VUCEL Dry Lab Safety Manual

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Coastal Ecology Laboratory, School of Biological Science

Victoria University of Wellington

IN AN EMERGENCY DIAL 1-111

For more information about laboratory safety in SBS or if you need assistance with an incidental chemical spill, minor accident or to ask about a potential hazard in the laboratory, contact Alan Hoverd (SBS Health and Safety Officer, ext 5579) or Derek Heath (SBS Laboratory Officer ext. 5580), or any SBS technician.

EMERGENCY INSTRUCTIONS
DIAL 1-111

FIRE

IF YOU DISCOVER A FIRE
Operate the nearest fire alarm call point by breaking the glass and pressing the switch down
Dial 1-111 and ask for the Fire Service
Use fire fighting equipment only if you are confident and it is safe to do so

IF YOU HEAR CONTINUOUS RINGING OF THE FIRE ALARM
DON'T linger, leave the building as quickly as possible
DON'T attempt to return to your room
DON'T run - keep calm
DON'T use lifts - keep left on stairs
DON'T return to the building until the all clear is given
ASSEMBLE at your assembly point (S W corner by the old garage) and keep well clear of the building

EARTHQUAKE

Stay inside the building during an earthquake
Take shelter alongside desks, tables, filing cabinets or under doorways
Keep calm and help allay panic in others
Take heed of your warden's instructions
Unless building has collapsed await instructions to evacuate building

IF THERE IS NO SHELTER
Kneel on floor, face away from windows
Clasp both hands behind the head, covering the neck
Bury face in arms, close arms tightly
Stay in this position until the earth tremors have subsided and it is safe to get up
ASSEMBLE at S W corner by the old garage

TSUNAMI

Follow directions of Civil Defence/Emergency Services
Move to nearest safe area (higher ground, 35m above sea level or at least 1km inland)
Do not return after the first wave as there may be several larger ones following

SEVERE WEATHER

Ensure all windows and doors are closed
If you have to move outdoors be aware of flying debris
Report any damage or flooding to Campus Care on 8888

MEDICAL EMERGENCY

Dial 1-111 and ask for the Ambulance
Apply First Aid if you are confident and it is safe to do so

ACTS OF VIOLENCE

Dial 1-111 and ask for required Emergency Service
Remove yourself to a place of safety where possible

SUSPICIOUS PERSONS

Dial 1-111 and advise Police
Ensure your personal safety
Provide description, location and direction of travel of suspicious person(s)

UTILITY FAILURE

Dial 8888 and advise Campus Care

TERRORISM/BOMB THREAT

Dial 1-111 and advise Police
Seek personal safety and security
Await further instructions from the Police

PERSONAL EMERGENCY PLANNING

It is understood that before staff can commit to remedial actions at the University, it is vital they know that their families are safe and well. To assist in achieving this it is important that you have a Home Civil Defence Plan

COMMUNICATION: Make arrangements for how to contact your partner, who will collect the kids from school and where you will all meet

PREPARATION: You will need to be self sufficient for 3-5 days

HAVE A WORKPLACE EMERGENCY KIT

Essential medication
3-5 days supply of water & non-perishable foods
Alternative lighting (torch, spare batteries, Lightsticks)
Warm waterproof clothing & strong walking shoes
Battery operated radio
Contact details for family

CD CIVIL DEFENCE

Issued by Facilities Management
Victoria University of Wellington

VICTORIA
UNIVERSITY OF WELLINGTON
TE WHARE WĀNANGA
O TE ŪPOKO O TE IKA A MĀUI

Some of the Key Points to Remember

- Chemicals that are transferred into another container must include the following information on the label: chemical name, formula, concentration, hazard warning, name or initials of person responsible for transfer. For example, if you transfer a small quantity of ethanol into a Schott Bottle it must have a sticker with the correct hazard classification label: "Class 4 – Flammable Liquid"

- If you are re-using an old container for storage (e.g. gel tank buffer, or Phenol waste) all the previous labelling must be completely removed and the container must be fully labelled with the following information: chemical name, formula, concentration, hazard warning, name or initials of person responsible for transfer.

- Glass containers/receptacles cannot be stored on shelves without some form of protection to prevent them from falling during an earthquake.

- Do not work alone in the lab if the procedure being conducted is hazardous.

- Seek information about hazards and plan procedures with regards to protection and equipment. Know the locations of the emergency wash station, eye wash station, first aid kit, fire extinguisher, fire blanket, MSDS station, and spill kit.

- Always read the Material Safety Data Sheet (MSDS) before handling a chemical. Never use a chemical if you do not know the specific details about what hazards it poses, the Personal Protective Equipment required for safe use, and/or the emergency procedure that needs to be followed in the event of a spill or accident.

- The major hazard that you will most likely encounter in the lab is Phenol. Do not use Phenol unless: (1) you have had training from the lab manager or deputy lab manager, (2) completed a hazards self-assessment form, and (3) read and understood the content of the lab safety plan and the appropriate MSDS.

