



School of Environment Laboratory, Workshop and Facility Booklet

(Version 6.0 January 2020)

Lab User Name:		ID Number:	
UPI:		Phone:	
Department: <input type="checkbox"/> ENV <input type="checkbox"/> SCS <input type="checkbox"/> SBS <input type="checkbox"/> IMS <input type="checkbox"/> Other (specify)	Position: <input type="checkbox"/> Academic Staff <input type="checkbox"/> Technical Staff <input type="checkbox"/> Student <input type="checkbox"/> Visitor <input type="checkbox"/> Other (specify)	Project: <input type="checkbox"/> Undergraduate <input type="checkbox"/> Masters research <input type="checkbox"/> PhD Research <input type="checkbox"/> Academic Research <input type="checkbox"/> Teaching <input type="checkbox"/> Other (specify)	Do you have an existing UoA Swipe Card? <input type="checkbox"/> Yes (write number below) <input type="checkbox"/> No
Description of work:			
Expected completion date:	Supervisor(s) or Principle Investigator (name):	Supervisor(s)/Principle Investigator approval (signed):	
Approved Laboratories	<input type="checkbox"/> ENV Field Store <input type="checkbox"/> ESP Labs <input type="checkbox"/> Electron Microprobe Lab <input type="checkbox"/> X-Ray Labs <input type="checkbox"/> Postgrad Rock Room <input type="checkbox"/> Academic Rock Room <input type="checkbox"/> Geochemistry Lab <input type="checkbox"/> HF Lab	<input type="checkbox"/> ENV MDLs <input type="checkbox"/> ENV Large Computing <input type="checkbox"/> Sedimentology Lab <input type="checkbox"/> Geophysics Lab <input type="checkbox"/> Climate Lab <input type="checkbox"/> Particle Analysis Lab <input type="checkbox"/> Coastal Lab <input type="checkbox"/> Ecology Lab	<input type="checkbox"/> Dendrochronology Lab <input type="checkbox"/> Photography Lab <input type="checkbox"/> Geocomputation Lab <input type="checkbox"/> Ontology Lab <input type="checkbox"/> Multi-use Lab <input type="checkbox"/> ENV Chemistry Lab <input type="checkbox"/> Transitional Facility <input type="checkbox"/> Other
<p>I hereby acknowledge, accept and agree to follow all University of Auckland and School of Environment rules in relation to general Labs, Chemistry Labs, X-ray labs, HF labs, TF Labs and ESP workshops as laid out in this manual and other relevant documentation.</p> <p>Signed by User: _____ Date: _____</p>			
<p>I hereby acknowledge the above signed Lab User has completed the requirements of the ENV Laboratory Induction programmes including attending required induction sessions and passing the relevant induction quizzes.</p> <p>Signed by Technical Manager: _____ Date: _____</p>			
Chemical Lab Annual Refresher Due:	Technical Manager approval for after-hours access		
	<input type="checkbox"/> Yes <input type="checkbox"/> No Where: _____		

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Safety Declaration

1. I have attended all required School of Environment Laboratory, Workshop and Facility safety inductions required for my research/teaching.
2. I will work in accordance with all aspects of the training and material provided, in particular:
 - a. I will follow the General Safe Method of Use.
 - b. I will consult MSDS sheets for chemicals whose hazardous properties I am unfamiliar with.
 - c. I will wear laboratory coats, safety glasses and correct type of glove when handling chemicals.
 - d. I will keep this Lab Safety Folder with me at all times when I am in a laboratory or workshop.
 - e. I will use fume hoods for toxic and flammable chemicals and I will leave fume hoods in a tidy and uncluttered state.
 - f. I will dispose of chemicals using a University approved method.
 - g. I will report any accident/incident immediately to the Laboratory Manager or the Technician in Charge.
3. I understand and will abide by the following;
 - a. The appropriate Lab Manager or Technician in Charge must be on-site while work on hazardous substances, equipment, or methods is under way.
 - b. On a daily basis, prior to working with hazardous substances, equipment or methods, lab users must inform the appropriate Lab Manager or Technician in Charge of their activities and advise when they have completed their work for the day.
 - c. After-hours lab work involving hazardous substances or methods is in general not permitted. In special circumstances, approval may be granted by arrangement with the Technical Manager who agrees for an appropriate person to be present for the duration of the work.
 - d. I will respect staff and other lab users at all times
 - e. I will respect the decisions made by lab management
 - f. I will wear correct personal protective equipment (PPE) at all times
4. I understand that any failure on my part to work within the guidelines and maintain a safe working environment may result in my access to spaces being revoked.

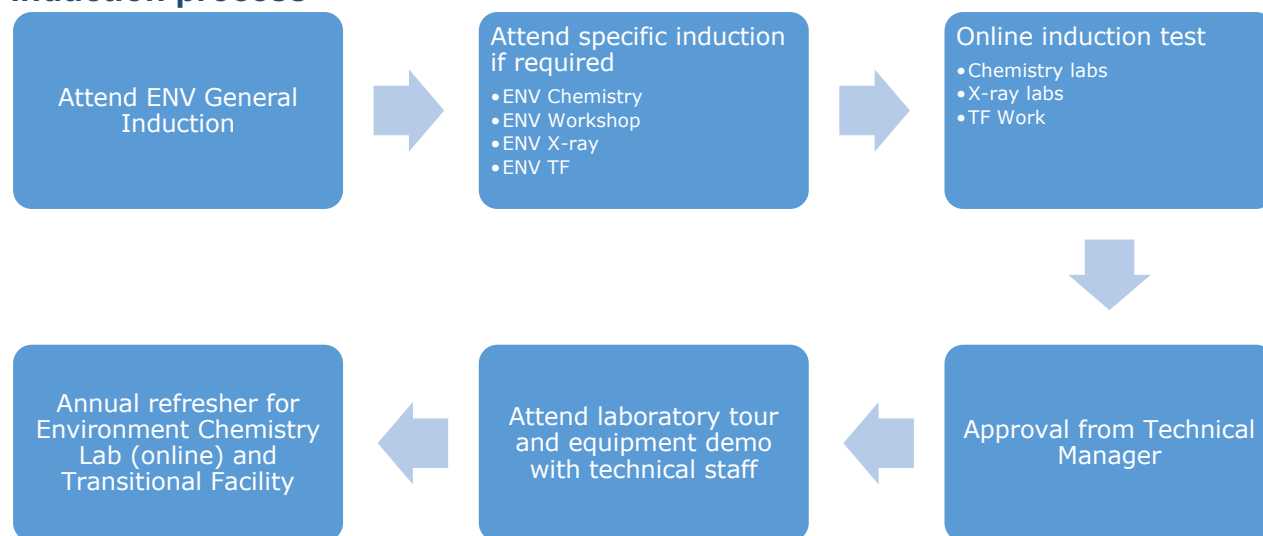
Key contacts

Name	Role	Phone	Email @auckland.ac.nz
Blair Sowman	Technical Manager and Transitional Facility Operator	84128	b.sowman
Natalia Abrego	Technician-in-charge – Environmental Chemistry	82433	n.abrego
Andres Arcila	Technician-in-charge – ESP and Microscopy	87417	a.arcila
David Adams	Technician-in-charge – Electron Microprobe and Ilab		david.adams
David Wackrow	Technician-in-charge – Sedimentology	81396	d.wackrow
Brendan Hall	Technician-in-charge – Coastal and Hydrology	84562	b.hall
Neville Hudson	Technician-in-charge – Rock labs and Microscopy	87431	n.hudson
Thomas Mules	Technician-in-charge – GIS and Geography		Thomas.mules
TBA	Technician-in-charge – X-ray		
Unisafe security	Emergency and Security	85000	

Safety Induction

For you to perform your research and learning as productively and safely as possible, first we need to introduce you to our labs and lab safety program, and provide you with all the relevant information and training you require. Given that most School of Environment (ENV) staff and students have little or no laboratory or chemistry background, it is imperative that we provide users with a sound foundation from which to manage laboratory hazards.

Induction process



Upon requesting access to ENV chemical labs, x-ray labs and ESP workshops, all staff, students, and visitors are required to have completed a full Lab Safety Induction. It does not matter if you have undertaken an induction process for another space, as the ENV spaces have their own unique hazards to be aware of.

Induction presentation (organised by one of the ENV technicians on a monthly basis)

- A 30-minute general induction that provides a basic overview of the ENV labs and working requirements.
- There are separate inductions for chemistry labs, TF Labs, Workshops and x-ray labs. Each covers the more in-depth lab safety and provides a chance to clarify information and provide specific details for the hazards and equipment in those spaces.
- A tour of the lab or workshop facilities with some hands-on instruction on basic laboratory procedures.

Induction Test

- You must complete and pass an online induction test for the relevant area you wish to work in. You will be added to the ENV Laboratory CANVAS course on completion of this induction.

Approval

- Upon completion of the above you can apply for access to the labs you need. You will need to complete the front page of this manual, and get your supervisor/PI to sign in agreement, before taking this booklet to the Technical Manager for approval. Certain specialised equipment, chemicals and methods require additional training and approval. Please ensure you see the technician in charge before starting.

Specific equipment training

- Basic approval will give you access to low hazard equipment and procedures. Certain equipment may require training and higher approval.

Refresher

- An annual online refresher (in CANVAS) is required to maintain access to the chemical labs and the TF lab. Failure to complete this will result in the revoking of your access automatically. It is up to you to complete this and let the Technical Manager know, you will not be reminded.

