Only if conditions permit and it is safe to do so, should anyone attempt to extinguish a fire.**

## Fire Extinguishers

The following types of fire extinguishers are installed throughout the buildings. Become familiar with their location and recommended use.

Type	Location	Colour	How to Use	What to Use For
Dry Powder	Physical Lab: Middle of the wall under the whiteboard.	Red with a white band.	Remove pin or break seal, squeeze handle.	General purpose, especially solvent fires.
CO2 Gas	Engineering workshop near the rear exit and in the middle of the corridor on the sixth floor.	Red with a black band.	Remove pin or break seal, squeeze handle.	General purpose, especially electrical fires.
Hose Reels	Link block each floor and middle of the corridors in Lab and Staff blocks.		Turn on stop valve, turn nozzle and control water flow.	Paper, rubbish, wood.
Blankets	In the civil defence locker, ground floor link block.	Use to smother flames if a person's clothing is on fire. <b>Do not roll</b> a person in a blanket if their clothes are on fire, as the blanket could act as a chimney and move the heat and smoke towards the face.		

### Used Fire Extinguishers

When an extinguisher has been used, immediately notify the departmental safety officer who will arrange to have it recharged.

A used extinguisher should be laid on its side on the floor.

## Chemical Hazards

Contact the lab or workshop technician **immediately** for advice in the event of:

- ◆ a major spillage
- ◆ a cylinder or apparatus leaking a hazardous gas
- ◆ a reaction that has become potentially explosive
- ◆ any such sudden emergency.

If you are unable to contact them, call the Fire Service on 111 from an area not affected by the hazard, and activate the building alarms.

**Note:** Current safety contacts can be found on Geography's home page under Safety Information.

An approved breathing mask, a drench shower unit and sand (to use for spillages), is available from the Physical lab.

## Gas Leaks

If you discover a gas leak:

- ◆ Shout a warning.
- ◆ Extinguish any flames and check that the nearest gas isolator switch is off.
- ◆ **Do not** switch off, or on, any electrical switch (due to the risk of sparking).
- ◆ **Do not use any electrical equipment, including cellphones and hand held radios.**
- ◆ **Do not activate the building alarms.** Initiate evacuation by giving verbal instructions to the occupants.
- ◆ Move away from the contaminated area.
- ◆ Contact the building or floor warden.
- ◆ Telephone the Fire Service on 111 from an area not affected by the gas leak, and follow their instructions.
- ◆ Move anyone overcome by fumes into fresh air and give rescue breathing if necessary.

## Earthquake

In a strong earthquake take immediate cover under any solid structure, such as a table, bench, or doorway. If you are outside, keep clear of buildings.

If you are inside:

- ◆ Stay inside.
- ◆ Move away from windows and glass partitions.
- ◆ Move clear of large light fittings and other suspended items.
- ◆ In libraries, move clear of book stacks.
- ◆ If possible, shelter under a desk, stand in a doorway, or lie beside a solid structure (such as beams or walls) and hold on.

Wait for instructions from the warden or rescue teams.

### **When the shaking stops:**

- ◆ If a fire has started, put it out if possible.
- ◆ Check for electrical and gas hazards. Turn off all electrical switches and gas taps.
- ◆ Assist anyone near you who is injured.
- ◆ Stay inside, there may be worse hazards outside.
- ◆ Wait for instructions from the warden or rescue teams.

### **If an evacuation is initiated:**

If the fire alarms sound, or the building is unsafe, or instructions are given, leave the building. Follow instructions from the rescue team leader or the building warden. Go to the assembly area as directed.

## **Accidents, Incidents and Critical Incidents**

An accident is an event that causes a person to be harmed, or could, in different circumstances cause a person to be harmed. An incident is a "near miss" accident that generally doesn't cause injury.

When an accident happens:

1. Give first aid assistance (on page 8) if required, and do not hesitate to call an ambulance (111 and/or 6111) if the injury is serious.
2. Contact departmental safety personnel for guidance. Current safety contacts can be found on Geography's home page under Safety Information.
3. Keep unnecessary people away from the scene.
4. If the accident involves serious harm, do not interfere with the accident scene except to treat an injured person or prevent further injury or serious damage to property.

Every accident and incident must be reported to the departmental safety officer as soon as possible after it occurs. This assists the university to meet its requirements under the Health and Safety in Employment Act to record and investigate accidents, and remedy or monitor hazards. Failure to report accidents is in breach of university regulations and may compromise ACC support and compensation.

If a hazard was involved, also fill out and return the Hazard/Incident Alert form.

**A critical incident** is an unforeseen and traumatic crisis event which could cause severe stress to the person who witnesses it. Examples include workplace violence, witnessing a fatality or near fatality, bomb threats, assault, explosions, etc. If a critical incident involves injury, follow the steps above. In all cases, contact the University Security Centre<sup>1</sup> and inform them of the situation.

## **First Aid Assistance**

In the case of a medical emergency or serious injury:

- ◆ Ring 111 and request an ambulance.
- ◆ If you suspect a heart attack, also call the University Cardiac Arrest number 7777 **immediately** and request defibrillation.
- ◆ For professional first aid help, phone:
  - 6402, Student Health & Counselling Service, Monday to Friday 8:30 am – 5:00 pm.
  - 6111, Campus Security, after hours.
- ◆ Give first aid until the arrival of an ambulance or a qualified medical expert.
- ◆ Contact a member of staff with a First Aid Certificate.  
See the central First Aid register on the UC staff intranet.

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<sup>1</sup> On campus, phone 6111. Off campus, phone 364 2111, or by mobile FREE phone 0800 823 637.

## Dealing with Blood and Moist Body Substances

There are recognised risks from coming into contact with moist body substances (blood and other body fluids). Several diseases can be contracted from infected blood or body fluids, including AIDS and hepatitis B.

To keep safe, follow this rule: don't touch until there is a barrier between you and the spill. Use disposable gloves when you assist the patient, and when you clean up. Be particularly careful if you have open cuts or unhealed wounds on your hands or lower arms. Whenever possible, get the patient to deal with their own blood spill.

## Chemical Exposure to Eye

Wearing appropriate eye protection (on page 20) greatly minimises the risk of injury due to chemical exposure to the eye, but if it does occur:

1. Immediately flush the eye using the closest eye wash.
2. Hold the eye open as wide as possible while flushing for at least 15 minutes.
3. Seek immediate medical treatment and check the MSD sheets for information about the chemical.

## First Aid Facilities

First Aid boxes, clearly identified by a standard First Aid sign, are located

- ◆ near the door just inside the Physical lab
- ◆ near the door of the link block first floor
- ◆ in the Map library
- ◆ midway along the sixth floor hallway
- ◆ in both vehicles, and in the boat.

Portable kits are available from the Field store.

Stock levels are checked regularly, but please report any deficiencies to the departmental safety officer.

Accident or Serious Harm forms are in each first aid kit, and must be filled in for each accident involving injury. Give the completed form to the departmental safety officer. Failure to do this is in breach of university regulations and may compromise ACC support and compensation.

# Evacuation Procedures

Make yourself aware of the evacuation procedures before you need to use them.

In the case of an emergency, follow the instructions of the floor or building wardens.

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## Lecture Theatres

Lecturers in charge of classes are responsible for the evacuation of their rooms, and for reporting to the Building Warden. Follow the instructions on the Rostrum notice.

## Undergraduate Laboratories

Students should leave via the main entrance in the link block.

Staff in charge of undergraduate laboratories instruct students to stop their work, turn off burners, turn off electrical gear, and shut windows and doors.

If the fire prevents leaving by the designated exit, use the exit at the other end.

After leaving the building, assemble across the road on the Forestry lawn.

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## On Hearing the Fire Alarm

When you hear the fire alarm, leave the building immediately.

### If it is safe to do so:

- ◆ close down any potentially dangerous processes or machinery
- ◆ turn off all electrical equipment which cannot be left unattended
- ◆ turn off all bunsen burners
- ◆ turn off the gas isolation valve switch if there is one in your department
- ◆ close the windows.