In The Event Of A Medical Emergency:

• Remain calm and begin lifesaving measures as required.
• Call for emergency services (Call 1-111) if necessary -- request an ambulance if needed. Notify Campus Care on ext 8888.
• Keep the injured person warm.
• Do not remove the injured person unless there is a danger of further harm.

How to Use This Manual

This Laboratory Safety Manual (LSM) describes policies, procedures, equipment, personal protective equipment and work practices that are capable of protecting staff and students from potential health hazards in the laboratory. Each staff member and student worker must complete an orientation to the Lab Safety Manual (LSM). They must sign a copy of a training sign-in sheet or other documentation that they have received the training. All lab spaces should be audited for compliance with the LSM twice a year by the laboratory manager.

The primary purpose of this plan is to minimize hazards, illnesses and injuries to staff, students, contractors and visitors in the laboratory. It is designed to help staff and post-graduate student members of the lab to recognize, evaluate and control hazards in the laboratory. The specified work practices and procedures have been developed to provide optimal safety. Effectiveness of the lab safety depends on the cooperation of everyone concerned.

Key SBS Personnel

SBS Health and Safety Officer: Alan Hoverd
Laboratory Safety Officer: Derek Heath
Transition and Containment Facility Operator (PC2): Joe Zuccarello

Laboratory Ergonomics

The purpose of an ergonomics program is to reduce or eliminate hazards that contribute to the development of cumulative trauma disorders (CTDs) -- a class of disorders related to repetitive motions. Ergonomic injuries are one of the fastest growing categories of workplace related injuries in New Zealand. Applying ergonomic principles can help reduce the risk of injuries or illnesses for those who work with computers, in laboratories, in jobs that require repetitive activities and in heavy materials handling. Pipetting, microscope work, computer use and improper lifting techniques are common causes of problems in labs.

Risk factors for CTDs include repetitive tasks, awkward postures, vibration, forceful exertions and heavy lifting. Allow your body to recover after these activities.

- Take frequent breaks
- Move around
- Don’t repeat the same motion for hours on end
- Avoid awkward motions and postures
- Perform relief exercises
- Expand the tasks each person performs to minimize the constant repetition of any one particular task

Awkward postures, repetitions, and use of force are not bad in themselves, however when sustained over long periods of time, thereby not giving your body the time to recover can lead to: overexertion, injury and perhaps permanent damage.

An Introduction to Chemical Safety

The key to chemical safety is the recognition, evaluation and control of hazards. There are a variety of resources, including Material Safety Data Sheets (MSDSs), to help gather basic information about chemicals, including hazard information (toxicity, reactivity, flammability and corrosiveness) and physical properties (state, volatility, odour). It may be necessary to do further research to evaluate the degree of hazard posed by a chemical. The result of the research process should be a set of guidelines including engineering controls (e.g. a fume hood), work practices and personal protective equipment (PPE).

MSDSs contain information on chemical identification, composition, physical properties along with health, physical, and environmental hazards. Other sections include emergency and first aid procedures, handling and storage procedures. The MSDS will discuss engineering controls for handling the material, and personal protective equipment that should be used. Most MSDSs also provide stability and reactivity information, toxicology, ecological information, disposal considerations, transport and regulatory information.

There are printed copies of MSDSs available for all the chemicals in the lab at the MSDS station. Other sources of chemical safety information include the references listed below. A variety of electronic resources can also be accessed through the Internet.

Chemical Safety References:

- Paper copies of MSDSs maintained in the lab
- Manufacturer's MSDSs posted on the Internet
- "CRC Handbook of Laboratory Safety"
- The Merck Index

The NZ Hazardous Substances Classification System

The New Zealand classification system uses number classes indicating the intrinsic hazard property (e.g. Class 6 – substances which are toxic), numbered subclasses indicating the type of hazard (e.g. Class 6.3 – toxic substances which are skin irritants), and lettered categories (e.g. Category A) indicating the degree of hazard (e.g. Class 6.3A – highly toxic substances which are skin irritants).

Chemical Procurement, Distribution & Storage

Before a chemical substance is ordered and received, information on proper handling, storage and disposal should be known. **All substances must be received by the lab manager or deputy lab manager.** No container will be accepted without an adequate identification label. No container will be accepted without a label exhibiting the:

- Identity of the hazardous chemical
- Appropriate hazard warnings; and
- Manufacturer's name and address.