ENV Laboratory, Workshop and Facilities Information

Lab	Room	Technician in Charge	Academic in Charge	Induction process
Teaching MDLs	302.130 + 140	Neville Hudson	Barry O'Connor	n/a
Teaching Computer Labs	302.180 + 190	Blair Sowman	n/a	n/a
Sedimentology	302.420	David Wackrow	Martin Brook	General
Dendrochronology	302.450	Colin Yong	Gretel Boswijk	General
Ecology	302.456	Brendan Hall	Kevin Simon	General
Coastal and Hydrology	302.460	Brendan Hall	Mark Dickson	General
Climate	302.485	Colin Yong	Jennifer Salmond	General
Geophysics	302.489	Colin Yong	Jennifer Salmond	General
Particle Analysis	302.491	David Wackrow	Paul Augustinus	General
Geocomputation	301.578	Blair Sowman	Michael Martin	n/a
Photography	301.581A	Blair Sowman	Kathy Campbell	General
Microscopy	301.586	Andres Arcila	Phil Shane	General
Environmental Chemistry	302.730	Natalia Abrego	Kevin Simon	General and Laboratory
Transitional Facility	302.790	Blair Sowman	n/a	TF / MPI
Earth Science Processing	301.039	Andres Arcila	Phil Shane	General and Workshop
Microprobe	301.020	Blair Sowman	Shane Cronin	General, Laboratory and Workshop
iTRAx	301.053		Shane Cronin	General, Laboratory and x-ray
X-ray Preparation	301.414		Shane Cronin	General, Laboratory and x-ray
X-ray Fluorescence (XRF)	301.415		Shane Cronin	General, Laboratory and x-ray
Electron Microprobe	302.B20	David Adams	Shane Cronin	General, Laboratory and x-ray
Postgraduate Rock Analysis Room	301.511	Neville Hudson	n/a	General
Academic Rock Analysis Room	301.525	Neville Hudson	Julie Rowland	General
Specialised Geochemistry Preparation (HF)	301.535	Natalia Abrego	Paul Augustinus	General, Laboratory and HF
Microscopy (Cryogenic and Gas)	301.536	Andres Arcila	Phil Shane	Cryogenic safety
Geochemistry Preparation	301.539	Natalia Abrego	Michael Rowe	General and Laboratory

ENV standard laboratory, workshop and facility rules

Use of ENV Labs, Workshops and Facilities

General Health & Safety

- Know the location of all emergency exits, fire alarms, first aid kits and phones
- No food or drink in any laboratory or workshop
- Smoking is prohibited on all University premises. This includes vapes and e-cigarettes.
- Covered shoes are compulsory – no open toed footwear.
- Lab coats, safety glasses, gloves and dust masks must be worn where deemed necessary.
- Hands must be washed before leaving the laboratory.
- Do not tamper with anything that appears to be in use or does not concern you.
- Advise staff of any faults, breakages, spills, incidents, or any potential hazards.
- The University and the School do not accept responsibility for lost or stolen items. Do not leave personal belongings or valuables unattended in the labs.
- Use of personal music equipment using headphones (such as iPods, etc.) is not permitted in any ENV workshops or labs. You may not be able to hear alarms or instructions from staff.
- Respect all other lab users, staff and students
- Respect decisions made by lab management and follow instructions if given
- You will only use equipment you are trained and approved to use
- Those who have not completed an induction may enter only when accompanied and supervised by the Technician-in-charge or laboratory manager
- Only approved technical staff are permitted to undertake repairs or maintenance
- Always report any defective equipment or dangerous conditions as soon as possible. Report these to the technician in charge or Technical Manager.
- Do not remove chemicals, consumables or equipment from a space without checking with the technician first. You might stop someone else doing their work.
- Keep working areas clean and make sure to fully clean your area when work is completed.

After hours

- The School chemical and x-ray laboratories are open 7.30am to 6.00pm Mon to Fri (excluding statutory or university holidays). Work beyond these hours is at the discretion of the technician in charge or Lab Manager depending upon the activity undertaken and potential risk. These labs are staffed from 9am till around 4.30pm weekdays.
- The School non-chemical laboratories are open 7.30am to 6.00pm Mon to Fri (excluding statutory or university holidays). Work beyond these hours is at the discretion of the technician in charge or Lab Manager depending upon the activity undertaken and potential risk. These labs are staffed from 9am till around 4.30pm weekdays.
- Formal approval to work after hours on an ongoing basis must be arranged in advance through the Technical Manager.

General Conduct

- Be considerate of other lab users and keep noise to a minimum.
- Keep your work area tidy and confined to your allocated workspace(s).
- Resources are shared. Do not monopolise equipment, workstations, or space.
- Advise staff of any shortage in supplies, paper, consumables, etc.

Hazardous Labs

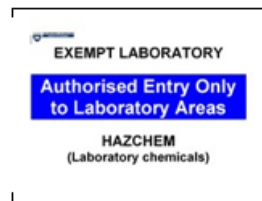
There are numerous laboratories in ENV which contain hazardous chemicals or equipment. ANY room with a hazard sign is **OFF LIMITS** to all staff, students and visitors unless they have been given a formal **Induction** and have completed any required training.

Rooms with the orange HAZARD sign typically indicate laboratories containing hazardous equipment or facilities. The hazards are usually;

- Mechanical
- Electrical



Numerous labs in the School contain potentially hazardous chemicals or substances as designated by the HSNO sign. Many substances within these labs are highly flammable, reactive, toxic, or corrosive and require special training to be handled.



The Transitional Facility sign indicates rooms which contain materials which are under quarantine for Biosecurity reasons. No quarantine materials are to be handled or removed from these rooms without approval from the TF Operator. If you intend to import or handle risk goods or quarantined materials, you will need to receive special training separate to this induction. See the TF Operator for further details.



If you notice an emergency situation (e.g., fire, smoking machinery, spill, unconscious person);

- ✓ Exercise **EXTREME CARE** – consider your own safety first!
- ✓ As a rule, **DO NOT ENTER** the scene unless absolutely necessary.
- ✓ Notify staff and/or emergency services and Security **immediately** and follow their advice.

Chemical Safety in the Laboratory

Exempt Laboratories

University laboratories are able to purchase chemicals without the need to obtain prior ERMA approval (a very privileged status), provided the laboratory meets the requirements of the HSNO (Exempt Laboratory) Regulations, 2001.

To meet these requirements you must:

- Know the identity of the Lab Manager and 'Persons in Charge' of your Laboratory (Section B below)
- Know how to access and use MSDS databases (Section C below)
- Understand and follow basic Laboratory Safety rules (Section E below).
- Understand and follow the basic rules for storage and handling of the various classes of hazardous chemicals (Induction Kit Part 2)
- Use correct Personal Protective Equipment (Section F below)
- Dispose of chemicals correctly (Section I below)
- Report all accidents and incidents (Section J below)
- Know Emergency Procedures (Section K below)

The HSNO Code of Practice for University and CRI Exempt Laboratories is a HSNO approved method of compliance with the Exempt Laboratory Regulations. The Code of Practice sets out documents called Safe Methods of Use (SMOU) which are a convenient set of rules which you must follow.

You will be given a copy of the General Safe Method of Use as part of the induction and you must observe the mandatory requirements of this Safe Method of Use.

Laboratory Managers

The School has several HSNO Exempt Laboratory facilities

One of the requirements of Exempt Laboratories is that each lab has a Lab Manager and in the absence of the Lab Manager there is a "Person in Charge".

You (as a new staff member or student) are required to know the identity of the Laboratory Manager and who are the 'Persons in Charge' for your laboratory.

Chemical Hazards and MSDS (Material Safety Data Sheets)

All laboratory chemicals are potentially hazardous. If you are handling a chemical for the first time or you are unsure of the hazardous properties of a chemical, you must consult the MSDS.

The University of Auckland has two very large databases available on-line via the Library website. These databases are Chem Gold II and Canadian Centre of Occupational Health and Safety (CCOHS). A separate sheet is available as part of this induction which details how you can access and search these databases.

<https://www.auckland.ac.nz/en/health-safety-wellbeing/health-safety-topics.html>

At a minimum you are expected to be able to access the database, take note of the hazard class, Risk and Safety Phrases and observe directives on the MSDS sheets. There is also a Chemical Safety Webpage available on the Science Faculty website which has links to these databases.

Chemical Safety Website



The Chemical Safety website (URL above) has all the Safe Methods of Use as well as extra information on disposal, transport and storage of chemicals. The website has additional resource materials on safe handling of chemicals.

Basic Laboratory Rules - What is required of you

You must:

- Consult MSDS sheets
- Label all solutions, containers, powders and experiments (use the green forms)
- Wear Safety Glasses when handling chemicals
- Use correct Personal Protective Equipment (i.e. use correct gloves)
- Wear laboratory coats and closed footwear
- Use fume hoods when handling toxic, corrosive and flammable liquids.
- Store all large bottles of flammable solvents in Flameproof cabinets or store bulk solvents (>20 litres) in the Dangerous Goods store
- Segregate chemicals correctly. Acids must be kept away from bases and oxidisers must be stored away from flammable solvents.
- Know the location of the nearest Spill Kit and how to use it
- Report all accidents within a reasonable timeframe to the technician in charge
- Ask permission of the Lab Manager to work after hours.
- Not undertake unsupervised work with highly hazardous chemicals
- Respect all other lab users, staff and students
- Respect decisions made by lab management and follow instructions if given
- Keep working areas clean

Personal Protective Equipment

Personal Protective equipment is designed to keep your exposure to chemicals to an absolute minimum. You must:

- Wear a laboratory coat when handling chemicals and the lab coat must be removed when leaving the laboratory areas.
- Wear closed footwear at all times
- Long pants must be worn in the chemical labs.
- Safety glasses must be worn when handling any chemicals.
- Face shields are required when handling cryogenic liquids.
- Wear gloves of appropriate type for the chemicals you are handling. This includes appropriate protection when handling liquid nitrogen.
- Use fume hoods when handling toxic, corrosive and flammable liquids

N.B. Some glove materials are more permeable to solvents than others. It is important that you choose the correct type of glove. Nitrile gloves are often the best choice. If you are unsure consult the glove compatibility charts on the Chemical Safety Website.

Fume Hoods

- Fume hoods rely on the internal baffle (at the back near the bottom of the fume hood) having an uninterrupted flow of air. This opening must be kept clear.
- Fume hoods must not be cluttered and definitely not used for storage if they are to function properly.
- The sash of the hood should be kept reasonably low and never left open beyond maximum indicated on the side of the hood. The sash opening on Variable Air Volume (VAV) Fume hoods must also be kept as low as reasonably possible – especially when work is completed.

Hazardous Chemicals you are likely to encounter

The following is a guide to commonly encountered hazardous chemicals used in the School's research and teaching. Other departments may have different chemicals and will have specific induction procedures to suit.

Concentrated Acids:

All are very corrosive not only to the body, but the fumes can also quickly attack sensitive equipment such as computers. Correct protective equipment and fume hoods are required. Ensure gloves are compatible. Some acids will react violently with organics (perchloric and nitric acids) and so must not be stored with organic solvents and acetic acid. Always remember that a lot of heat may be generated on diluting a concentrated acid (H_2SO_4 in particular), and so the acid should always be added to the water (not water to acid)

Hydrogen Peroxide

Concentrated H_2O_2 (100 vol, 150vol etc.) can react with explosive violence on contact with organics (solvents, samples). It will rapidly foam and spit when added to a sample with high organic content (ex. soil). Store away from organics, correct protective wear is required. On contact with the eyes, or skin, the damage is virtually immediate.