1. Close corridor and laboratory smoke doors behind you to prevent draughts.
2. Follow the directions of the floor warden and leave the building using either the stairs in the link block or the south–end of the building. Assemble in the area in front of the Commerce and Forestry buildings if exiting from the staff block, or in front of the Psychology/Sociology link block in the car park if exiting from the lab block. Do not gather too close to the building.

Do not use lifts. They may fail in an emergency, or open at the floor the fire is on.

The first staff member or research student to reach the phone on the level one south end landing must follow the instructions by the phone, including phoning the Fire Service.

### **People with Disabilities/Injuries**

In an emergency, if a person is unable to leave the building by stairs, leave them with someone either near the main lifts or south end landing and contact the building warden or fire service immediately on reaching the south–end exit.

Do not remove an unconscious or seriously injured person unless they are in immediate danger of further injury by fire/falling debris, etc. Stay with them and send for help. Give first aid and get someone to call for an ambulance.

If you are disabled and likely to need assistance in an emergency, contact the Floor Warden or Building Warden of any building that you use regularly and ask for your details to be recorded in the Building Assistance Register.

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## **Floor Wardens**

Building wardens are responsible for their building when they are present and have overall charge of the building in an evacuation.

Floor wardens are responsible for their floors when they are present.

Staff and research students take over these role (on page 12)s when the appointed wardens are absent.

A list of wardens is maintained on the UC staff intranet.

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## Floor Wardens' Duties

The prime concern of floor wardens during an emergency is saving life.

On hearing the alarm:

1. Initiate evacuation, instructing all personnel to leave the building.
2. As you check the floor, collect and wear the warden's armband.
3. Ensure, as far as possible, that your floor/area is evacuated. Check toilets.
4. Ensure that all smoke-stop doors on the way to the exit are closed.
5. Note the location of persons remaining on the premises. This might include disabled or injured persons, or fire control personnel.
6. When you reach level one at the south-end, slide your floor's indicator across on the evacuation board to indicate that your floor is clear.
7. Report to the Building Warden, and give details of anyone still in your area.
8. Remain at the evacuation control point with the Building Warden for further instructions.

Only if conditions permit and it is safe to do so, should anyone attempt to extinguish a fire.

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## Building Wardens' Duties

1. Ensure that the Fire Service has been notified.
2. Report to the south end landing on level 1 where the panel is the ground floor link block evacuation box. Retrieve vest and clipboard.
3. Wait for the reports from the floor wardens.
4. Report to the Fire Service when they arrive.

During an emergency the building warden has absolute authority until the emergency service arrives.

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# Departmental Safety Rules

These departmental safety rules apply to all staff, research workers and students unless otherwise specified.

1. Always wear safety glasses and laboratory coats in laboratories and workshops except for those areas that are officially exempted.
2. Wear proper footwear, i.e., that protects the whole foot, in all laboratories and workshops.
3. Smoking is prohibited.
4. Eating and drinking is prohibited in laboratories.
5. Do not work with hazardous or toxic materials without taking the proper precautions. Consult your supervisor or safety officer for information about the appropriate precautions.
6. When there is no authorised person in a laboratory or its writing up room, the laboratory or corridor door must be locked.
7. Non-authorised persons may not be in a laboratory except under the direct supervision of an authorised person.
8. It is illegal to work in an office, laboratory, or workshop with the major access door locked.
9. Undergraduate students are not permitted to work in class laboratories outside the prescribed hours.
10. Keep the visibility windows in the doors clear of coats or coverings.
11. Students and staff are not permitted to carry out experimental work in a laboratory unless a second person is within call. No student may work in a laboratory after 11 pm without written permission from a supervisor. Do not attempt unauthorised preparations of any substances.
12. Students are not permitted to carry out electrical wiring on equipment or extension cords.
13. All flammable material, except when in use, must be stored in the yellow storage cabinets to comply with the HSNO Act.
14. Learn to use the first aid equipment provided, so that you can use it with confidence in an accident.
15. **In the case of an accident:**
  - Ring Student Health Services (ext 6402) if medical attention is required.
  - Ring 111 immediately if the injury is serious, or if there is no answer from Student Health Services.
16. Report all accidents to the departmental safety officer immediately. This is particularly important when the circumstances leading to the accident are likely to recur.

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## After Hours Access

During a normal working day the main doors are electronically locked outside the hours of 7.30 am and 6.00 pm (5:30 pm outside term time) Monday to Friday.

Research workers and students must consult with the departmental secretary regarding access to the building and issuing of keys.

Students must carry their Canterbury Card at all times. Refer to Building Access (on page 17) for information about experimental work conducted outside normal working hours.

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## Equipment Maintenance

Keep all electrical equipment in a clean usable condition. Do not leave it in fume cupboards.

The law requires regular inspection of electrical equipment. If you find any equipment to be faulty, or if the re-inspection date has passed, immediately unplug and label the equipment as faulty or out of date and notify the departmental safety officer.

Also report any equipment which needs servicing, such as magnetic stirrers, hot plates, heating mantles, balances, ovens, vacuum pumps, etc.

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## Service Breakdowns

Report any breakdowns in general services to the departmental safety officer.

If a serious breakdown occurs or if a potential hazard is involved, for example, leaking gas taps, contact Works and Services (ext 6400) immediately, or if it is outside normal work hours, Security (ext 6111).

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## Special Analyses

Students should consult their supervisor if they wish to have soils and samples analysed.

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## Leaving Apparatus on Overnight

Experiments left running must be labelled with the operator's name and details of the materials in use. Switch off any electrical equipment such as ovens, water baths, and stirrers, which are not required for immediate use.

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## Procedure on Completion of Research Work

Once bench work has been completed, students (in consultation with their supervisors) must:

1. Clean up their laboratory work bench including all fume cupboards used.
  2. Return chemicals and glassware to the store.
  3. Return any keys issued to them.
  4. Notify the laboratory technician.
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## Material Safety Data Sheets

Anyone using a new chemical that they or their colleagues are unfamiliar with must check out its hazardous nature and obtain a printout.

MSDS sheets are available from Chemwatch (<http://chemwatch.canterbury.ac.nz>), or through the departmental web page. Other sites are [apschem.com.au](http://apschem.com.au) and [www.sigmaaldrich.com](http://www.sigmaaldrich.com).

If in doubt, contact the laboratory technician.

Under the Health and Safety in Employment Act access to a computer database such as Chemwatch for MSDS data is not considered a substitute for keeping printed copies of MSDS in the laboratory.

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## Smoking

The university is a smoke-free environment. Smoking is prohibited in every building and field station used by the university.

# Building Access

## Normal Working Hours

The main doors and the corridor doors of the department are electronically locked outside the hours of 7.30 am and 6.00 pm (5:30 pm outside term time) Monday to Friday.

## Night Time, Weekends, or Holidays

The doors of the building are locked throughout all holidays, and every night between 5:30 pm and 8:00 am.

## Working Outside Normal Hours

Any inherently hazardous operations must never be carried out alone. Potentially hazardous work should only proceed when informed people are in the vicinity; nights and holidays should be avoided, but if this is not possible, at least one other person should be within easy call, and know that the operation is being performed.

All equipment not in use must be turned off at the power outlet during the night, weekend, etc.

## Visitors and New Staff

All new staff, Ph.D., M.Sc., Hons students, research assistants and visitors must report to the departmental secretary, on their initial arrival in the building. They will need to provide the following information:

- ◆ their departmental staff member contact
- ◆ work location in the building
- ◆ type of work they will be carrying out, for example, laboratory, office, instrumental, computer
- ◆ any first aid training or other specialised skills
- ◆ any disabilities which may affect their exit from the building in an emergency.

The following will be provided:

- ◆
- ◆ a copy of the Departmental Safety Handbook, if laboratory bench work is to be carried out. The manual must be signed for, and read and signed before work commences.

Staff who fail to register their students, research assistant or visitors with the departmental secretary must bear the responsibility and liability for any accident, hazard, instrumental and computer problems that may occur.

**Adult visitors** to laboratories and workshops must be safe-guarded as appropriate, for example, with eye protection in a designated eye protection area. The responsibility rests with the host.