The following guidelines must be followed when receiving and/or handling chemicals:

- Never open a reagent package until the label has been read and completely understood
- Add new chemicals to the Chemical Inventory \\Staff\data\SCIFAC\SCIFAC-Biology\6_Groups, Committees & Meetings\VUCEL\Dry lab\VUCEL chemical inventory.xlsx
- Mark all incoming chemicals with the date received, name of the owner and next VUCEL ID reference number from the chemical inventory file above
- Use Chemwatch to print off a copy of the MSDS. Appropriate safety requirements must be put in place before the substance is used if necessary. The user must read and sign this copy of the MSDS which must be filed in the lab folder.
- Chemicals with the following HSNO classes must be tracked: Classes 3.1A and 3.2A, Classes 4.1.2A and 4.1.2B, Class 4.1.3A, Classes 4.2A and 4.3A, Class 5.1.1A, Classes 5.2A and 5.2B, Classes 6.1A, 6.1B and 6.1C, Classes 9.1A, 9.2A, 9.3A and 9.4A. Add a tracking label to all chemicals with these classes and create an entry on the tracked chemicals list \\Staff\data\SCIFAC\SCIFAC-Biology\6_Groups, Committees & Meetings\VUCEL\Dry lab\Tracked chemicals.xls
- Clearly label all chemical storage areas with labels or placards to warn lab users and emergency response personnel such as fire fighters or paramedics.

Housekeeping, Storage, Maintenance & Inspections

Access to exits, emergency equipment and utility controls should never be blocked. All laboratory work areas should be cleaned and counter wiped, glassware washed and put away, and hands must be washed before the leaving the laboratory.

With regards to laboratory chemical storage, the amounts permitted should be as small as practical. Chemical storage on bench tops and fume hoods is not allowed. Chemical exposure to heat or direct sunlight should be avoided. Storage areas and cabinets should be segregated into well identified areas that are adequately ventilated. Highly toxic chemicals or opened containers should be in unbreakable containers or in secondary containment.

Toxic substances should be segregated with regards to compatibility in a well-identified area with ventilation. Highly toxic or other chemicals whose containers have been opened should be in unbreakable secondary containers. When chemicals are hand carried, the container should be placed in an outside container/ bucket or carried with both hand while having one hand on the bottom of the container to laboratory stations.

Stored chemicals should be examined at minimum annually for replacement, deterioration and container integrity. Periodic inventories should be conducted with unneeded items going for appropriate disposal or return.

Safety features for the laboratory facility should include:

- Accessibility to approved fire extinguishers and first aid kits
- Working emergency shower and eye wash station
- Forced ventilation from a fume hood
- Impervious shelving with half-inch lip, secured to wall with the top shelf below eye level
- Good illumination; and
- A Spill Kit and other clean-up materials.

Adverse hazardous chemical reactions can occur when incompatible materials mix because of:

- accidental breakage,
- fires and earthquakes,
- container failure,
- mixing of gases or vapors from poorly closed containers.

Reaction products can include:

- heat or fire generation,
- evolution of toxic or flammable gases,
- pressurization of containers; dispersal of materials or violent polymerization.

Never store flammable liquids in a standard or domestic refrigerator.

If flammable liquids must be refrigerated or cooled, they must be kept in an approved "flammable storage" refrigerator or freezer. The accumulation of vapors in a confined space can result in an explosion or fire if these vapors are ignited by the various electrical components inside a typical household (domestic) refrigerator compartment. Special flammable storage refrigerators have no ignition sources inside the cabinet. Environmental rooms (cold/warm rooms) have many ignition sources and little or no air circulation from outside. Small quantities of hazardous materials (e.g. 500 ml) may be used in these spaces but they should not be stored there.

Storage of chemicals in any refrigerated environment requires proper precautions: (1) Keep all containers tightly closed, (2) No open containers (no open beakers, test tubes, flasks, bottles, or other containers), and (3) Make sure that the integrity of the container and the lid or stopper is adequate.

Waste receptacles for tips and tubes on lab benches

Any container that is used as a waste receptacle on a lab bench must have all of the previous labelling removed. It you choose to use an old food container (this is NOT recommended), it cannot have on it any markings about food – remove all labels, pictures and writing. Clearly label the container as a waste receptacle and if it is going to contain tips and tubes contaminated with hazardous waste, then it must have a hazardous item sticker on the side (e.g. *Class 6.1 – Toxic*).

CHEMICAL STORAGE: THE "DO's"

- Chemicals must be stored properly when not in use
- Chemicals must be stored in adequately labelled containers
- Always store chemicals with labels in the forward, readable, position
- Chemicals that are transferred into a another container must include the following information on the label: chemical name, formula, concentration, hazard warning, name or initials of person responsible for transfer
- Flammable liquids and solids must be stored in a dedicated flammable storage cabinet
- Use of secondary containment to limit spills and avoid incompatibility problems
- Order chemicals in plastic containers or plastic-coated bottles to reduce breakage
- Plan your storage to survive a catastrophic event (e.g. earthquake) by limiting the potential for spills and breakage
- Return chemicals to their designated storage location promptly after use
- Store corrosives acids in the vented acid locker
- If nitric acid is brought into the lab it must be isolated within the acid storage cabinet by enclosing it in a high density polypropylene container because it not only is an acid but also an oxidizer
- Keep lab shelves organized and compatible chemicals together
- Do not permit unauthorized persons in the laboratory; and
- Ensure hazardous waste or by-products are labelled and stored properly before disposal.

Before leaving your work space and the laboratory, secure open chemical containers, close and lock the flammable lockers, and close and lock the acid lockers.