Hydrofluoric Acid

This is a special case as it is not only very corrosive but also very toxic. Suffering exposure of as little as 2.5% of the body (e.g., the hand) will produce a lethal hypocalcemia in 2-3hrs.

The School has developed special procedures for the use of HF which require special approval for prospective users. All HF work must be done in segregated lab conditions under strict supervision. Consult the School's Lab Managers for further information.

Tetrabromoethane (TBE) (and similar high density organic liquids)

May have irritant and narcotic effects. Generally they should only be worked with inside well ventilated fume hoods. Long term exposure is likely to result in liver and kidney damage. For further info consult the respective MSDS.

Disposal of Chemicals

- With few exceptions chemicals must be disposed by a licensed chemical waste contractor.
- Flammable solvents, reactive chemicals and heavy metals must never be disposed to sewer.
- Please contact the Laboratory Manager or technician in charge for further details.
- When you leave University or move to a different project you must ensure that any solutions and reagents in fridge/ freezer, cold-room and laboratory shelves associated with your project and not required by your research group leader are disposed before you leave.

Accidents/Incidents/near misses

- All accidents and incidents must be reported to the technician in charge in a reasonable timeframe.
- You must complete the University Accident/Incident form and send to the Technical Manager or Health and Safety Manager as soon as possible.
- Remember that what you don't report might cause another person to get hurt.

Coping with an Emergency

- Ensure you know where emergency spill kits are located and how to use these kits.
- If you use a spill kit, inform the laboratory manager immediately so that replacement parts can be procured.
- Report any accident or incident immediately to the technician in charge.
- You must know how to initiate emergency procedure/evacuation in the event of a fire or major chemical spill.
- In the event of a major spill in your lab involving the Emergency Services, be sure that you and the Lab Manager make yourselves available to the Emergency Services in case they require further information.

Emergency Services 111

Unisafe Emergency 966

Classification & Safe Handling of Chemicals

Introduction

- Chemicals can be classified according to their hazardous properties. The UN Classification of chemicals is used extensively for transport of chemicals. The universally accepted pictograms corresponding to each hazard class are often found on the sides of chemical containers. UN Classification of any chemical can also be found by consulting Chem Gold II.
- If you are unsure of the properties of any chemical check the MSDS sheets/databases for information. Chem Gold II is one such database which specifies the appropriate UN Class (although it is given as 'DG Class' for each chemical in Chem Gold II).
- Chem Gold II is available to University staff and students on a 24 hour/7 day week basis via the LEARN Database.
- More detail on safe handling can also be found by consulting the specific Safe Method of Use for each class of chemical (available on the Chemical Safety Website).
- If you are unsure of any aspect of chemical handling or storage consult your Laboratory Manager

UN Classification of chemicals and some simple rules for handling each class

The UN Classification system categorises chemicals into one of 8 different hazard classes. The following is a brief description of the UN Classification along with a few simple class specific rules for their safe handling and storage.

UN Class 2 - Gases

All gas cylinders must be properly restrained.

Class 2.1 – Flammable Gases (e.g. hydrogen, acetylene)

In addition to restraining cylinders:

- All cylinders of Class 2.1 Flammable gases that **are used with a source of flame** must be fitted with flashback arrestors.
- All Class 2.1 Flammable gases must be stored in a well ventilated area.



Cryogenic Liquids

- Ensure appropriate protective gear (thermal mittens and face protection at a minimum) are used.
- Liquid nitrogen must NEVER be stored or transported in an enclosed area occupied by people.

Class 2.3 - Toxic gases

- Cylinders of toxic gas attached to regulators must be stored in fume cupboards.
- Notify your lab manager if you find older cylinders of toxic or corrosive gas that show any signs of corrosion.



UN Class 3 - Flammable Liquids (e.g. xylene, ethanol, diethyl ether)

- Flammable solvents MUST be stored in flameproof cupboards.
- Waste solvent in excess of 10 litres must be stored in DG store.
- If fridges are used for storage of highly flammable solvents, these fridges must be spark-proofed and labelled as such.
- Flammable solvents must never be stored with Class 4 and 5 compounds (Remember to segregate Classes 3, 4 and 5).
- Flammable liquids MUST be stored and used well away from ignition sources.



- Explosive organic peroxide may accumulate in ethers such as diethyl ether. All bottles of ether solvent must have date of purchase or date of last test. Notify your lab manager when a bottle has not been tested in last 18 months.
- As a general rule all highly flammable solvents must be decanted in a fume cupboard.
- Bulk quantities of flammable solvents MUST be stored in a DG store.
- Waste solvent must NEVER be disposed to sewer.

UN Class 4 - Reactive Solids

- You are unlikely to have these compounds in your lab. However they are highly reactive – you must take care and follow any instructions given in the MSDS.
- Always store Class 4 solids away from compounds that are Class 3 (Flammable Liquids) and 5.1 (Oxidisers). (Remember to segregate Classes 3, 4 and 5).
- Always store Classes 4.1 and 4.3 stored away from Class 4.2.
- Always store Class 4.3 stored away from water and moisture



Class 4.1 – Flammable solids (Phosphorous) or desensitised explosives (e.g. Picric acid)

- Take care to check that desensitised explosives such as picric acid is always stored with sufficient quantities of desensitising agent (water).
- NEVER let picric acid become dry!



Class 4.2 – Spontaneous combustible solids (e.g. diethyl zinc)

- Never store Class 4.2 compounds with 4.1 and 4.3

Class 4.3 – Dangerous when wet (e.g. Sodium metal, Sodium borohydride)

- Always store Class 4.3 compounds away from water and moisture



UN Class 5.1 - Oxidisers (e.g. perchlorates, peroxides)

- Always store oxidisers away from Class 3 and Class 4 compounds. (Remember to segregate Classes 3, 4 and 5)
- NEVER store oxidisers with combustible organic compounds
- Remember that in addition to oxidising acids such as perchloric acid, strong mineral acids such as nitric acid are also oxidising acids.



UN Class 5.2 – Organic Peroxides (e.g. Benzoyl peroxide)

- You are unlikely to have these compounds in your lab. However they are highly reactive – you must always ensure separate cool storage.



UN CLASS 6 – TOXIC AND HARMFUL

Many chemicals fall into category of toxic or harmful.

Acutely Toxic Compounds

- Special care needs to be taken when handling acutely toxic compounds (labelled 'very toxic').
- An LD50 (oral) <20 mg/kg indicates a highly toxic compound.

Harmful Compounds

- The harmful effects of some chemicals are only evident after repeated exposure (e.g. hypersensitivity associated with formaldehyde or glutaraldehyde exposure).
- Some chemicals are known to be mutagenic, carcinogenic or teratogenic, so exposure must be kept to a minimum.

Simple Rules for Handling Toxic or Harmful Chemicals

- Always wear correct gloves when handling toxic and harmful compounds (more information about the compatibility of gloves can be found on the chemical safety website).
- ALWAYS use fume hoods to reduce exposure to an absolute minimum.
- Always consult MSDS databases.
- Where highly toxic compounds are stored in laboratories, these compounds must be secured in locked cupboards.
- Some highly toxic compounds may have specific rules for their safe handling – please consult your Lab Manager for further information.

UN CLASS 7 – RADIOACTIVE COMPOUNDS

There are separate rules for handling radioactive compounds. UN Class 7 has been included in this explanation of UN Hazard Classes for the sake of completeness

UN CLASS 8 – CORROSIVE COMPOUNDS

- Do not store acids and bases together
- Review phosphorous and sulphur halide stocks regularly.
- Remember that concentrated Nitric and sulphuric acids are also oxidising agents and must NEVER be stored with organic compounds



Very Toxic



Workshop Safety

Mechanical Hazards

Equipment and activities in the ESP lab and workshops can cause serious harm. This can range from simple cuts to eye injuries or possible amputation.

- Know where these hazards exist
- Only operate machinery you have been trained and approved to use
- Adhere to the correct operating procedures at all times
- Always check equipment for damage or wear before using
- Make sure all guards and protective devices are in place and secure
- Wear the required safety equipment
- Never work in the ESP lab or workshops when your judgement or coordination is impaired
- Do not wear loose long sleeves or jewellery
- Long hair must be tied up at all times



Dust Hazards

Dust created by rock and wood processing poses a significant respiratory hazard

- Always use extraction systems
- Used P2 rated particle masks where necessary
- Minimise dust production by using plenty of water where appropriate



Electrical Hazards

Most equipment in the ESP lab and workshops is electrically powered and poses a potential electrocution hazard especially as many items also require water.

- Users must not interfere with or open electrical equipment
- Users must not use locked out equipment or remove lockouts
- Ensure the electrical safety sticker is visible and current
- Keep your work area and the floor as clean and dry as possible
- Report all faults immediately to the Technician in charge



Chemical Hazards

Some ESP lab and workshop processes use chemical solvents and epoxy adhesives.

- Avoid skin contact – wear gloves if necessary
- Wear safety glasses
- Use extraction systems to manage fumes
- Use minimal quantities
- Avoid ignition sources
- Have your MSDS with you, or know where they are stored
- Know the location of the first aid kit, eye wash and fire extinguishers



Workshop Equipment Hazard Information

Hazard Key			
E	Electrical	T	Thermal (heat)
M	Mechanical (Crushing, cuts, etc.)	Ch	Chemical
Pr	Projectile (hazard to eyes)	N	Noise
D	Dust	UV	UV Radiation
Finishing lab			
Equipment	Hazard	Hazard Rating	Extra Training required
Buehler PetroThin Section machine	E, M, Pr	Low	Yes
Hotplates	E, T, Ch	Low	Yes
Vacumet impregnator	Ch	Low	Yes
Lapping machine	E, M, Pr	Low	Yes
UV Bonding jig	UV	Low	Yes
Buehler Ecomet 30 Polishing	E, M, Pr	Low	No
Tegramin 30 Polisher/Grinder	E, M, Pr	Low	No
Buehler Beta grinder polisher	E, M, Pr	Low	No
Buehler roll grinder	E, M, Pr	Low	No
Rock Lab			
Covington slab saw	E, M, Pr, Ch	Med	Yes
Rock splitter	E, M, Pr, D	Med	Yes
Geokut slab saw	E, M, Pr	Med	Yes
Coring Drill	E, M, Pr, D	Med	Yes
Boyd crusher	E, M, Pr, D	Med	Yes
Hot press	T	Low	Yes
Ring mill (2)	E, M, D	Low	Yes
Lapping machine	E, M, Pr	Low	Yes
Slab polisher	E, D	Low	No
Wood workshop			
Table saw	E, M, Pr, D, N	Med	Yes
Table sander	E, M, Pr, D	Med	Yes
Drill press	E, M, Pr	Med	Yes

Use of Fume hoods

Purpose

To provide instruction on the proper use of chemical fume hoods to control exposure to hazardous materials. All users of fume hoods shall be familiar with the procedures described below. Fume hoods should be used for all activities/experiments that may create hazardous airborne contaminants, with the exception of biological agents. For biological materials, a biological safety cabinet should be used.