**Contractors** must liaise with the departmental safety officer before they commence work within the department. If there are contractors or cleaners in your area check that they have been cleared.

**Children** are not permitted in laboratories, workshops, or the library, even if accompanied by a parent who is a staff member.

Under no circumstances may keys issued to an individual be lent to someone else. Failure to comply with this rule in terms of restricted access laboratories is in breach of national Health and Safety regulations, and will result in disciplinary proceedings.

# Hazard Identification and Personal Protection

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## Potentially Hazardous Situation

Staff or students who identify a hazardous situation or practice must:

- ◆ report it to the departmental safety officer, or a member of the Safety Committee, and
- ◆ complete a Hazard Form, (forms available from room 153 or UC staff intranet), and return it to the departmental safety officer.

This also applies to near miss incidents.

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## Hazard Identification

Supervisors and graduate students complete and sign Hazard Identification and Assessment forms (CSH1 to CSH3, where applicable) each year as part of the University's ongoing obligations under the Health and Safety in Employment Act.

Extra copies of the assessment forms, and the guides for filling them in, are available from room 153.

Completed forms must be returned to the departmental safety officer by their due dates.

### Dress

Always observe the department's safety rules on dress. Every person working in a laboratory, store, or workshop must wear:

- ◆ adequate town or walking shoes which protect the whole foot, i.e., not sandals
- ◆ a laboratory coat of at least knee length, or overalls as appropriate
- ◆ suitable eye protection and specially provided protective gloves, footwear, and specialised clothing when necessary.

Keep long hair properly confined to avoid getting it caught.

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## Eye Protection

There is always risk of serious eye injury in a laboratory containing glassware and/or chemicals.

You can minimise this risk by wearing appropriate eye protection in all laboratories **at all times**. You are at risk of serious injury from events in any part of the laboratory, so keep your safety glasses on even if you are not manipulating chemicals and/or glassware. Supervisory staff should be particularly vigilant in bringing risks to the attention of other staff, and ensuring that appropriate protection is provided and used.

It is a sad fact that many scientists have been blinded in laboratory accidents. Don't let it happen to you.

Simple safety glasses with shatterproof lenses and protective side panels are adequate for most laboratory situations.

Students who wear contact lenses are at further risk of injury. If chemicals enter the eye it is often difficult to remove contact lenses to allow thorough washing of the eye. Students who wear contact lenses should either wear prescription safety glasses in the laboratory, or wear full protective goggles.

Students who wear prescription spectacles should use clear framed safety glasses over their own glasses in the laboratory, or prescription safety glasses.

Appropriate protective glasses must also be worn where ultraviolet light is being used, for example, with photography, lasers or UV spectro-photometers.

All laser light sources are potentially dangerous. Never look directly into a laser beam, or a beam reflected from another surface. Laboratories housing analytical equipment fitted with a laser light source should display the standard "Caution/Danger Laser Beam" sign on the door.

Any procedure which requires that a laser beam be exposed must be performed by a suitably protected and qualified person, during which time a "No Entry" sign must be displayed on the door.

Also see Chemical Exposure to Eye (on page 9).

## Laboratory Coats

All students and employees (academic staff, laboratory staff and demonstrators) must wear laboratory coats when working with lab equipment.

Laboratory coats or other protective work clothing that has been worn in contaminated areas must not be worn in tea rooms, tutorial rooms, or lecture theatres.

## Other Personal Protection

Wear or use the appropriate protective clothing or devices whenever there is the possibility of injury or infection from mechanical or chemical sources. Personal protective equipment includes gloves, safety shoes, facemasks, and safety glasses (on page 20).

## Food and Drink in Laboratories

It is unsafe to consume food or drink in a laboratory for obvious safety reasons. Observe the following rules:

- ◆ Do not eat your lunch, or make tea or coffee, in a laboratory.
- ◆ Never drink from a beaker or flask. This practice has led to fatalities elsewhere.

- ◆ Do not store food in a laboratory refrigerator.
- ◆ Do not heat food in a laboratory oven or microwave.

### **Smoking**

Smoking is prohibited in the building.

### **Running in the Building**

Except in an emergency, do not run in the building. Collisions and slips are common causes of injury and potentially very dangerous.

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## **Report Concerns to the Safety Committee**

Anyone in the department can contact a member of the Safety Committee if they consider that there is a deficiency in current safety procedures, or that improvements could be made in certain areas.

The Safety Committee member may, after broader consultation, take the matter to the Chair of the Safety Committee. If the matter concerns a change in department policy, the Chair will convene a meeting of the Safety Committee to discuss the issue.

# Harassment

Harassment, including sexual and racial harassment, is any behaviour that is ongoing, and is embarrassing, intimidating, intrusive or offensive to the receiver.

If any staff or student feels that they are being harassed, they should report it to protect themselves, and other potential victims. Harassment is not tolerated in the university and is against the law.

Further information about harassment, and a list of people throughout the university who deal with harassment complaints, is available from the Registry.

Behaviour that is acceptable to one person may be offensive to another. Be careful in your dealings with the people around you not to cause offence.

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## Glassware

Glassware can contribute to a variety of accidents and injuries due to it breaking or leaking. The most common causes of major or minor cuts to the hands are:

- ◆ handling damaged glassware
- ◆ pushing glass tubing through a hole in the rubber stopper
- ◆ fitting flexible tubing to a glass tube or outlet.

Follow the guidelines below to prevent injuring yourself or others.

- ◆ **Cracked or broken glass**

Immediately repair or dispose of glass apparatus which is cracked or has jagged edges. Rinse it, and place it for disposal in the specially marked "Glass Only" waste bins.

- ◆ **Tubing**

When you are fitting tubing or pushing it through a rubber stopper, always use tubing of the correct size and a small amount of lubricant (glycerol and ethanol, or preferably water). Keep your hands close together as this will reduce leverage on the glass, which causes breakage.

- ◆ **Dirty glassware**

Rinse dirty glassware free of harmful chemicals before setting it aside to be washed.

- ◆ **Pipettes**

Never use mouth suction pipetting for any substances or solutions that could be injurious if it entered the mouth, for example, strong acids, alkalis, and solvents. Use one of the readily available and excellent mechanical-suction devices for pipettes.

- ◆ **Glassware under vacuum**

All glassware subject to vacuum conditions must be of the correct design and manufacture. Check it periodically for strain and damage. Always check glassware drawn "new" from store before use.

Strain checks and annealing, if required, can be carried out by the Glassblowing Workshop.

- ◆ Never use scratched glassware for vacuum work, nor thin walled glassware with flat sections such as standard conical flasks. Heavy walled buchner flasks are okay.

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# Electrical Equipment

Observe the following guidelines to ensure safety in the use of electrical equipment:

- ◆ Before you use any electrical equipment, make sure it has a sticker indicating that it has been electrically checked and the date recorded. If the equipment has no sticker, do not use it until it has been checked by a competent person – contact the departmental safety officer. Equipment must be clean before it is checked.
- ◆ If any electrical equipment is damaged, for example, by a water or chemical spill, do not use it. Arrange for it to be electrically checked immediately.
- ◆ Only authorised electronic or mechanical workshop staff may repair or modify equipment capable of being connected to the building electrical supply.
- ◆ All new and externally borrowed mains operated equipment must be inspected and approved by before it can be used.
- ◆ Works and Services staff carry out all work involving the electrical supply for the building, for example, fittings, fixed wiring, switchboards, etc.

When a circuit breaker has "tripped" on overload, an authorised person must check the circuit and its load before power is restored.

- ◆ **Electrical leads**

Always remove leads from the power outlet by pulling on the plug, not on the cable.

- ◆ **Electrical cables**

Keep cables off the floors to minimise hazards and to assist the cleaners. If you can't keep the cables off the floor, install a ramped cover over them to minimise accidents, and make it easier to move equipment.