CHEMICAL STORAGE: THE "DON'T's"

- Chemical storage cabinets should not have open floor drains
- Never grab a container from the top only, chemical containers should be carried with two hands
- Don't use unlabelled chemicals
- Don't permanently store chemicals in the fume hood
- Don't store chemicals over, under or near a sink or drain
- Don't mix chemicals in a sink
- Don't store reagents and/or apparatus on the lab bench
- Don't store chemicals on the floor
- Don't block aisles with stored chemicals
- Don't store chemicals above eye level or on top of cabinets
- Don't dispose of broken glassware in rubbish bin without wrapping it
- Don't store hazardous waste in the work areas
- Don't store chemicals alphabetically

To avoid unnecessary exposure to chemicals involves the development of safe laboratory practices:

- Do not smell or taste chemicals
- Vent any discharge of toxic chemicals into the fume hood
- Avoid eating, smoking, gum chewing or application of makeup where laboratory chemicals are present
- Avoid storage, handling and consumption of food or beverage in chemical storage areas, refrigerators, laboratory glassware and utensils
- Handle and store glassware with care to avoid damage
- Only use equipment for its designated purpose
- Wash hands thoroughly after working in the laboratory
- No horseplay in laboratory area that could distract, confuse or startle another lab worker
- Do not mouth suction pipette or start a siphon
- Tie back long hair, loose clothing and wear shoes not sandals
- Keep work area clean and uncluttered
- Make sure chemical bottles and equipment is properly labelled and stored
- Clean up the work area at the end of each day
- Assure the appropriate eye protection is worn where chemicals are stored and handled
- Inspect gloves before use, wash them before removal and replace them periodically
- Use appropriate respiratory equipment when necessary
- Use any other protective and emergency equipment as appropriate
- Avoid use of contact lenses in the laboratory unless unavoidable
- Remove laboratory coats and aprons immediately if contaminated
- Seek information about hazards and plan procedures with regards to protection and equipment
- Unattended operations requires signs on the door and provisions for secondary containment
- Be alert to unsafe conditions and see that they are corrected; and
- Do not work alone if procedure being conducted is hazardous.

FOR INCIDENTAL SPILLS OF A CHEMICAL (i.e. SMALL SPILLS THAT YOU ARE COMFORTABLE HANDLING): RESPONSE PROTOCOL

- Notify everyone in the laboratory and evacuate non-essential people immediately
- Affected skin or clothing should go immediately under eye wash/shower/drenching unit
- Avoid breathing the vapour if it is a liquid spill
- Notify a health professional of any injuries
- Notify the laboratory manager and your supervisor as soon as possible regarding the incident and ask for assistance
- Deny access to the area until clean-up has been completed
- If you feel unsure of your ability to clean up the spill or if you perceive the risk to be greater than normal laboratory operations do not attempt to deal with the spill. Call the laboratory manager/deputy laboratory manager or Campus Security for help (ext. 8888). Never put yourself at risk!
- Follow the general procedures for using the Spill Kit and the information on the MSDS
- Promptly clean-up spills, using appropriate protective apparel and equipment and proper disposal
- When the clean up has been completed file an accident/incident report form

SERIOUS SPILLS OF A HAZARDOUS CHEMICAL: EMERGENCY RESPONSE PROTOCOL

- Notify everyone in the laboratory of the situation, evacuate the lab, if possible stabilize area (e.g. turn off any sources of ignition and depress the red button by the door), however, the safety of staff and students takes precedence
- Notify VUW campus security of the emergency on phone ext. 8888 or 1-111
- Notify the lab manager/deputy lab manager and your supervisor
- To prepare for an emergency you should know: (1) the correct evacuation routes, (2) the location of the master power shut-off, and (3) what to do during a power outage.

Emergency Procedures to assist affected people:

- If you know the chemical that has caused harm, the MSDS will state the immediate medical assistance that is required

If you are unsure of the specific nature of the chemical accident, the following emergency response is generally recommended:

- Eye Contact: Promptly flush eyes with water for a prolonged period (15 minutes) and seek medical attention
- Ingestion: Encourage the victim to drink large amounts of water and seek medical attention

- Skin Contact: Promptly flush the affected area with water and remove any contaminated clothing, If symptoms persist after washing, seek medical attention

Guidelines for Fume Hood Use

Engineering controls (e.g. fume hoods, etc.) are the most reliable way to protect worker safety in laboratories.

As a rule of thumb, materials with a Threshold Limit Value (exposure limit) of less than 50 ppm should be used in a hood.

Do not open laboratory doors or use portable "breeze-box" fans in the laboratory. They cause drafts, which interfere with proper fume hood performance and can blow vapors from the laboratory into the hallway. If fume hoods are used properly, there should be no need for additional ventilation in non-emergency situations.

Hoses and electrical cords should not be directed through the hood face opening, as they will interfere with closing the sash and are more likely to be accidentally snagged by persons working or walking in front of the hood. If hoses or cords must leave the hood, a small utility port should be provided in the side of the hood, with a cap to seal it when it is not in use. A utility port should be only large enough to allow plugs, etc. through, to interfering with proper hood function.