Safety precautions

- All operators must receive training on the safe operation of the fume hood prior to using the equipment. Training may be delegated to a qualified individual, but it remains the responsibility of the PI to ensure their personnel are adequately trained.
- Don the required PPE, including lab coat, gloves and eye/face protection.
- Substitute toxic chemicals with less hazardous materials whenever possible.
- Ensure work area is unobstructed. If materials must be stored in the hood (e.g., in-use waste containers) place items adjacent to a side wall. To ensure proper function, the baffles at the lower rear of the hood and the airflow through the front opening must not be obstructed.
- Do not store chemicals in fume hood unless storage is the sole use of the hood.
- Always work at least 6" (15 cm) in from the front lip of the hood.
- Keep sashes as low as possible when working in the hood.
- Do not extend your head inside of the hood while experiments are being performed.
- Perchloric acid at concentrations >70% must not be used in standard fume hoods. Heated or concentrated perchloric acid must be handled in specially designed hoods with wash down features to prevent formation of explosive perchlorates.

Inspection/certification:

UoA Property Services performs 6 monthly fume hood certifications and random inspections. Do not use a chemical fume hood unless the certification is visible and current.

Other considerations

- If a fume hood is malfunctioning, do not attempt to use it. Post a sign indicating the hood is out of service and report the equipment problem to the appropriate technician.
- Fume hoods use a large amount of energy, but closing the sash when not in use brings consumption down drastically. Always close the sash on the hoods in your lab when they are not in use.
- Keep fume hoods clean. Clean up any minor spills as they occur, and periodically clean inside of the hood.
- If an experiment is left unattended in a hood, post a sign indicating what the experiment is and who to contact.

Preparation

- Ensure you have completed a Hazard Assessment for the intended work.
- Don the required PPE, including lab coat, gloves and eye/face protection.
- Plan your work so that you know what items and chemicals you need in the hood and the order which materials are to be dispensed and mixed.
- Ensure the fume hood is on and that the airflow is adequate (visually check flow alarm or tell-tale to see if flow exists).
- Retrieve chemicals and required items and place in the hood.

Operation

- Lower sash to a reasonable working height. Maximum height is marked on the side of the sash.
- Uncap/open containers one at a time and dispense required amounts.
- When possible, use pipetting devices to avoid the need to pour liquids.
- When diluting, always add acids or base to water to avoid splashes of concentrated hazardous materials.
- If heating is required to dissolve a hazardous material, all heating must be done inside the hood in an uncapped container. Heating a sealed container may cause an explosion. Do not heat solutions which contain flammable solvents as diluents.
- Should a spill occur, attempt to contain the spill at the source, assess the situation and evacuate the lab if necessary.
- When finished, recap all containers and return chemicals to appropriate storage locations and close sash to its lowest level.

Laboratory Gases

Purpose

To provide instruction on the proper storage and use of gases provided to ENV laboratories and workshops. All compressed gases must comply with the relevant sections of the Hazardous Substances Regulations 2004.

Since gases are invisible they can be extremely difficult to detect.

ENV makes use of the following gases – oxygen, air, helium, nitrogen, LPG and acetylene. Gas bottles may only be handled by ENV technical staff. Do not attempt to change a gas bottle. Do not attempt to change the flow or pressure of gases through the systems. These are only to be adjusted by ENV technical staff.

If you suspect a gas leak or something is wrong then inform a technical staff member immediately.

Get yourself and other users out of the area as quickly as possible.

Compressed Air

Compressed air can be extremely dangerous. It can force objects around a space at high speeds causing injuries. It can force air into the body causing an air embolism (air bubbles in the blood stream). Never point compressed air at yourself or another person.

Classifications of gases

Oxidising gas

- A gas that gives up oxygen readily, removes hydrogen from a compound, or accepts electrons.
- Many materials that do not burn in air may ignite or burn in the presence of an oxidising gas.
- ENV uses Oxygen



Flammable gas

- A gas which will burn in air at a pressure of 101.3KPa absolute.
- Flammable gas in the presence of the correct mix of air and ignition source that will lead to combustion.
- ENV uses Acetylene
- ENV uses LPG



Toxic gas

- A gas that is known to be toxic or corrosive to humans as to pose a hazard to health.
- Presumed to be toxic or corrosive to humans because it has an LC50 value equal to or less than 5000ppm.



Non-flammable, non-toxic gas

- A gas which is non-flammable, non-toxic, non-oxidising, and is resistant to chemical action under normal conditions/
- The displacement of oxygen or air by an inert gas may pose a risk of asphyxiation.
- ENV uses Nitrogen
- ENV uses Helium



Glassware washing

You are required to wash your own glassware. Don't expect someone else to do it for you. Standard glassware is used for general testing, and reagents.

Acid washed glassware is for sensitive testing and low detection limit analysis.

If in doubt, please ask a technician.

Glassware Washing Protocols:

Standard glassware (manual washing)

1. Remove any Vivid/Sharpie marks with ethanol, remove any tape, etc.
2. Wash 3x or more with hot tap water and scrub off any visible dirt
3. Soak in detergent bath for >1 hour
4. Scrub again to remove any visible residue
5. Rinse 3x in hot tap water
6. Air dry on a lab bench (preferably on a clean paper towel or absorbent paper)
7. Return glassware to general glassware cabinet

Acid washing (manual)

1. Complete steps 1 - 5 above
2. Soak for 24 hours in acid bath
3. Rinse 3x with deionized water
4. Cover opening with plastic wrap, cap or parafilm
5. Air dry on a lab bench (preferably on a clean paper towel or absorbent paper)
6. Return glassware to acid washed glassware cabinet

Note: lab coat, safety glasses, and gloves must be worn in steps 2 & 3

Dishwasher

1. Remove any Vivid/Sharpie marks with ethanol, remove any tape, etc.
2. Scrub off any visible dirt
3. Load into dishwasher (please advise technician when full – do not operate dishwasher unless authorised to do so)
4. Return glassware to appropriate cabinet

Use of Gloves for Safe Handling of Chemicals

Did you know?

- Different chemicals require different gloves to protect the user.
- All gloves deteriorate in contact with chemicals – some quicker than others.



Therefore you must choose your gloves carefully and use them properly

Choosing the right gloves

1. What chemicals are being handled? List these and consult a **Glove Compatibility Chart** (and learn to correctly read the chart). This will advise which type of glove is best suited (e.g., latex, nitrile, neoprene, etc.). Carefully note the breakthrough times, permeation and degradation rates). You may need different gloves for different parts of the work.
2. How much dexterity is needed? Thicker gloves are generally more durable and offer better protection however handling of smaller items becomes more difficult and may create a new hazard.
3. Size and length. Choose the size most appropriate to your hands. Consider carefully whether longer gloves are necessary.
4. If you are allergic to latex, you may need to consider using nitrile gloves as a first layer.

Rules for glove use in the labs

- Wear the correct gloves when needed.
- Wear gloves no longer than 2 hours.
- If covered in chemicals, rinse and dry the gloves before removing them.
- Remove the gloves in the correct manner (refer to video – *To be (safe) or not to be*)
- Disposable gloves must be discarded once removed. Do not save for future use.
- Dispose of gloves into the proper container
- Non-disposable/reusable gloves must be washed and dried, as needed, and then inspected for tears and holes prior to reuse.
- Wash hands once gloves have been removed.
- Remove gloves before touching non-lab items (e.g. phones, computers, pens and one's skin).
- Do not wear gloves out of the lab. If gloves are needed to transport anything, wear one glove to handle the transported item. The free hand is then used to touch door knobs, elevator buttons, etc.
- If for any reason a glove fails, and chemicals come into contact with skin, consider it an exposure and seek medical attention.

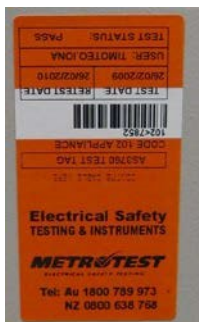
Electrical Safety

All electrical appliances must be tested (and have passed)

Every mains-operated electrical appliance used within the School of Environment, whether owned by the School or privately, must comply with the Electrical Safety Standard AS/NZS 3760 and must carry a sticker showing that it has been tested and found to comply. Leased computing equipment has been exempted from this requirement. If you bring in a new appliance, it will need to be tested – please contact the Technical Manager.

Check the test sticker

Before switching on or using any mains-powered equipment, check that the test sticker is less than a year old and that there is no apparent damage to mains leads, plugs, switches, fuse holders. Most appliance electrical safety problems can be spotted by eye. Protect electrical leads from mechanical, chemical, or heat damage.



Electrical leads and power boxes

When an item of equipment is situated at a distance from a power point, the electrical lead should not run along the floor. If necessary, place hooks along the wall to raise the lead above the floor. Do not use extension cords as a substitute for fixed wiring. Additional power outlets can be requested from Property Services.

When power boxes are used that enable a number of appliances to be run from one power outlet, care must be taken to ensure that the circuit is not overloaded. Where possible, use power boxes with circuit breakers attached. However it is better to once again request more permanent power outlets.

Safe use of electrical appliances

- Keep clothes, paper and other flammable materials well clear of heaters and other equipment producing heat as a function of their operation.
- Keep all objects and dust away from air vents required by equipment for cooling to reduce the risk of fire. Liquid spills should be immediately removed as these can cause electrical short circuits that may lead to metal cases becoming 'live' or to fire.
- In wet or damp conditions a residual current device should be used. Protective rubber gloves and boots should be worn.
- Turn off and preferably unplug all electrical apparatus that is not in use.
- Any electrical equipment left operating and unattended should have the control switch clearly marked and instructions for switching off in the case of emergency posted in a prominent position

No tampering

Do not interfere with or alter the fixed electrical supply to an office, laboratory or workshop. This includes the opening of fuse boxes.

Do not open covers on any equipment that leaves potentially 'live' circuits exposed.

Faults and repairs

Report any faulty equipment immediately to the technician in charge. Outside of normal hours and where prompt attention is needed ring the University Security Desk, x85000. Your concern will be relayed to Property Services who are on call.

Switch off the faulty equipment and remove it from service, or leave a warning notice if it is likely to be a hazard to other workers.