- ◆ **Electric heaters, hair dryers, heat guns, and hot plates/stirrers**

- Never use "open bar" radiators or fan heaters in the building, especially in laboratories and stores. They are unacceptable fire and explosion hazards.
- Hair dryers and heat guns are equally hazardous in the presence of flammable solvents and should be used with extreme care.
- Modern hot plates and hot plate/stirrers are usually suitable for work with flammable solvents, but take care not to use those of older designs which could have open heaters under the top plate.

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## Gas Cylinders

Avoid mechanical damage to cylinders or their control valves: their destructive potential is unbelievable.

Before using a gas cylinder you must know and understand the properties of the gas in it (flammability, toxicity and chemical activity), and establish plans to deal with any emergency situation that might arise during its use.

Do not attempt to use a gas cylinder if you have not been instructed in its use. Make sure you are familiar with the procedures recommended by the suppliers.

Gas cylinders can be heavy. If you are small, or feel uncomfortable handling cylinders, seek assistance.

Always follow these safety precautions:

- ◆ Follow the department guidelines for storing and handling gas cylinders.
- ◆ Use appropriate methods to transport cylinders (on page 25).
- ◆ Although cylinders are painted in accordance with BS349 to indicate the gas they contain, do not rely on this alone. Check the official stamping on the cylinder or its label.
- ◆ You must use special precautions when using compressed (or liquefied) toxic gases such as chlorine, ammonia, etc. Contact the departmental safety officer before such cylinders are used in the department.
- ◆ Take special care when using carbon monoxide (CO), oxygen (on page 34), or acetylene (on page 35).
- ◆ Gas cylinders should **always** be turned off at the main valve of the cylinder when not in use.

## Transport a Gas Cylinder

Never move high pressure gas cylinders with regulators attached without first ensuring that the main valve is closed.

Never lift a cylinder by the cap, or drag it, or slide it along the ground.

Transport cylinders on a suitable hand trolley chained at the top and bottom and then supported or secured in the vertical position. Cylinders of liquefied gas (for example, ammonia, carbon dioxide, chlorine, nitrous oxide, acetylene) must be used vertically.

## Storage and Handling

Gas cylinders should **always** be turned off at the main valve of the cylinder when not in use.

- ◆ All gas cylinders must be securely chained or strapped in an upright position to a bench or wall. Free standing cylinders are not permitted. Do not use gas trolleys as stands.
- ◆ Never lift a cylinder by the cap, or drag or slide it along the floor. Take extreme care to not drop a cylinder.
- ◆ Do not store unconnected gas cylinders inside the building.
- ◆ Do not store or use compressed gases in unventilated areas.
- ◆ Keep the number of gas cylinders in a workshop or laboratory to a minimum, to minimise the fire and toxic risk.

- ◆ Use the BOC tag system. Ring BOC when cylinder is empty and arrange for delivery of a full one.
- ◆ Clearly identify full and empty cylinders and store them separately.
- ◆ Use the correct regulators and valves, and use them correctly. The valve outlets for combustible gases are screwed left-hand and those for non-combustible are screwed right-hand to avoid the dangers that could arise by the interchange of cylinders during use. Valve and regulators should be checked regularly by the technicians in charge of laboratories.

There are at least 20 different connections between gas cylinders and their regulators. These include right and left-hand threads, varying thread diameters and thread pitches. If you have any queries, consult with the mechanical workshop.

- ◆ Keep cylinders and valves away from possible contamination and **never grease them**. Oil or grease will ignite explosively in the presence of compressed oxygen. Do not use undue force in opening or closing a valve.
- ◆ Open the valve on a hydrogen cylinder slowly – too quickly can cause ignition due to static electricity.
- ◆ Never discharge the contents of a gas cylinder without a pressure control valve. Uncontrolled admission of a compressed gas to glass apparatus could result in a serious explosion and so a safety valve device must be fitted between the reducing valve and such apparatus. A gas cylinder must never be discharged completely — a positive pressure of about 2 atmospheres should be left to discourage leakage of air into the cylinder.
- ◆ Keep a cylinder key with the cylinder. Open main cylinder valves slowly to eliminate the possibility of compression heating causing and explosion within the regulator.
- ◆ Make all connections to flexible pipework securely with Jubilee clips or a similar fastening.

## Fume Cupboards

Fume cupboards **must not** be used for storage of chemicals. NZS 7203. The total amount of flammable liquids in use and solvent residues in fume cupboards must not exceed 2.5 litres. Keep fume cupboards clean and clear of all unnecessary bottles and apparatus. If a fume cupboard is found in an untidy and hazardous state, and is used to store chemicals, the laboratory will be closed down until the accepted standards are met.

Fume cupboards must be completely cleaned out every 12 months, and inspected by the laboratory technician. Performance checks are carried out regularly. Forms for monthly checks are installed in each cupboard, and the checks completed by the lab technician.

Keep the sash on the fume cupboard pulled down below the indicated mark at all times, except when setting up equipment. This allows an adequate air flow through the cupboard.

Direct any queries about the suitability of a fume cupboard for a specific operation to the laboratory technician or a member of the Safety committee.

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## Fridge/Freezers

It is dangerous to leave unknown substances in flasks for other people to find. Always label containers clearly with:

- ◆ the date (substance to be kept for a maximum of three months only)
- ◆ the name of the substance
- ◆ the name or initials of the student.

A notice informing students of this procedure must be put on all fridge/freezers, and the fridge/freezers checked every three or four months.

Clean-ups are to become a requirement in the completion of a student's degree training.

During the clean-up days, all fridges and freezers are emptied, defrosted and cleaned. Only correctly labelled chemicals, and chemicals of a similar class, are replaced in the fridge/freezer.

# Safety in the Use of the Laboratory

Each laboratory has a manager who is responsible for providing information to new users, and ensuring that safety requirements are met.

Laboratory managers control all activities in their designated areas of responsibility. That includes administering and ensuring compliance with departmental, university, and government regulations.

Failure to comply with specific health and safety instructions from a laboratory manager will result in the offender being banned from the facility.

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## General Laboratories

Always maintain good housekeeping in the laboratory. It is an essential part of basic laboratory practice and safety.

- ◆ Dispose of unwanted materials immediately.
- ◆ Clean up all spills right away.
- ◆ Maintain adequate working space.
- ◆ Keep floors and exits clear of apparatus and materials.
- ◆ Before leaving the laboratory, wash your hands thoroughly, remove your laboratory coat and any other safety equipment.

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## Safety Inspections

Safety Committee representatives inspect the laboratories every six months.

The safety officer circulates the inspection reports to group leaders, who are then responsible for the implementation of the findings.

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## Annual Clean Up

A thorough clean-up of all laboratories and instrument rooms in the department takes place in November each year. The date is arranged with the laboratory technician, who is then available to supervise the return of equipment and chemicals to the stores, arrange for the repair of broken equipment and laboratory fittings, and the disposal of chemicals.

Each group ceases work for at least one full day to carry out the clean-up.

The Safety Officer and group leaders inspect, and ensure that the following points receive close attention:

- ◆ Shelves, cupboards, drawers, and fume cupboards are thoroughly cleaned.
- ◆ Each bottle of reagent is examined and a decision made to keep, relocate, combine, rebottle, dispose of it, or return it to store.
- ◆ Refrigerators and freezers are cleaned out and defrosted.
- ◆ Arrangements made for the recovery or disposal of residues.
- ◆ Surplus glassware is returned to the store and broken items submitted to the glassblowers for repair.
- ◆ Electrical and other general items of laboratory equipment are cleaned, examined for faults, and sent to the workshop for repair, if necessary.
- ◆ Faulty switches, power points, light fittings, and any other laboratory fittings in need of maintenance, are isolated from the mains, labelled as faulty, and reported to the workshop.

Representatives of the Safety Committee inspect each laboratory at regular intervals.

# Safety in the Use of Chemicals

Many chemicals cause poisoning if they are breathed, ingested, or come into contact with the skin. Some chemicals, if improperly handled, cause fire or explosion.

- ◆ Make sure you know the hazards of, and the control procedures for, the chemicals that you use.
- ◆ Be familiar with the labels and pictograms used in chemical classification (on page 50).
- ◆ Memorise the emergency safety routines and know where to find firefighting equipment and the nearest large sink and eyewash stations.
- ◆ Always use fume cupboards for experiments using dangerous chemicals.
- ◆ Observe the department's guidelines for safe use of chemicals, including their transportation, storage, and disposal.