Personal Protective Equipment (PPE)

Engineering controls (e.g. fume hoods) and work practices are the most important tools to protect lab workers from the hazards they face. However, the variable nature of lab work requires that proper personal protective equipment (PPE) be used at all times. Choice of PPE depends on many factors, including whether other options are available to control exposure, the type of exposure, the toxicity of the chemicals used and the type of operation. At a minimum all lab workers should have appropriate footwear, appropriate clothing and splash resistant goggles whenever they handle any hazardous materials. Lab coats or aprons are recommended to protect street clothing. For many operations protective gloves will be required. In all cases, adequate PPE that is in good condition must be available at all times, and in sizes which fit correctly.

• **Protective Clothing** – When working with hazardous materials in a laboratory environment dress so that torso, legs, and feet are continuously covered and protected from spills and splashes. Lab coats or vinyl aprons are recommended when working with hazardous materials.

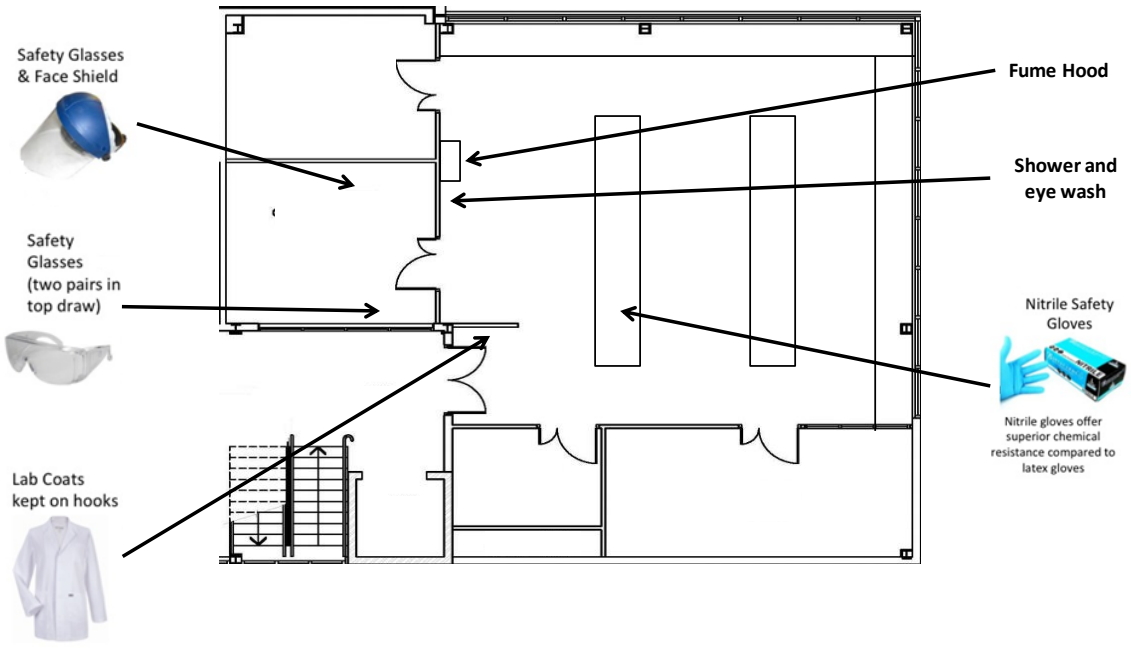
• **Eye Protection** - splash-resistant goggles are required for everyone wherever and whenever there is a potential for chemicals to be splashed into the eyes.

Hand Protection – Wear protective gloves whenever handling hazardous or toxic chemicals, substances of unknown toxicity, sharp-edged, very hot or very cold objects. Some general principles to follow for the selection and use of protective hand gear

are:

- Wear gloves of a material known to be resistant to permeation by the chemical in use.
- Inspect gloves for tears or holes before use. Replace gloves if permeation or degradation has occurred.
- Wash gloves when they become contaminated to minimize contact and before removal.
- Remove gloves before handling objects like doorknobs, pens, notebooks, keyboards.
- Single use, disposable, Nitrile type gloves are adequate for incidental contact with most (but not all) hazardous materials. For non-incidental contact and gross contamination, heavy-duty gloves need to be selected for specific applications.

Location of Personal Protective Equipment



Glove Use Guidelines

Latex gloves are widely used in labs. Unfortunately latex gloves offer little protection from commonly used chemicals and up to 20 percent of the population is allergic to latex products.

Latex gloves are only suitable for biological materials, nonhazardous chemicals, very dilute aqueous solutions of hazardous chemicals, clean area and medical or veterinary applications. In all cases single-use surgical-type nitrile gloves can be substituted. Nitrile gloves are more durable and provide a clear indication when they tear or break. Nitrile gloves also offer better resistance to most chemicals and are non-allergenic. If latex is required, hypoallergenic, non-powdered gloves should be used.