All electrical appliances that fail electrical safety tests will be taken out of service or rendered inoperable until the appliance is repaired by an electrically certified technician.

Do not attempt construction of electrical equipment or carry out alterations or repairs to it unless you are appropriately licensed and hold a current practicing certificate.

All electrical work (including fitting and rewiring plugs, and the replacement of fixed wiring fuses) is to be performed by electrically certified technicians.

Faults in fixed wiring are to be reported to Property Services.

Laboratory hazard assessment process

Use this procedure to assess and manage **ALL** potential lab hazards for the **ENTIRE** period of your work. This procedure is an obligation for complete new process/procedure than intend to be done in the Lab.

- STOP** - Carefully consider all aspects of the lab work you plan to do (including analysis, preparation procedures, materials required, etc.).
- IDENTIFY HAZARDS** - Identify and list the hazardous facilities, materials, methods or equipment used.
- Create a **HAZARD MANAGEMENT PLAN** to obtain the information, procedures, and skills required to effectively manage the hazards by,
 - Discussing with supervisor & Lab Manager,
 - Receiving supervised training,
 - Printing and reading MSDS's & SMOU's
 - Consulting research papers.
- FILE** this information into your Lab Safety Folder and keep it with you throughout your work.
- Get **SIGN OFF** from the respective person in charge and (if applicable) your supervisor.
- DO IT** – proceed with your lab work in accordance with your Hazard Management Plan.
- STAY AWARE and REFLECT** – be on the lookout for any new potential or actual hazards as they present themselves and review your work daily. Be prepared to add to or modify your Hazard Management Plan accordingly.

An example

Identified Hazards	Hazard Management Plan	Supervisor/P.I. Approval	Lab Manager/ Technician Approval																
A comprehensive assessment of the proposed work must identify all potential hazards	Lab user to obtain relevant hazard management info (procedure or MSDS) and keep in their lab folder. Identify info here and sign as read and understood																		
DESCRIPTION OF WORK: Nitric acid digestion of estuarine sediment																			
<ul style="list-style-type: none"> HSB 365 Nitric Acid 15% conc (diluted from 70%) Digestion process Hot plate 	<ul style="list-style-type: none"> SMOU 14 – Corrosive compounds MSDS for >70% conc HNO₃ Research paper - Bloggs (2013) Electrical Safety in ENV guideline <p>Will receive initial method supervision and training from Prof. Buck Rogers</p>	<table border="1"> <thead> <tr> <th>Name</th> <th>Date</th> </tr> </thead> <tbody> <tr> <td>Buck Rogers</td> <td>21 Jan 2013</td> </tr> <tr> <td colspan="2">Signed</td> </tr> <tr> <td colspan="2">B. Rogers</td> </tr> </tbody> </table>	Name	Date	Buck Rogers	21 Jan 2013	Signed		B. Rogers		<table border="1"> <thead> <tr> <th>Name</th> <th>Date</th> </tr> </thead> <tbody> <tr> <td>Chuck Norris</td> <td>21 Jan 2013</td> </tr> <tr> <td colspan="2">Signed</td> </tr> <tr> <td colspan="2">C. Norris</td> </tr> </tbody> </table>	Name	Date	Chuck Norris	21 Jan 2013	Signed		C. Norris	
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Building your lab safety folder

All chemicals and equipment have specific hazard information and training relating to their safe use beyond the induction process. Below is a list of specific hazard information which, if relevant, **MUST** be read and understood prior to use and appended as part of your developing lab safety folder.

If a hazard exists which isn't listed here, seek technical advice **BEFORE** undertaking your work.

Material Safety Data Sheets (MSDS's)

MSDS's give detailed safety information on specific chemicals and can be accessed through **GoldFFX** (<https://www.library.auckland.ac.nz/databases/>). Lab users must consult the respective MSDS for ALL chemicals they use and incorporate them into their hazard assessments.

Access to MSDS's with instructions is given on the Faculty of Science website

Chemical spill emergency procedure

Always consider your own safety first

Assess the scene

- Is there any respiratory hazard? *If YES – EVACUATE immediately, see Lab staff*
- Is the spill safe from ignition? *If NO - Turn off ignition sources only if safe to do so*
- Are others safe from the spill? *If NO – EVACUATE others & provide first aid*
- Is the substance highly hazardous? *If YES –seek Lab staff immediately*
- Can the substance be identified? *If YES, get MSDS; if NO, see Lab staff*
- Is the spill small enough to handle yourself (see over page)? *If NO, see Lab staff*
- Do you have the correct training, expertise and equipment? *If NO, see Lab staff*

If you decide to EVACUATE;

- **Evacuate all personnel in labs**
- **Call 111**
- **Tend to victims** (copy of the MSDS must accompany the victim)
- **Secure the scene**
- **Consider building evacuation for gas leaks or uncontrolled fire**
- **Take a copy of the MSDS for the Emergency Services**
- **Do not re-enter the spill site until advised that it is safe to do so**

Alert

- Alert technical staff or Lab Managers
- Alert all co-workers and neighbouring labs
- Isolate and manage the site – do not let others approach the spill area

Prepare

- Consult MSDS (esp. Sections 6 & 8)
- Get appropriate protective equipment
- Get appropriate spill containment kit
- Get plastic disposal bag with hazardous substances label

Contain

- For dry chemicals, gently brush into a dustpan and place into disposal bag
- For wet chemicals, use absorbent material to protect drains
- Isolate spill area. Place absorbent material around margin of spill
- Place absorbent material over top of spill

Collect

- Using tongs, pick up any broken glassware and place into disposal bag
- Pick up all absorbent pads and place into disposal bag

Clean

- Use detergent spray and absorbent pads to clean spill site
- Dispose of pads into disposal bag
- Place disposal bag into fume hood until disposal

Dispose

- Ensure disposal bag is clearly labelled with nature of chemical
- Tech staff will dispose of the bag through the appropriate disposal agents

Report

- Ensure an incident report form is completed and submitted to the Technical Manager

Safe Method of Use 2 - Laboratory Work Practices

The following basic good laboratory practices **must** be observed in all laboratories in the University of Auckland:

1. Food or drink for human consumption **must not** be consumed or stored where hazardous substances are stored or used.
2. Protective clothing including laboratory coats **must** be worn in any laboratory area or facility and **must** be removed when going from laboratory areas to the tearooms or office areas.
3. Protective gloves of appropriate material **must** be worn when handling chemicals (see SMOU 5 for more details).
4. Safety glasses **must** be worn at all times in laboratories, except in the following circumstances:
 - a) no foreseeable eye hazards exist in the room space; or
 - b) eye protection will significantly interfere with the intended task (an example might be microscopy) and there is no imminent risk of eye injury in the immediate vicinity; or
 - c) While in transit through the laboratory via the safest and most direct route and there is no imminent risk of eye injury in the immediate vicinity of the route.

Note: Prescription glasses **do not** constitute safety glasses and provide no protection for splashes coming from the sides. Those wearing prescription lenses must wear safety glasses over the top of prescription lenses or have plastic side covers fitted to prescription lenses.
5. Closed footwear **must** be worn where hazardous substances are stored or used.
6. Hands **must** be washed before leaving the laboratory room.
7. A fume hood or fume cupboard or other means of ventilation, isolation or extraction (e.g. an isolating cabinet or a 'cytotoxics' cabinet) **shall** be used when working with toxic, volatile or odoriferous substances, or particulate/dusty matter, to ensure a safe working environment.
8. All hazard labels on surplus containers and packaging **must** be defaced or rendered illegible before discarding.

Safe Method of Use 19 - General Exempt Laboratory Requirements

Those using the General Safe Method of Use must have also read and comply with Safe Method of Use #2 - Laboratory Work Practices.

Further information can be obtained by consulting MSDS Sheets and the Safe Methods of Use specific for each hazard class of chemical.

Note: 'Must' denotes a mandatory requirement and 'should' denotes a recommendation.

General Requirements for Use and Storage of Chemicals

General

1. All accidents and near misses must be reported
2. The requirements of Safe Method of Use for Personal Protective
3. Equipment instructions **must** be followed
4. MSDS sheets **must** be consulted prior to handling any chemical whose properties the user is not familiar with.
5. Chemicals **must** be properly segregated. Please read segregation guidelines (Section C below).
6. Containers with chemicals **must** be clearly and legibly labelled.
7. Labelling means that primary containers have the following information:
 - a. Identity of compound
 - b. Its concentration (if applicable)
 - c. Warning label (a UN pictogram or written warnings on the label will suffice)
8. All working containers must have the following information:
 - a. Identity of compound i.e. a chemical name is preferable but a formula or chemical shorthand such as 'EtOH' or 'HCl' will suffice provided it is well accepted and understood by those persons in the laboratory
 - b. Its concentration (if applicable)

Gases

1. All gas cylinders **must** be secured.
2. Cylinders of flammable gases **must** be used with a flashback arrestor when attached to a source of ignition.
3. Cylinders of toxic or corrosive gases with regulators attached **must** be stored in fume hood (see SMOU 9 for Gases regarding specific requirements)

Flammable Solvents

1. Flammable solvents **must** be kept in cabinets. If volumes of flammable liquids is greater than 10 litres then these cabinets must be flameproof. No more than 100 litres of flammable solvent **must** be stored in each flameproof cabinet and no more than one 20 litre container **should** be stored in flame-proof cabinets.
2. Flammable solvents and combustible organics **must not** be stored with oxidisers (hydrogen peroxide, sodium nitrate, hypochlorite) or any oxidising acid (concentrated nitric or perchloric acids). Please read segregation guidelines if you have any doubts.
3. Bulk flammable solvents in the laboratory **must** be kept to a minimum – use DG stores for bulk solvent.

4. If highly Flammable (Class 3.1A) solvents (e.g. ethers) are stored in refrigerators, these refrigerators **must** be spark-proofed (and the refrigerator labelled as such). Use of highly flammable (Class 3.1A) solvents is restricted to fume hoods.
5. Ethers such as diethyl ether and tetrahydrofuran **must** have date of purchase clearly written on container. Once opened, ethers such as diethyl ether **must** not be kept longer than 18 months without being tested for peroxides. Subsequent testing must be performed at intervals as specified in the appropriate SMOU. If testing is not available, the ethers **must** be disposed. Testing dates and results **must** be indicated on the label. Any compound with peroxide levels greater than 100 ppm **must** be disposed.
6. Flammable liquids **must** not to be stored or used near sources of ignition (e.g. flames, hot plates, electrical switching).
7. Flammable liquids **must** be decanted in fume hood or well ventilated areas. The only exceptions will be Class 3.1B and C liquids that are diluted in aqueous solvents (e.g. diluted ethanol and methanol).
8. No waste solvents are to be stored outside flameproof cabinets, unless the waste receptacles are less than or equal to 2.5 litres and are attached to analytical machines in a closed system.