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## Use and Transport of Chemicals

### Responsible Ordering of Chemicals

To prevent its stocks of hazardous, but no longer required, chemicals building up over the years, only order the minimum amount needed for the work in hand. For example, if you need 10 mL of a solvent, get it from a colleague rather than obtaining a large volume.

### Label Containers

Each container must be clearly labelled with the name of its current contents. Containers should never carry more than one contents label.

Any container that has unlabelled contents should be taken to the Chemistry Issue Store for disposal. Unlabelled containers are the responsibility of the laboratory's supervisor.

## New Hazardous Chemical or Procedure

If you are using dangerous materials it is your responsibility to warn relevant personnel of the potential hazard.

Check with your supervisor or the Safety Officer before you obtain a new hazardous chemical or institute a new hazardous procedure. You will need to complete an Unusually Hazardous Substance Form (CSH2) (available from room 154 or the Chemistry webpage), and return it to the laboratory technician. You must also devise a suitable hazard control procedure. Obtain and study the relevant Material Data Sheets and keep them near your workspace for ready consultation.

**Note:** Under the Health and Safety in Employment Act, access to a computer database such as Chemwatch for MSDS data is not considered a substitute for keeping printed copies of MSDS in the laboratory.

## Highly Toxic Volatile Materials

Take special precautions with highly toxic volatile materials, for example, HCN, and with large quantities of flammable solvents.

Never use naked lights or non-spark-free electrical appliances near flammable or explosive solvents.

Do not carry out experiments involving quantities of flammable solvents or any other hazardous material or procedures outside normal working hours (8.30 am – 5.00 pm).

If you have to carry out a hazardous procedure, even during normal hours, make sure that your colleagues know what you are doing.

## Transport of Chemicals

The following substances **must not** be carried in the passenger lifts.

- ◆ bulk chemicals and potentially hazardous chemicals in any quantity
- ◆ liquids of any kind in quantities greater than one litre (unless the 4 litre red safety containers are used)
- ◆ more than 4 kg of any non-hazardous solid
- ◆ strong acids and bases, volatile solvents, inflammable liquids and toxic solids (these are banned in any quantities from the passenger lifts)
- ◆ large gas cylinders and filled cryogenic dewars.

Make alternative arrangements with stores staff to transport them in the goods lift. Use a winchester carrier to move all quantities of acids, caustic, flammable or dangerous liquids to and from laboratories and stores in the goods lift.

Never carry a winchester by the neck. Always use a winchester carrier if you need to move a winchester any distance.

If you need to move chemicals across the campus, take extra care to prevent accidental dropping, toppling, spillage, or contact with people. Make sure that containers are securely sealed and protected from bumps or falls. Choose routes clear of obstacles and large groups of people.

Also see Transport of Cryogenic Material (on page 32).

### **Transport of Cryogenic Material**

- ◆ Never transport liquid nitrogen via the staircase.
- ◆ You can carry up to one litre of liquid nitrogen in a covered dewar flask. Carry volumes larger than one litre in containers secured on trolleys.
- ◆ If the material has to be transported between floors, use the Goods Lift.
- ◆ If you must use the passenger lifts, send the material unaccompanied.
  - This will require two people, one to load the dewar on a trolley into the lift, and one to receive it on the right floor.
  - Attach a label to the trolley to warn would-be lift users not to use the lift until the trolley has been removed by the user. The attached notice should be a full A4 page size stating "DANGER, DO NOT ENTER THE LIFT".

## Chemical Spills

To avoid accidents, spillage of chemicals on benches or floors must be cleaned up immediately, irrespective of whether the chemicals are dangerous or not.

Acid and alkali solutions must be neutralised before cleaning up. Mercury is particularly toxic and should be sucked up with a capillary connected to a water pump and the area then treated with a wash of calcium hydroxide and flowers of sulphur mixed to a thin paste with water.

**For small spills** (up to 5 litres of liquid) you can use Universal Sorbent Pillows for the control and pickup of hazardous or problem liquids. The pillows are found in the centre of the corridors. You can also use sand or Zorbant. Zorbant spill kits are located by the entrance door and below the fume cupboard in the lab. To use:

1. Set the container upright.
2. Place an adequate number of hazard pillows, or amount of sand or Zorbant, directly on to the spill to pick up or contain the liquid.
3. Allow 5 to 10 minutes for complete saturation.
4. Using rubber gloves, put the pillows or sand into plastic bags and seal so escape of volatiles is kept to an absolute minimum.
5. Notify the departmental safety officer and the laboratory technician.
6. Deliver the plastic bags to stores, who will arrange for the university chemical waste disposal contractor to pick up.

After hours, put the pillows, sand, or Zorbant in an operating fume cupboard which is not being used, advise the storeman and take to stores in the morning.

**If a major spillage of a dangerous chemical** occurs, evacuate the immediate area and seek assistance from the Safety Officer or

- ◆ the laboratory technician
- ◆ the workshop technician
- ◆ the Chemistry safety officer or technical manager.

If no staff members are immediately available, dial 111 (dial 1 first for an outside line) and ask for the Fire Service.

Do not attempt to contain the spill without the appropriate protective equipment. Emergency life support apparatus are located in the centre of each floor. The apparatus is not to be used to contain the spill, but to aid in emergency egress from the laboratory.

Provide the appropriate MSDS form to the Fire Service when they arrive.

Also see Accidents Involving Chemicals (on page 39).

---

## Storage of Chemicals

Follow the department's guidelines about the storage of chemicals, to minimise the risks and to comply with the HSNO Act, 1996.

- ◆ Store bottles of oxidising and dangerous acids in a plastic tray.
- ◆ Do not store strong acids close to solvents.

- ◆ Store all flammable chemicals, unless in actual use, in the yellow storage cabinets. All flammable chemicals must be stored overnight in these cabinets.
- ◆ Do not store bottles larger than one litre on shelves above eye level.
- ◆ Do not store Winchester bottles (empty, or containing liquid) on the floor.
- ◆ **Never** store materials in a fume cupboard.
- ◆ Always store the following chemicals in a "safe" cupboard, **not** on laboratory shelves:
  - cyanide
  - arsenic compounds
  - barbiturates
  - mercury salts
  - strychnine
  - pyridine.

Never leave unlabelled materials anywhere at any time.

---

## Carcinogens

Always make every effort to find an alternative chemical which is not a carcinogen.

When handling carcinogens, always use personal protection to prevent any absorption through your mouth, lungs or skin.

Store carcinogenic substances as follows:

- ◆ Place containers in a polythene bag and seal the bag with sellotape.
- ◆ Label the bag clearly "CARCINOGEN" or "SUSPECTED CARCINOGEN".
- ◆ Store the bag away from other chemicals.

Also see Hazardous Chemicals (on page 34).

---

## Oxygen

Ensure that oxygen cylinders are shut off securely when not in use, and that there are no leaks in an "oxygen system" when in use. The risk of fire is considerably increased by an oxygen enriched atmosphere.

---

## Hazardous Chemicals

A large number of chemical reagents and solvents are now known to be capable of causing cancer (carcinogens) or birth defects (mutagens). While a detailed list of such substances is available in the Chemistry Department, a summary of the more common compounds is listed below:

- ◆ Compounds of chromium (including dichromates), nickel, cadmium, cobalt, manganese and arsenic; lead acetate.

- ◆ Chlorinated hydrocarbons, for example, carbon tetrachloride, trichloroethylene, chloroform, 1.1.2 trichloroethane.

Note that while the solvent 1.1.1 trichloroethane, known as 'chlorothene NU' or 'Genkalene', is not on the list, exposure to this material should in any case be kept to a minimum due to its chemical toxicity. This toxicity is, however, considerably less than that of other common chlorinated hydrocarbons such as carbon tetrachloride, which is particularly dangerous.]