Surgical-type (4 mil or 8 mil) gloves are suitable for "incidental contact." This means that no, or very little, actual contact with a chemical in use is anticipated. The gloves are there to prevent chemical contact with the skin where a spill or splash to the hand may occur. For "extended contact" a more substantial glove should be used.

Double gloving affords a double layer of protection. If the outer glove starts to degrade or tears, the inner glove offers protection until the gloves are removed and replaced. Best practice is to check the outer glove frequently, watching for signs of degradation (change of color, change of texture, etc.) and re-gloving as necessary.

For highly toxic materials and materials easily absorbed through the skin, Norfoil gloves (Silver Shield by North Hand Protection, 4H by Safety4, or New Barrier™ brand by Ansell Edmont) are generally recommended. They are somewhat bulky but dexterity is regained by using a heavier weight (8 mil) disposable nitrile glove over the Norfoil glove. These gloves and others are also available from many vendors.

Disposing of Hazardous Wastes

The laboratory has three different types of waste streams and care needs to be taken to avoid placing a hazardous chemical into the incorrect receptacle. The three types are:

1. **General (or domestic) Waste:** normal bins that take any waste that is not a biological or chemical hazard, for example, paper towels (not contaminated with hazardous waste), clean plastics, etc.

2. **Bio-Hazard Waste:** The large yellow wheelie bins only take hazardous waste of biological origin (e.g. bacteria, tissue samples, etc) and only when it has been rendered inactive first by bleach or autoclaving.

3. **Chemical Hazardous Waste (transfer to basement unless flammable):** Any chemical waste product that is classified as Corrosive, Reactive or Toxic must be transferred to the basement waste chemical storage area. Storage of small amounts of waste in the dry lab storage cabinets (i.e. less than two litres per individual) is permitted. All flammable waste is to be stored in the flammables cabinet.

General requirements of hazardous waste

To be done in the laboratory:
- Designate and label a specific place or places in the laboratory for waste collection.
- Place all waste containers in adequate secondary containment (dishpans, etc.).
- Store all waste in compatible, adequately sized containers. Containers must be leak-proof, free of exterior contamination, and have at least 50 mm of headspace inside above the contents.
- Label containers as Hazardous Waste. Labels must indicate the contents of the container (full chemical names, not abbreviations), the concentration, and its hazard type(s) and the date.

Check the 'Safe Method of Use' sections for specific guidelines on disposing of Phenol. Contact the lab manager for assistance if you are unsure or need to dispose of a waste item that is not detailed in the Lab Safety Plan or the Standard Operating Procedure (Lab Manual).

General Procedure for Containment and Disposal of Hazardous Chemical Liquid Waste

If you are going to use a re-cycled chemical bottle ALL of the previous labelling must be removed before you start

1. The bottle (receptacle) must be correctly labelled with the: name of the chemical waste, CAS number, concentration, your name and the date. Do not start using the hazardous chemical until you have read and understood the MSDS and Safe Method of Use documentation.

2. The bottle must have the appropriate hazard class sticker (e.g. *Class 6.1. – Toxic*, and/or *Class 8 – Corrosive*).
3. When the liquid has reached about ¾ of the bottle's volume, close it off and notify the lab manager or assistant lab manager.
4. Print off the MSDS for the chemical(s); this needs to be included with the bottle when it is deposited in the basement.
5. Transfer the bottle containing the hazardous waste into secondary containment for transport (e.g. a BDH SafePak™) and move it down to the basement.
6. Place the bottle into the appropriate storage bin in the basement (NEVER STORE INCOMPATIABLE CHEMICALS TOGETHER)
7. Write the next consecutive number on the bottle from the register and then enter that number into the hazardous waste register so that your container can be tracked with an "ID" number and include all of the details needed for the safe disposal of the waste (e.g. chemical name, volume, concentration, etc, and your name).

YOU ARE RESPONSIBLE FOR DISPOSING OF WASTE CORRECTLY!

Secondary Spill Containment
Secondary containment for a single container (tank) must be 110% of the volume of the primary container. The secondary containment for multiple containers must be 150 percent of the largest container's volume, or 10 percent of the aggregate volumes of all containers, whichever is greater. Secondary containment should be constructed of materials capable of containing a spill or leak for at least as long as the period between monitoring inspections. Hazardous materials that in combination may cause a fire or explosion, or the production of a flammable, toxic, or poisonous gas, or the deterioration of a primary or secondary container must be separated in both the primary and secondary containment so as to avoid intermixing. Secondary containment systems can be provided through the use of trays or drums placed in over-pack drums as long as all provisions of the secondary containment requirements are met.

Disposing of glass bottles and broken glass

The laboratory has a designated receptacle for broken glass. All glass bottles need to be decontaminated from any hazardous chemical before they are disposed. Always wear safety glass when preparing glass for the broken glass bin. Extreme care needs to be taken if the glass is broken or chipped; do not risk cleaning the glass item if the glass item itself represents a hazard.