Reactive Toxic and Corrosive Chemicals

1. Particular care **must** be taken when storing and handling Class 4 and 5.2 Reactive Compounds (users must consult and comply with relevant SMOU and MSDS).
2. Class 4 (reactive solids), 5.1 (oxidisers) and 5.2 (organic peroxides) compounds **must** be segregated from combustible organics and flammable liquids.
3. Desensitised explosives such as picric acid **must** be under the supervision of a Laboratory Manager who will ensure that the levels of desensitising agent are checked every 6 months (see clause C7).
4. Fume hoods **must** be used for handling Class 4 and toxic compounds and decanting flammables and concentrated acids.
5. Highly toxic chemicals (Oral LD50 < 5 mg/kg) **must** be stored in a secure area or locked cupboard/refrigerator if the laboratory is not secure. A register should be kept of these toxic compounds (see SMOU for more detail).
6. Where liquids are stored inside cabinets there **should** be some form of secondary containment – flameproof cabinets have sumps which provide secondary containment.
7. Individual winchesters of liquid **should** be transported in a carrier.
8. Fume hoods **must** not be used for storage of chemicals with the exception of highly toxic gases or chemicals that leak toxic fumes.
9. Recirculating fume hoods **must** be clearly labelled with limitations of use.

Requirements for Highly Hazardous Chemicals

Where chemicals have highly hazardous properties, they may require additional measures over and above general safety rules provided by the General Safe Methods of Use.

The reader is referred to specific Safe Method of Use and to the specific MSDS.

In particular:

Reactive Solids	SMOU 11
Oxidisers	SMOU 12
Organic Peroxides	SMOU 13
Acutely toxic compounds	SMOU 14
Unknown Properties	SMOU 15
Compounds with Chromic toxicity	SMOU 16
Corrosives	SMOU 17

Note that for acutely toxic compounds in particular, users **must** consult MSDS sheets and ensure clear warning labels or pictograms are present on all containers.

Segregation and Particular Storage Requirements

1. Water sensitive compounds (hydrides, borohydrides) **must** be stored away from sources of water.
2. Acids **must** be stored away from alkalis.
3. Oxidisers (nitrates, hypochlorites, peroxides, chlorates, permanganates) **must** be stored separately from flammable or combustible organic compounds and **must** never be stored with flammable solvents.
4. Oxidising acids (concentrated nitric and perchloric) **must never** be stored with flammable solvents, organic acids (acetic or formic) **should** be kept separately from any organic compound.
5. In situations where oxidising acids (perchloric or nitric) are stored in corrosives cabinets, organic acids (formic and acetic) **should not** be stored in the same cabinet. Instead these organic acids **should** be stored in the flammables cabinets. Note: Segregation can be achieved by distance or in some cases by enclosing small bottles of incompatible chemical in a plastic container.
6. Purchasing date of time sensitive compounds such as ethers **must** be recorded on bottle. Compound will be tested or discarded at the prescribed date (see SMOU for Peroxide – forming chemicals).
7. Desensitised explosive compounds such as picric acid **must** be checked every 6 months to ensure adequate levels of desensitising agent are present.

Compounds with Chronic Toxicity

Care **must** be taken to reduce exposure to any chemical (through the use of fume hoods and gloves). The adverse effects of some compounds are only evident after repeated low-level exposures (e.g. sensitising agents). Particular care **must** be taken when MSDS sheets indicate a compound is teratogenic, mutagenic or sensitising agent.

Fume hoods **must** be used when handling sensitising agents such as formaldehyde as well as many common solvents (xylene) to reduce inhalation hazard not only to the user but also to other laboratory personnel. Gloves of appropriate resistance **must** be worn when handling these compounds.

Disposal of Chemicals

With few exceptions all chemicals **must** be disposed by a licensed chemical waste contractor (see Chemical Safety Website for more details).

Work Alone or After-hours

1. Laboratory personnel working alone or after-hours **must** ensure they obtain prior permission from their supervisor and the Technical Manager.
2. Laboratory personnel working alone or after-hours **must** familiarise themselves with emergency procedures and have easy access to emergency telephone numbers.
3. It is strongly recommended that any person working after-hours notifies Unisafe (Extn 85000) when they enter the building and expected time of leaving.
4. In the case of some specific chemicals (e.g. HF) work alone or afterhours **is specifically prohibited** (these prohibitions are specific to chemical concerned and are included in the SMOU for that chemical).

Requirements for an Exempt Laboratory

Laboratory Management

1. Every Exempt Laboratory **must** have a Laboratory Manager.
2. 'Persons in Charge' of the Laboratory **must** be nominated in the absence of the Laboratory Manager. Otherwise (unless the building has perimeter access control – FMHS, SBS or Liggins Institute) the laboratory **must** be locked when Lab Manager or a 'Person in Charge' is not available.
3. There can only be one person in charge of the Laboratory at any onetime. Therefore a hierarchy **must** be established.
4. All of the above **must** be in writing and all laboratory personnel **must** be aware of who is in charge of the laboratory at any given time.
5. It is suggested that a list giving name of the Laboratory Manager and Persons in Charge in order of hierarchy is posted in a prominent place in the laboratory or on a website.

Requirements of the Lab Manager

The Laboratory Manager or "Person in Charge" **must**:

1. Make themselves available to Emergency Services in the event of laboratory evacuation and must ensure any laboratory staff who can provide information to Emergency Services are also available.
2. Ensure all laboratory personnel have access and follow the Safe Method of Use for every category of chemical that is present in the lab. The General Rules above are extracted from specific SMOUs and should suffice. Specific SMOUs are available on the Chemical Safety Website.
3. Ensure lab personnel know location of spill kits and protective equipment and how to operate this equipment.
4. Ensure lab personnel know which gloves are appropriate for the chemical they are using. Note that this information is available on the Chemical Safety Website.
5. Ensure all laboratory personnel have access to and can extract information about any chemical in the lab from MSDS databases. Note that two MSDS databases (Chemweb Gold and CCOHS) are available within the University. Specific Safe Methods of Use should be consulted for more detail.
6. Ensure all laboratory personnel have access to a 24 hours emergency number.
7. Check (or arrange to have checked) all containers of chemicals to ensure they are not leaking and are properly labelled. Particular attention should be paid to labels on containers of corrosive compounds.
8. Check to ensure chemicals are properly segregated.
9. Check to ensure opened containers of ethers are not stored for longer than 18 months.
10. Ensure there is adequate shelf-space assigned for chemical storage.

Requirements of the Lab Personnel

All laboratory personnel must:

1. Follow Safe Method of Use on Basic Laboratory Safety.
2. Use protective equipment as directed with particular attention to safety glasses and the use of correct type of gloves.
3. Make themselves available to the lab manager and Emergency Services if they are able to provide information relevant to the emergency.
4. Read and follow Safe Method of Use for the category of chemical they are using (the above general rules will cover most situations).
5. Ensure (in writing) that the Laboratory Manager is aware of any acquisition of highly hazardous chemical for which there is no Safe Method of Use.
6. Ensure laboratory is locked when either Lab Manager or Person-in Charge is absent.
7. Note: the requirement to lock the laboratory will not necessarily apply to Liggins Institute, School of Biological Sciences and Faculty of Medical and Health Sciences where there is adequate perimeter security.
8. Destroy any warning labels on packaging before discarding the packaging.
9. Report any leaking container or malfunctioning equipment to the Laboratory Manager.
10. Report container with illegible or defaced label to the Laboratory Manager.
11. Know the location of spill kits and protective equipment.
12. Know how to deal with spill of any chemical in the laboratory.

Reporting Accidents and Incidents

1. All accidents and incidents **must** be reported to Laboratory Manager.
2. All accidents and near misses **must** be reported to University Health and Safety Office **on the prescribed University Accident/Incident form**. Ensure a copy is sent to Faculty or Department Manager.
3. Accidents involving splashes to the eye may require reporting to OSH. These accidents **must** be reported as soon as possible to the University Health and Safety Office.
4. The Laboratory Manager and any person with information relevant to the emergency **must** make themselves available to the Emergency Services

Safe Methods of Use

There are additional SMOU's relating to specific hazards which are accessible through the Faculty of Science website

Current students » Health and safety » Risk management » Chemical safety » Safe Methods of Use

General Laboratory and workshop safe methods of use

- SMOU 1 – General Exempt Laboratory
- SMOU 2 – General Exempt Workshop
- SMOU 3 – Lab Work Practices
- SMOU 4 – Laboratory Management
- SMOU 5 – Personal Protective Equipment
- SMOU 6 – Storage of Chemicals in the Laboratory
- SMOU 7 – Emergency Procedures
- SMOU 8 – Planning for Power Failures

Safe Methods of Use for Classes of Chemicals

- SMOU 9 – Class 2 Gases
- SMOU 10 – Class 3 Flammable Liquids
- SMOU 11 – Class 4 Reactive Solids
- SMOU 12 – Class 5 Oxidisers
- SMOU 13 – Class 5.2 Organic Peroxides
- SMOU 14 – Class 6.1 Toxic Compounds
- SMOU 15 – Unknown Properties
- SMOU 16 – Class 6.5 Chronic Toxicity
- SMOU 17 – Class 8 Corrosives

Safe methods of use for problematic chemicals

- SMOU 18 – Cryogenic Liquid
- SMOU 19 – Storage of Liquid Nitrogen
- SMOU 20 – Formaldehyde

Safe methods of use for spills and clean up

- SMOU 21 – Mercury spills
- SMOU 22 – Ethidium Bromide decontamination
- SMOU 23 – Diaminobenzidine decontamination