- ◆ Benzene, aniline and aniline salts, formaldehyde ('formalin'), 'Rhodamine B' (a dye used in some dye lasers).
- ◆ Organic nitroso compounds, and naphthylamines in particular, should be handled with extreme care.

If you are using unfamiliar chemicals, remember that as well as checking for carcinogenic activity you should check the acute chemical toxicity of these in a reference book such as Sax 'Dangerous properties of Industrial Materials' (see copies in the Physical Sciences Library). For example, cadmium compounds and carbon tetrachloride are both toxic as well as carcinogenic.

**Do not become careless in handling carcinogenic chemicals.** The onset of the cancer may occur 20 years or more after the exposure to the chemical.

---

## Acetylene

Particular care is required when acetylene is used because of its ability to form shock-sensitive explosive acetylides with copper, silver salts and metals.

Never let the pressure in any piped acetylene system exceed 1.6 bar, and make sure that the system is fitted with a flame arrester. If other gases are involved, use non-return valves.

A heavy blow on an acetylene cylinder can ignite the contents as a result of adiabatic compression and the cylinder may explode sometime later if action is not taken immediately. Those responsible for the use of acetylene must know the emergency routines to follow if the cylinder starts to warm up.

---

## Hydrofluoric Acid

Hydrogen fluoride (HF) gas and its aqueous solution, hydrofluoric acid, is strongly corrosive and penetrates glass, metal, leather and natural rubber (but not PVC). Not surprisingly, it can cause severe burns to skin, eyes and other mucous membranes, including the respiratory tract, through skin exposure and inhalation.

Burns from concentrated solutions are painful immediately, but burns from dilute solutions (< 20%) may initially be relatively pain-free which may lead to a delay in treatment. This is dangerous as HF penetration of the skin or other tissue can affect calcium levels in the body and this can be life threatening. Solutions of concentrations as low as 0.1% are designated as hazardous substances.

The MSDS must be easily accessible and a hardcopy mini MSDS located where HF is used.

Never work with HF unless:

- ◆ you have completed HF awareness training
- ◆ there is an eyewash station in the immediate area, and an emergency shower within 10 metres

- ◆ you have appropriate eye and skin protection. Refer to the MSDS for details. Always check the integrity of the personal protective equipment before you use it.
  - **Gloves:** Wear neoprene gloves of more than 0.3mm thickness with disposable gloves under them. Always rinse gloves under water before you take them off. Never wear cotton gloves under the neoprene gloves.
  - **Apron:** Wear a neoprene apron over a laboratory coat. Tyvek does not offer adequate protection.
  - **Visor:** Wear a full-face visor over safety glasses.

### **Control Measures**

- ◆ Carry out operations using HF in a fume cupboard to ensure that airborne concentrations of HF do not exceed the ceiling value of 3 ppm.
- ◆ Purchase HF in 500 mL safety pourer bottles supplied by Merck to ensure its safe handling and reduce the risk of spills. The safety pourer system combines a special bottle, spout and ventilated screw cap, which reduces the risk of leakage when storing and handling the acid.
- ◆ Purchase 2.5 L safety pourer containers if larger volumes of HF are required.
- ◆ Ensure that all containers are labelled according to the Hazardous Substance Regulations. The minimum requirements for decanted chemicals are the full chemical name, and the risk and safety phrases.

### **First Aid**

Refer to the first aid notice posted on fume cupboards or areas where HF may be used.

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## Solvent Handling and Use

Most ethers form peroxides in air, and this can cause a hazard. When supplied, most ethers contain additives (inhibitors) to prevent this. Hazardous levels are only likely under two circumstances:

1. The contents have been exposed to sufficient air for long enough for all the inhibitor to be used up. This is unlikely in most circumstances, even with an old half-full bottle.
2. The ether in question has been "purified" by distillation, and then stored by a student for future use. This occurs far too frequently. Distillation will give a peroxide-free material, but it also removes the inhibitor. Any material kept is unprotected. Ethers do not remain pure solvents.

Judge the affinity for oxygen by looking at how much inhibitor the manufacturer adds. Of the common ethers used, the most dangerous, potentially, is tetrahydrofuran, because it contains quite a bit of inhibitor, is widely used, and is invariably distilled before use. Other cyclic ethers such as dioxan are also bad, but are used far less frequently, and not in large quantities.

The most hazardous ether is di-isopropyl ether, but it is rarely used as it readily forms peroxides. The store has orders to only buy it in small bottles. Discard any opened bottles.

Ether and glyme are not too bad. Distilled ether tends to get used up quickly, and is stored over sodium. Glyme is usually distilled before use, and unused material retained, which puts it in the same category as dioxan, although it doesn't pick up peroxides as quickly.

Most ethers with no inhibitor in them give a positive test for peroxides in a very short time, as the test is very sensitive.

---

## Disposal of Chemicals

Each individual user is responsible for checking the properties and disposal methods for materials used. You will find information on the disposal of chemical wastes on their MSDS sheets. Consult your supervisor or the laboratory technician if in doubt.

- ◆ Any wastes that you deliver to the store for disposal must be labelled and rendered safe to handle by untrained personnel. Complete a Waste Disposal Request Form for each item.
- ◆ Water miscible solvents may be poured down the sink. Run plenty of water down the drain at the same time.
- ◆ Chemicals which cannot be disposed of via the drainage system must be neutralised and labelled. Return these to the store for disposal at a later date.
- ◆ Do not pour non water solvents down the sink. Collect them in "solvent residue" bottles, which will be emptied regularly.

Do not mix acetone and chloroform in the residue bottles as the resulting mixture may explode. You can leave solvent residues and other materials for disposal in the designated area of the Store after advising the laboratory technician, who may reject the items if they are unsatisfactory for disposal.

- ◆ The Safety Officer will assist groups to dispose of hazardous, water immiscible and flammable materials, and should be consulted.

- ◆ If you are about to leave the department or complete a project, consult your supervisor about safe disposal of any hazardous chemicals that you may have remaining in your laboratory. **Do not** hide unwanted chemicals in the refrigerator or freezer, or leave them around the department, or dump them anywhere on the university premises.

See the university's Disposal of Chemical Wastes Policy for more information.

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## Tracked Chemicals

A number of chemicals used in laboratories are tracked to comply with ERMA regulations.

This is the responsibility of laboratory managers and involves the periodic checking of weights and volumes of chemicals both in storage, and in use.

Anyone who uses tracked chemicals will receive instructions about this from the laboratory manager. Failure to accurately document quantities used and the purpose for using them will result in denial of access to the laboratory.

The introduction of new chemicals into the laboratory without prior approval from the laboratory manager is in breach of department and ERMA regulations and will result in disciplinary proceedings.

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## Accidents Involving Chemicals


See Chemical Spills (on page 33) for guidelines and advice on dealing with chemical spills.

Generally, chemicals coming into contact with the skin or other tissues need to be diluted, flushed away, or neutralised, immediately. Take the following emergency actions, and then seek medical advice from the Student Health Centre (6402). Emergency showers are located in laboratories.

Acid in eye:	Wash thoroughly with water, then with 1% borax solution. Use an eye bath.
Alkalis in eye:	Wash thoroughly with water, then with saturated boric acid solution. Use an eye bath.
Acid or alkali on other part of the body:	Wash thoroughly with water, then with borax or boric acid solution.
<b>Poisons if swallowed.</b>	
Acids:	Quickly wash out the mouth with water. Give the person plenty of water to wash the throat, then milk of magnesia at intervals. <b>Do not give emetics.</b>
Alkalis:	Quickly wash out the mouth with water. Give the person plenty of water to wash the throat, then a 1% solution of acetic acid. <b>Do not give emetics.</b>
Heavy metal salts, oxalic acids and oxalates, permanganates, bromine and iodine:	Flush with plenty of water and give the person copious amounts of water to drink.
<b>Poisons if in the mouth but not swallowed.</b> Spit out and rinse the mouth repeatedly with water.	

Remember that many poisons can be absorbed through the lungs or skin. Hydrogen sulphide (in the lungs) or aniline (on the skin) for example, can both prove fatal in sufficient quantities.