Operational Hazards

Many common pieces of laboratory equipment and common laboratory operations can cause severe injuries or damage if not used properly.

Centrifuge

1) Before using any centrifuge, review instructions in the owner's manual. Check rotor for rough spots, pitting & discoloration. Consult manufacturer if any are discovered.
2) High-speed rotor heads are prone to metal fatigue. Each rotor should be accompanied by its own logbook indicating the number of hours run at top or de-rated speeds. Do not exceed the design mass for the maximum speed of the rotor. Failure to observe this precaution can result in dangerous and expensive rotor disintegration.
3) Make sure rotor, tubes and spindle are dry and clean and that the rotor is properly seated and secured to the drive hub. Tubes must be properly balanced in rotor (ó gram at 1 G is roughly equivalent to 250 Kg @ 500,000 G's).
4) Ensure your samples are EQUALLY balanced. Use balance to check and compare weights: DO NOT eyeball! Specimen weights must match exactly! Samples must be equally spaced/balanced when placed in the rotor.
5) Before use, tubes should be checked for cracks. The inside of cups should be inspected for rough walls caused by erosion and adhering matter should be removed. Metal or plastic tubes (other than nitrocellulose) should be used whenever possible.
6) Use sealed rotors, sealed buckets, or a guard bowl with gasketed cover as well as safety centrifuge tubes (tube or bottle carrier with sealable cap or "O" gasketed cap).
7) After use, tubes, rotors, and centrifuge interiors must be cleaned and dried. If microbiological/bacterial agents were used, everything must be disinfected.
8) If a tube breaks, the centrifuge should be turned off, allowed to stand undisturbed for 15 minutes before opening. Clean and disinfect the rotor. If infectious material was placed in the centrifuge, plan proper decontamination and cleanup.
9) Cleaning and disinfection of tubes, rotors and other components requires considerable care. No single method is suitable for all items, and the various manufacturers' recommendations must be followed to avoid rotor fatigue, distortion and corrosion.
10) Once run is complete, make sure the rotor has STOPPED before opening the centrifuge lid.

Steam Autoclave

Following are general guidelines for autoclave use:

- Pyrex bottles, empty or full should have their caps placed on loosely, to prevent explosion due to the expansion that occurs during heating. Use tinfoil to cover non-safety-glass bottles (non-Pyrex).
- Always use some type of secondary containment, typically polypropylene or stainless steel tubs. This will eliminate the primary cause of damage to the machines and reduce down time.
- Always follow written lab procedures, however dry goods typically require about 30 minutes sterilization, plus about 20 minutes drying time (dry time may need to be increased for enclosed items such as pipette tips or bottles with lids).
- Average liquid sterilization times (add an additional 10-20 minutes for crowded items): <500 ml, 30 minutes 500 ml - 1 L, 40 minutes 2 L - 4 L, 55 minutes 4 L, 1 hour
- Not all plastics can be autoclaved. Polypropylene and polycarbonate will survive; but polyethylene and high density polyethylene will not. The different types of plastic can be identified by looking for initials imprinted on the bottom of containers (PP=polypropylene, PC=polycarbonate, PE=polyethlylene, HDPE=high-density polyethylene). If you are unsure about a new container, place it in an autoclave safe container the first time.
- To prevent the bottoms of bottles from breaking, place them in a tub with 40-50 mm of water.
- Use "slow exhaust" or “liquid cycle” or equivalent for liquids and let them stand for 10 minutes.
- Do not open any autoclave until the pressure gauge labeled "chamber" reads zero, stand back and allow steam to escape through the open door before reaching in to remove items.
- Never open an autoclave set for "slow exhaust" until the cycle is complete. Superheated liquids can boil over, possibly damaging both autoclave and autoclave operator. After the cycle is complete, let liquids stand 10 minutes more, movement could cause liquids to boil.
- Handle hot glassware with care, using dry, heat resistant gloves to remove items.

SAFETY TRAINING PLAN

VUCEL Dry Lab Operation and Safety Check List

The VUCEL Dry Lab Safety Manual details the laboratory standard operating procedures and the Laboratory Safety Plan details the safety procedures that must be followed at all times. After you have familiarised yourself with the laboratory standard operating procedures and the laboratory safety plan and completed a safety briefing, check through the list below and tick off the items as you have familiarised yourself with them. Then complete a self-assessment to identify the list of hazards that you expect to encounter during your research project. If you are in any doubt about the items on the list below ask the lab manager or your supervisor for clarification and/or additional training. Hand the completed and signed form to the lab manager.