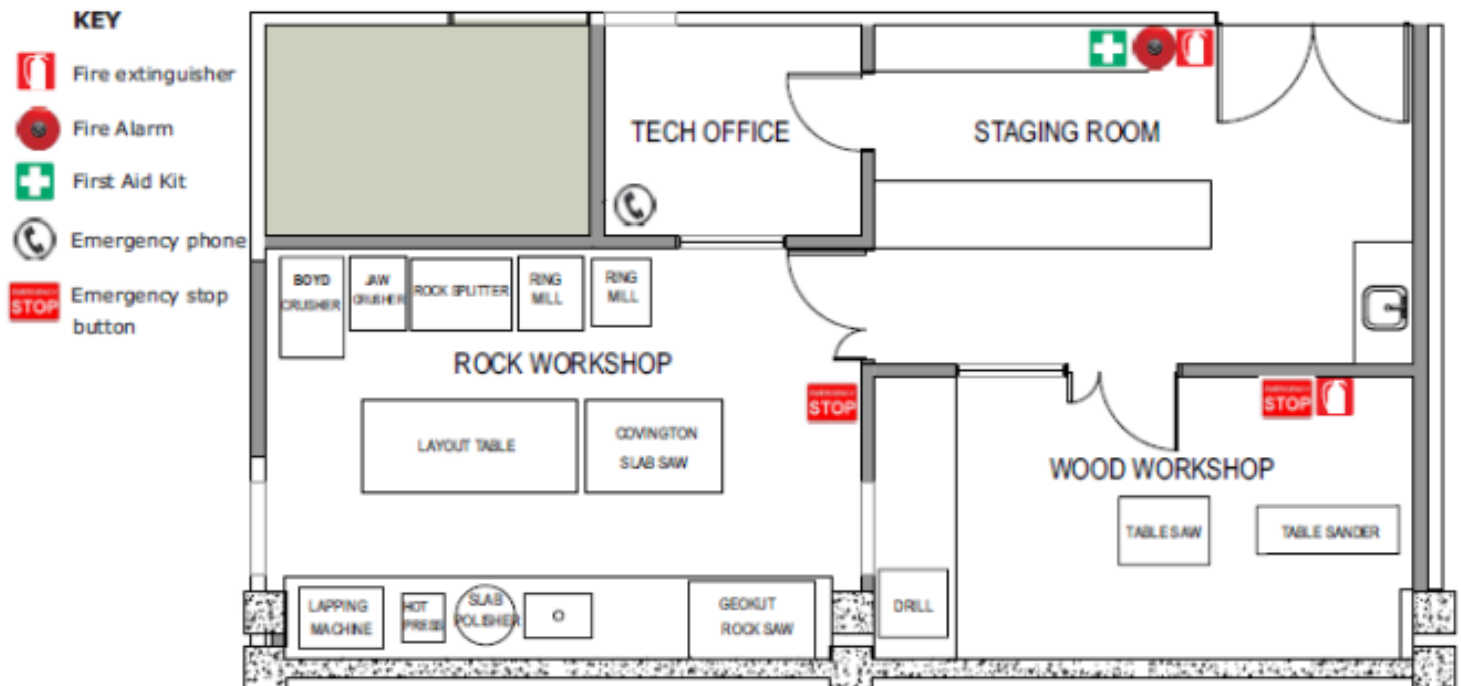
Safe methods of use for highly hazardous compounds

- High Haz SMOU 1 – Picric Acid
- High Haz SMOU 2 – Hydrofluoric Acid
- High Haz SMOU 3 – Phenol
- High Haz SMOU 4 – Peroxide forming chemicals
- High Haz SMOU 5 – Pyrophoric Compounds

Safe methods of use for protective barriers

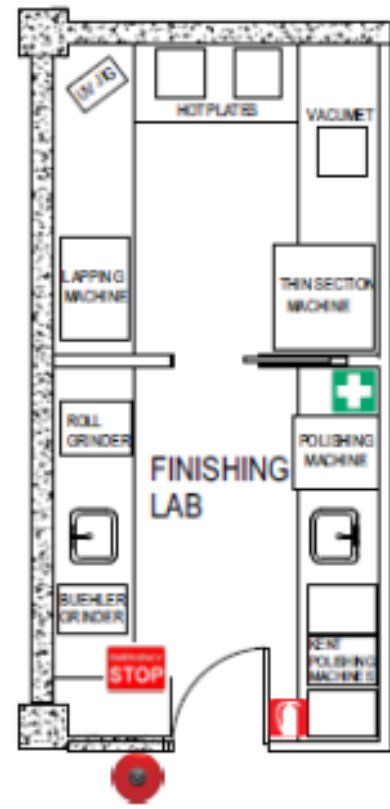
- SMOU 24 – Blast Shields and FC Sash

Laboratory, Workshop and Facility Maps



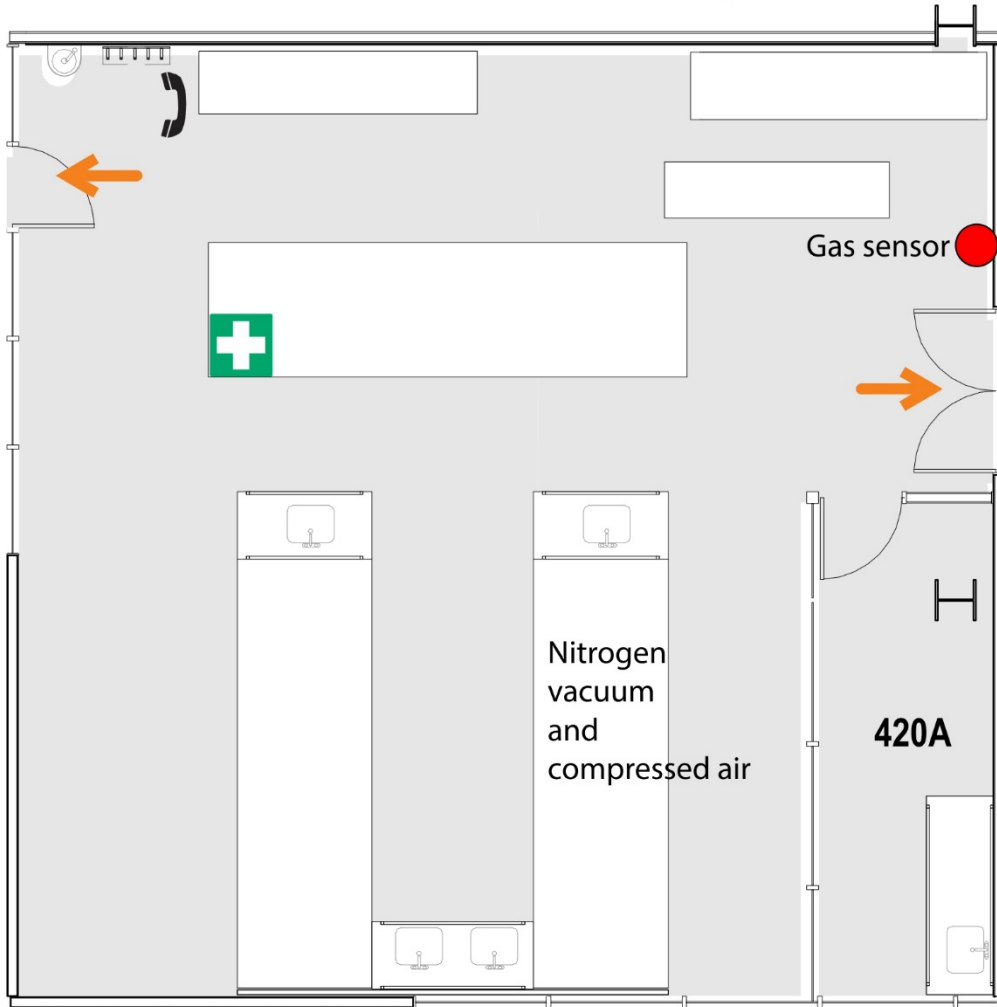
301.B039 - ESP Lab - floorplan

- KEY**
-  Fire extinguisher
 -  Fire Alarm
 -  First Aid Kit
 -  Emergency phone