## Definitions

<p>Carcinogenic</p>	<p>Something that can cause cancer.</p>  <p>I don't care if you ARE Kaptain Karcinogen. I want my FLAME BROILED Burger Back !!</p> <p>© Uwe Oehler, Driquana@chembio.uoguelph.ca</p>
<p>Mutagenic</p>	<p>Something that induces genetic mutation. Mutation is defined as:</p> <ul style="list-style-type: none"> <li>◆ a process by which a gene or some other DNA sequence undergoes a change in structure</li> <li>◆ a gene or other DNA sequence that has undergone a structural change</li> <li>◆ an individual that has undergone a mutational change and expresses that change in the phenotype.</li> </ul> <p>Mutagenic compounds have reproductive effects.</p>
<p>Teratogenic</p>	<p>A substance or drug producing abnormal embryos, i.e., that tends towards teratogenesis. Teratogenesis is defined as the development of an abnormal mass of cells composed of diverse, differentiated and undifferentiated cell types during foetal development, causing physical defects in the foetus.</p> <p>Teratogenic compounds have reproductive effects.</p>

# Safety in the Field

Field work is an activity involving inherent risks and hazards. Severe or dangerous conditions may be encountered in any season in New Zealand. Trip leaders take safety precautions and every reasonable care concerning the safety of members of their party. However, everyone working in the field must behave responsibly to reduce the risk of accidents.

Field trip leaders must complete a Risk Analysis and Management form (RAM) and discuss it with the department's safety officer at least five days before the field trip.

The researcher in charge of each research project must complete an annual re-assessment of the Risk Analysis and Management Form (RAM) in consultation with all associated field workers. It is the responsibility of all field workers to review field health and safety each year, identifying any new hazards or significant changes in the risk status of existing hazards.

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## Use of Departmental Vehicles

Always follow university and department procedures when using department vehicles for fieldwork. These include hazard assessment policies and procedures, for example, off road driving, recording trip intentions, emergency procedures, etc.

This policy applies to all vehicles operated by the department, including “research vehicles” dedicated to particular projects, vehicles loaned from other departments, or hired for departmental business from commercial rental companies.

Students must have permission from their supervisor every time they use a departmental vehicle.

### Authorisation

All drivers must be authorised by the Head of Department (or nominee – workshop technician). A register of authorized drivers is maintained in the school office. Drivers not registered on this database may not be covered by the university’s insurance.

Drivers must hold a current full New Zealand Driver’s Licence. An International Driver’s Licence may be permitted for some visitors but overseas students must obtain a New Zealand Licence. Holders of provisional or restricted licences are not permitted to drive departmental vehicles.

To obtain authorization, complete the Vehicle Use form before your first intended journey. Use of certain vehicles (e.g., four-wheel drives, trailers, boats, sea water trailer, cherry picker) will only be approved if the department’s Health and Safety Committee is satisfied that you have the appropriate experience or training. You will be notified which vehicles you are authorised to drive and/or what training must be completed beforehand.

Vehicles may be used for departmental business only. Failure to observe this rule could result in a charge of car conversion.

### Book a Vehicle

Complete a booking sheet for any communal vehicle.

Sign and enter the purpose and mileage in the vehicle log book.

Some vehicles may be reserved for particular purposes, for example, local trips, or on-road only. Please ensure you comply with these restrictions.

Vehicles normally dedicated to specific research projects may at times be available for booking by arrangement with the principal investigator or technician in charge.

### The Driver's Responsibilities

The authorised driver, or the staff member in charge, is required to:

- ◆ Complete a Vehicle Use form before taking the vehicle out.
- ◆ Follow the booking procedure for communal departmental vehicles.
- ◆ Complete the vehicle log-book for each trip indicating the account to which the use is to be charged.
- ◆ Accept responsibility for the vehicle, and for the safety and well being of passengers.
- ◆ Obey the road code. In particular, adhere to the open road speed limit of 100 km/hour, or 80 km/hour with a trailer.
- ◆ Use the appropriate lights (tail-lights, brake-lights, indicators) if driving a trailer.

- ◆ Carry chains during the winter, and know how to fit them before taking the vehicle out of town.
- ◆ Not exceed the maximum loading weight permitted on their licence. In most cases, carrying 7 – 8 passengers and their luggage will reach or exceed that limit.
- ◆ Attend to the maintenance and security of the vehicle. Make sure the windows are closed and the vehicle is locked when it is unattended. Check the oil and water regularly.
- ◆ Report any accidents or damage as soon as possible to the workshop technician. After hours, contact Security (364 2111, or FREEPHONE 0800 823 637). Note that there is an excess charge of \$1000 for repairs to vehicles driven by students younger than 25.
- ◆ Pay all fines and penalties for speeding, parking, and other infringements. These are the responsibility of the driver and must not be charged to any university account.

### **The Passenger's Responsibilities**

- ◆ Obey the instructions of the driver.
- ◆ Wear seat belts if they are fitted. It is a legal requirement and non-compliance can result in a fine.
- ◆ Alcohol and smoking are not permitted in departmental vehicles.
- ◆ Do not distract the driver with loud music, shouting, etc.

## **Fieldwork Alone, In Pairs, or Small Groups**

Individual or small-group fieldwork involves an important element of self-reliance, and the ability to cope alone. Therefore students in this category must be responsible for their own safety in the field. There are additional hazards involved in working alone, influenced by factors such as the nature of the project, the area, altitude, weather, and, most importantly, how, and how fast, assistance can be obtained if needed. Simple accidents can become serious due to isolation.

- ◆ If you are staying overnight, arrange a call-in procedure with a base contact, and detail this arrangement on your field intentions form. If you are staying in a place with more than one party, make sure they know to raise the alarm if you don't return at an expected time.
- ◆ Make sure you have analysed the risks involved, and have adequate safeguards in place.
- ◆ Before you go, learn basic river crossing skills and mountaineering skills.
- ◆ Make sure you take the following things with you:
  - appropriate clothing and footwear
  - relevant medication
  - a first aid kit. Ana-kits are available from the Registry for insect stings.
  - a survival kit. Always take a bit more food than you are likely to need. Take a reflective silver blanket, and a compass and map. These are available from the department.
  - the relevant NZMS 260 maps of the area, and a compass
  - a cellphone and/or locator beacon. The department has a cellphone, and the university has a number of cellphones available for use on fieldtrips (except during exam times and graduation weeks). Contact the Buildings Section in the Registry to book a cellphone. Be sure to book well in advance. The Registry also has information about cell phone ranges. If you are going to an area that has poor, or non-existent, reception, take a locator beacon. Make sure you know how to use it before you go.

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## Safety Equipment

All equipment is kept in the store room and must be signed out. Use the Equipment/Service Request form. Equipment includes:

- ◆ Chains for Toyota Hi-Ace and Hilux
- ◆ Torches
- ◆ Hand-held compass
- ◆ EPERB
- ◆ First aid kits
- ◆ Spade
- ◆ Cell phone
- ◆ Maps
- ◆ Survival blanket.

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## Climate Towers

No-one may climb a climate tower without the authority of the safety officer. Authorisation will only be given after careful consideration of the applicant's climbing ability, and the safety officer may require a demonstration.

Climbing towers is hazardous and should be done with extreme caution. Anyone unfamiliar with the techniques of climbing, and/or are not used to heights, should not attempt it.

### Rules for climbing towers

- ◆ Do not climb towers alone. At least one person must be on the ground at the base of the tower as a 'spotter'.
- ◆ All those involved must wear approved and securely fastened safety helmets.
- ◆ All those climbing the tower must have clean footwear and at all times wear a safety harness which can be clipped to the tower.
- ◆ Carry tools and equipment in a manner that they are readily available and will not fall on those below.
- ◆ Give due consideration to weather conditions.

### Erecting and dismantling climate towers

Do not attempt to erect or dismantle a climate tower without the supervision of the workshop technician.

A climate tower can not be built without a plan and you may need the assistance of a qualified engineer to do this. You will need to check with the local council whether you need resource consent.

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## Suggested Clothing for Fieldwork

The following items of clothing are recommended as the **minimum** that should be worn/taken for fieldwork in New Zealand.

- ◆ A hat. You will need protection from the sun, and from the cold.
- ◆ Shirt.
- ◆ Loose fitting trousers (not jeans).

Wear wool or polypropylene. Cotton is not recommended, especially not denim jeans.

- ◆ Warm sweater or jersey.
- ◆ Brightly coloured raincoat with hood.
- ◆ Stout footwear. Never sandals.
- ◆ Boots with mountaineering soles.

**Note:** Gumboots should only be worn for work requiring shallow wading.

## Safety in Boats

The department's research boat is available for research and field work. the Maritime Safety Authority requires the boat to be registered with the MSA and to operate under the Safe Ships Management system (SSM). The person responsible for the SSM system is the workshop technician.

Maritime Safety also requires the boat operators to be qualified as Local Launch Operators (LLO). The department's LLO qualified operator is the workshop technician, who must approve all boating activities.

A Boat Log and Voyage Plan must be completed before each trip. Also see the Day Skipper Manual.

# Forms

All of these forms are available on the UC staff intranet, Human Resources Toolkit, under Health, Safety and Wellbeing. If you can't access these forms, contact the departmental safety officer for printed copies.

<b>Form</b>	<b>For more information, see:</b>
Fieldwork Forms	Safety in the Field (on page 41)
Equipment/Service Request Form	Safety Equipment (on page 44)
Accident Reports	Accidents, Incidents and Critical Incidents (on page 8)
Hazard Forms	Hazard Identification (on page 19) and Potentially Hazardous Situation (on page 19)

# Contacts

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## Staff with First Aid Certificates

A current list of first aid certificate holders is maintained on the UC staff intranet. See the central First Aid register.

## Floor Wardens

Building wardens are responsible for their building when they are present and have overall charge of the building in an evacuation.

Floor wardens are responsible for their floors when they are present.

Staff and research students take over these role (on page 12)s when the appointed wardens are absent.

A list of wardens is maintained on the UC staff intranet.

## Departmental Safety Committee

The following positions make up the departmental safety committee:

Chair: departmental safety officer

Ex officio: head of department

Staff safety representative

Laboratory, field, and equipment technician

Workshop technician

Geo-cartographic and multimedia technician


PhD rep.

# Appendices

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## Definitions











<p>Carcinogenic</p>	<p>Something that can cause cancer.</p>  <p>I don't care if you ARE Kaptain Karcinogen. I want my FLAME BROILED Burger Back !!</p>
<p>Mutagenic</p>	<p>Something that induces genetic mutation. Mutation is defined as:</p> <ul style="list-style-type: none"> <li>◆ a process by which a gene or some other DNA sequence undergoes a change in structure</li> <li>◆ a gene or other DNA sequence that has undergone a structural change</li> <li>◆ an individual that has undergone a mutational change and expresses that change in the phenotype.</li> </ul> <p>Mutagenic compounds have reproductive effects.</p>
<p>Teratogenic</p>	<p>A substance or drug producing abnormal embryos, i.e., that tends towards teratogenesis. Teratogenesis is defined as the development of an abnormal mass of cells composed of diverse, differentiated and undifferentiated cell types during foetal development, causing physical defects in the foetus.</p> <p>Teratogenic compounds have reproductive effects.</p>













# Chemical Classification and Description










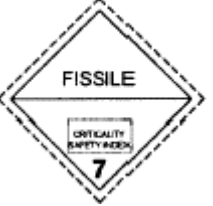


## Classifications under HSNO





Class 1	Explosiveness
Class 2	Flammability – gases
Class 3	Flammability – liquids
Class 4	Flammability – solids
Class 5	Capacity to oxidise
Class 6	Toxicity
Class 7	Unallocated
Class 8	Corrosiveness
Class 9	Ecotoxicity

## Pictograms







<p>Class 1.4 Explosive. (UN Division 1.4)</p>		<p>Class 1.5 Explosive. (UN Division 1.5)</p>	
<p>Class 1.6 Explosive. (UN Division 1.6)</p>		<p>Class 2.1.1 A Flammable gases. (UN Class 2.1)</p>	
<p>Class 2.1.1 B Flammable gases.</p>		<p>Class 2.1.2A Flammable aerosols. (UN Class 2.1)</p>	
<p>UN Class 2.2 Gases under pressure:</p> <ul style="list-style-type: none"> <li>◆ compressed gas</li> <li>◆ high pressure liquified gas</li> <li>◆ Low pressure liquified gas</li> <li>◆ dissolved gas</li> <li>◆ refrigerated liquified gas.</li> </ul>		<p>UN Class 2.3 Toxic Gas. (Refer HSNO Class 6.1A, B, and C acute toxic; where the substance is a gas.)</p>	
<p>Class 3.1A Extremely flammable liquid. 3.1B Highly flammable liquid. 3.1C Flammable liquid. (UN Class 3)</p>		<p>Class 3.1D Flammable liquid.</p>	

<p>Class 3.2A, B and C Desensitised explosive. (UN Class 3)</p>		<p>Class 4.1.1A and B Readily combustible solid. (UN Class 4.1)</p>	
<p>Class 4.1.2A, B, C, D, E and F Self-reactive substance. (UN Class 4.1)</p>		<p>Class 4.1.2G</p>  <p><b>FLAMMABLE SOLID</b></p>	
<p>Class 4.1.3A, B and C Solid desensitised explosive. (UN Class 4.1)</p>		<p>Class 4.2A Spontaneously combustible: Pyrophoric liquid and Pyrophoric solid. (UN Class 4.2)</p>	
<p>Class 4.2B and C Spontaneously combustible: self-heating substance (UN Class 4.2)</p>		<p>Class 4.3A, B and C Substance which emits flammable gas when it contacts water.  (UN Class 4.3)</p>	
<p>Class 5.1.1A, B, and C Oxidising liquid and solid. 5.1.1A Strong oxidiser 5.1.1B and C Oxidiser (UN Class 5.1)</p>		<p>Class 5.1.2A Oxidising gas. (UN Class 5.1)</p>	
<p>Class 5.2A Organic peroxide.</p>		<p>Class 5.2B Organic peroxide.</p>  <p>(also use the pictogram from class 5.2A)</p>	

<p>Class 5.2C, D, E and F Organic peroxide. (UN Class 5.2)</p>		<p>Class 5.2G Organic peroxide.</p>	
<p>Class 6.1A, B and C Acute toxic. 6.1A: very toxic. 6.1B and C: toxic. (UN Class 6.1)</p>		<p>Class 6.1A, B and C Acute toxic where the substance is a gas. (UN Class 2.3)</p>	
<p>Class 6.3A and B: skin irritant. 6.4A: eye irritant. 6.5B: sensitisers (dermal).</p>		<p>Class 6.5A: sensitisers (respiratory). 6.6A and B: mutagen. 6.7A and B: carcinogen. 6.8A, B and C: reproductive/developmental. 6.9A and B: target organ/system.</p>	
<p>Class 7 Radioactive material. Category 1</p>		<p>Class 7 Radioactive material. Category 2</p>	
<p>Class 7 Radioactive material. Category 3</p>		<p>Class 7 Radioactive material. Fissile.</p>	
<p>Class 8.1A Corrosive to metals. (UN Class 8)</p>		<p>Class 8.2A: extremely corrosive to skin. 8.2B: highly corrosive to skin. 8.2C: corrosive to skin.</p>	

<p>Class 8.3A Eye corrosive.</p>  <p><b>CORROSIVE</b></p>	<p>Class 9 Eco-toxic. Class 9.1A – D: aquatic. 9.2A – D: to soil.9.3A – C: to terrestrial invertebrates. 9.4A – C: terrestrial invertebrates.</p>  <p><b>ECOTOXIC</b></p>
<p>Class 9 Miscellaneous dangerous goods.</p> 	<p>Class 10 Tracking.</p> 

**Pictograms:**

<p>Explosive</p> 	<p>Harmful or irritant</p> 
<p>Oxidiser</p> 	<p>Corrosive</p> 
<p>Flammable</p> 	<p>Environmentally toxic</p> 
<p>Toxic</p> 