301.B042 - ESP Finishing Lab - floorplan

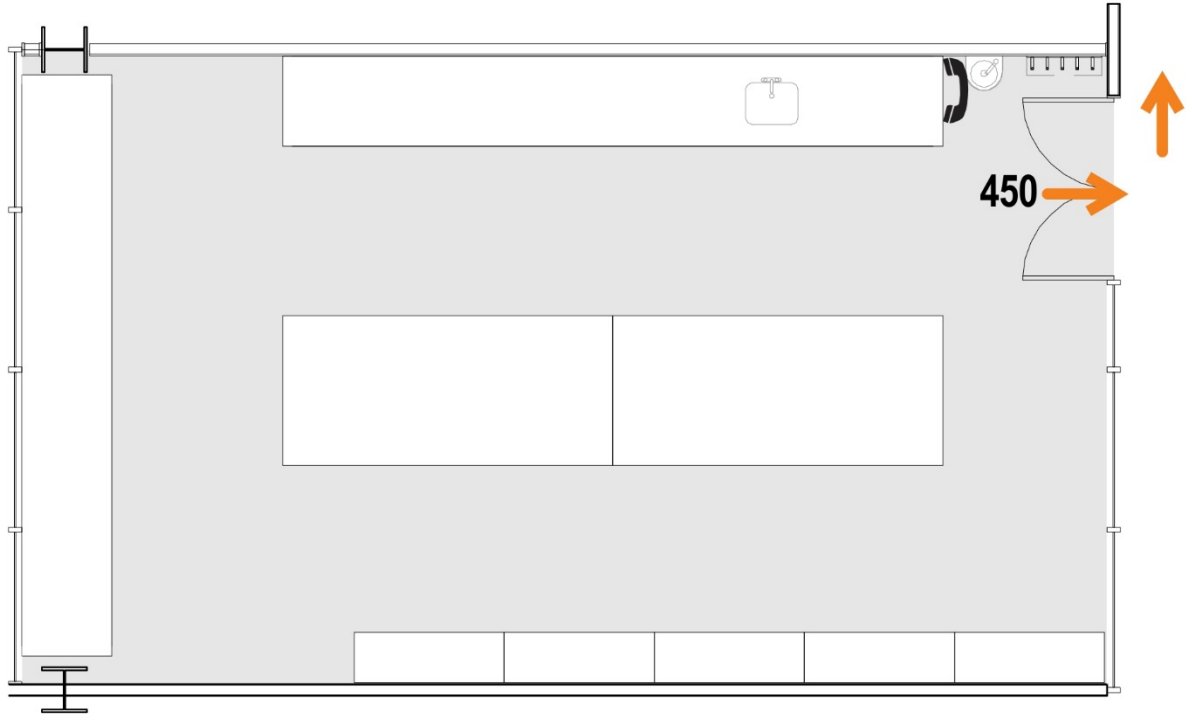
302.420
Sedimentology Lab
D Wackrow



KEY



-  First Aid
-  Lab phone
-  Fire Escape route

302.450
Dendrochronology Lab
C Yong

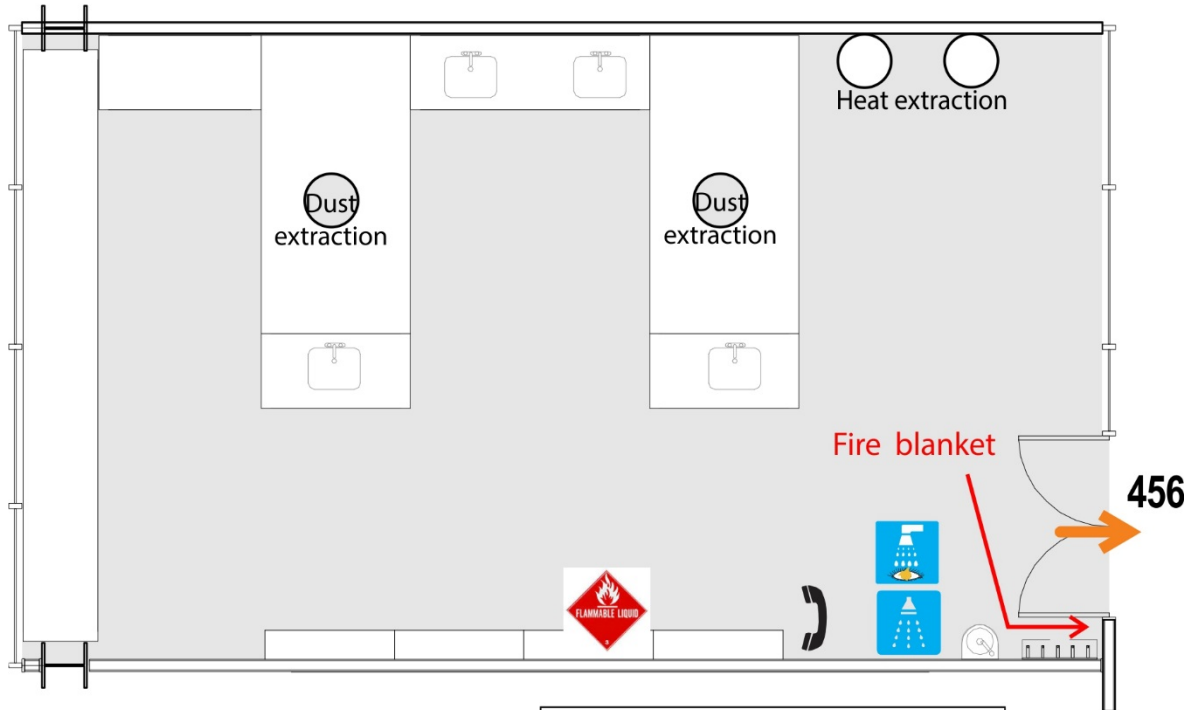


3 m

KEY

-  Lab phone
-  Fire Escape route

302.456 Ecology Lab B Hall



3 m

KEY

-  Safety Shower
-  Eyewash
-  Lab phone
-  Fire Escape route
-  Flammable liquids

302.460
Coastal + Hydrology Lab
B Hall



3 m

KEY




-  First Aid kit
-  Lab phone
-  Fire Escape route

302.485 Climate Lab
302.489 Geophysics Lab
Colin Yong

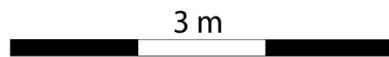
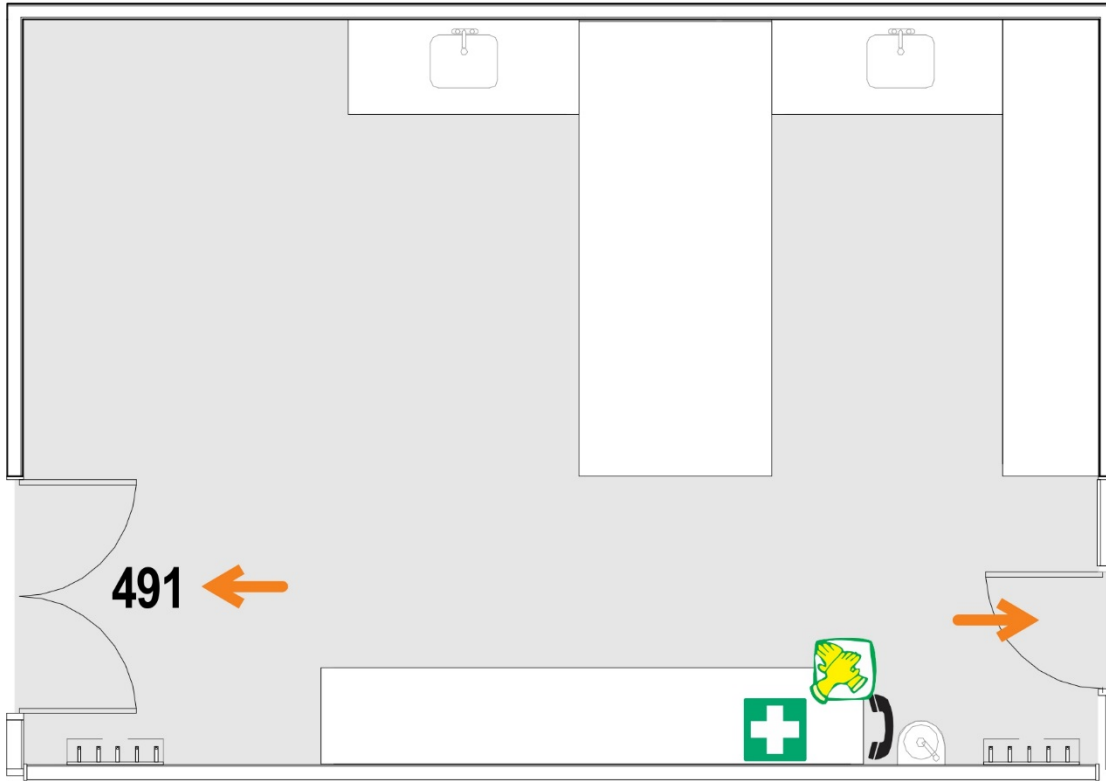


3 m


KEY

-  Fire extinguisher
-  Lab phone
-  Fire Escape route

302.491
Particle Analysis Lab
D Wackrow

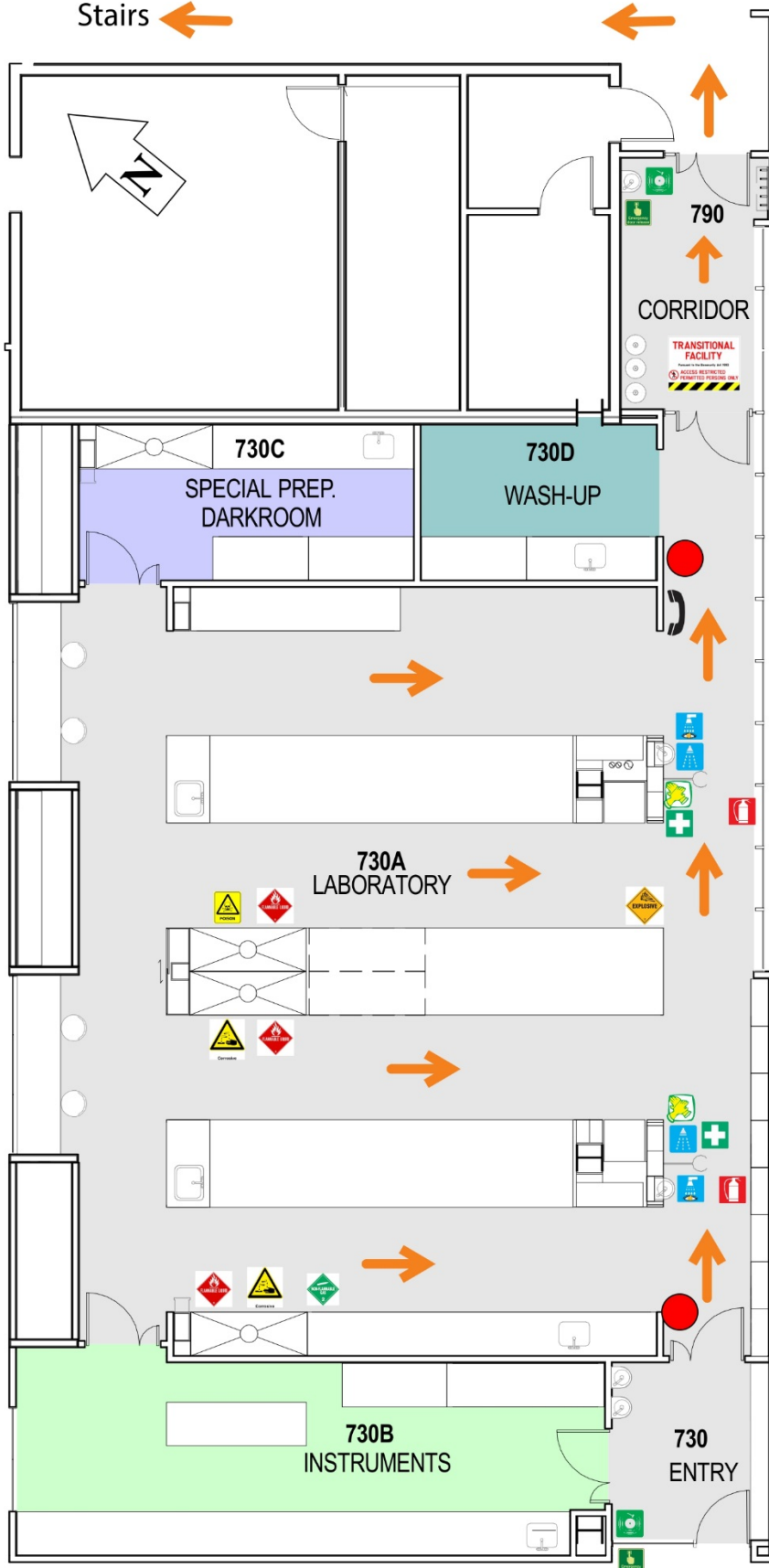


KEY

















-  First Aid
-  Spill Kit
-  Lab phone
-  Fire Escape route

302.730 A B C D
Chemical Labs
Natalia Abrego

Stairs ←



KEY

-  Fire extinguisher
-  Fire Alarm + Gas shut off button
-  First Aid
-  Safety Shower
-  Spill Kit
-  Eyewash
-  Lab phone
-  Fire Escape route
-  Non Flammable gas
-  Flammable liquids
-  Oxidising explosives
-  Toxics
-  Corrosive
-  Transitional Facility
-  Emergency door release
-  Spill button

Scale  3 m