Check List:

- ☐ You know the location of all exits, fire alarms, fire extinguishers and fire blankets
- ☐ You understand what procedure to follow in an emergency
  What is the phone number for an emergency? _____
- ☐ You know the location of and how to use the safety shower, eye wash, first-aid kit, and PEG for skin contact with phenol
- ☐ You understand that all chemicals must be registered at the technician's office before entering the dry lab
- ☐ You understand that all receptacles (even those containing water) must be labelled with the contents, your name and the date as well with a hazardous sticker if required
- ☐ You understand how to operate the fume hood
- ☐ You are familiar with the various storage locations for chemicals (e.g. flammables cupboard, general chemicals shelf, and fridges)
- ☐ You know where to find hazardous chemical labels
- ☐ You are familiar with the folder listing all the chemicals in the lab, and the MSDS files
- ☐ You have a lab coat, and know where to find safety glasses and a source of gloves
- ☐ You understand how to dispose of a hazardous waste
- ☐ You have been through the contents of the spill kit and become familiar the procedure for dealing with a spill in the laboratory
- ☐ You know how to complete the Hazard Report and Accident/Incident Report forms

Self-Assessment: List the hazards that you will most likely encounter during your time in the lab, what personal protective clothing and equipment you will require, what you will do if there is an emergency, and whether you need any additional training.

Hazard	Requirements for personal protective equipment and safe protocols	Emergency response	Would you like any additional training? (Y/N)

Name: Signature: Date:

LABORATORY SAFETY ADUITS

Monthly Lab Audit: CEL202 (dry lab)

Date					
Checked by:					
No obstructions to the exits, fire alarm, fire extinguishers, safety shower, eyewash, PEG, first aid kit, MSDS folder and spill kit?					
All warning signage in place?					
All chemicals properly stored and labelled?					
The fume hood is properly functioning, clear of clutter, all receptacles and containers properly labelled and in secondary containment?					
Is personal protective equipment available (i.e. nitrile gloves, coats and glasses/face shield)?					
Have all absorbent materials (e.g. cardboard boxes) been removed from the floor and lab coats put on hooks?					
All heavy items or glass bottles stowed at a safe height and/or secured from falling in an earthquake?					
Ensure nutrient analyser waste has been dealt with					
Check hazard bin (replace if full)					

Appendix

Hazard assessment

Prior to handling any substance the handler will inform themselves of the properties and hazards associated with that substance. Under the HSNO Act a hazardous substance is any substance that exceeds the levels defined in regulations of any of the following properties:

- Explosiveness
- Flammability
- Oxidising ability (can accelerate a fire)
- Corrosivity
- Toxicity (acute or chronic)
- Ecotoxicity (can kill living things directly or by building up in the environment)
- Can generate a hazardous substance on contact with air or water

The classification systems for the HSNO hazardous properties are set out in Schedules 1 to 6 of the *Hazardous Substances (Classification) Regulations* 2001. The classification systems comprise numbered classes (e.g. Class 6) indicating the intrinsic hazardous property, numbered subclasses (e.g. Subclass 6.1) indicating the type of hazard, and lettered categories (e.g. Category A) indicating the degree of hazard. (An exception to this is with explosive substances where they are classified into both a Subclass indicating the type of explosive hazard, and a Category, indicating compatibility groupings, in the combinations permitted by the UN Recommendations on the Transport of Dangerous Goods Model Regulations. Categories for explosive substances do not indicate the degree of hazard).

The combination of numbers and letters used in the classification system (e.g. 6.1A) constitutes a hazard classification of a substance.

The classes for the hazardous properties are as follows (with examples of some of the types of United Nations Dangerous Goods Symbols)

Class 1	Explosiveness	
Class 2	Flammability, gases	
Class 3	Flammability, liquids	
Class 4	Flammability, solids	
Class 5	Oxidising capacity	
Class 6	Toxicity	
Class 8	Corrosiveness	
Class 9	Ecotoxicity.	

Class 7 is unallocated in the HSNO classification system as it is reserved for radioactivity which is outside the scope of the HSNO Act. Class 7 is used in the United Nations Transport of Dangerous Goods classification system for radioactive materials. In New Zealand, these substances are covered by the Radiation Protection Act which is administered by the National Radiation Laboratory of the Ministry of Health. Similarly, Subclass 6.2 is unallocated in the HSNO classification system for toxicity, as it is reserved in the UN Transport of Dangerous Goods classification system for infectious substances. These are also outside the scope of the hazardous substances part of the HSNO Act.

All of the HSNO hazard classifications can be seen in tables presented at the following website http://www.ermanz.govt.nz/resources/publications/pdfs/ER-UG-04-1.pdf

Rules for SBS HSNO Laboratories

The following laboratory practices are to be observed:

1. The handling, storage and disposal of hazardous substances ***shall*** meet the requirements of the SMOU, the MSDS and the code of practice for CRI and University Exempt Laboratories.
2. Containers of 2.1A, 3.1A, 3.2A, Class 6 category A with inhalation risks, and class 8 A categories ***shall*** only be opened and used in a fume cupboard or facilities providing sufficient ventilation.
3. Bottles and jars of ready-to-use reagents **"stored"** on benches or on shelves between benches ***should*** not exceed 1 litre for category A substances and 2.5 litres for all other categories per laboratory.
4. Food intended for human consumption ***shall*** not be consumed or stored where hazardous substances are handled.
5. Food or drink for human consumption ***shall*** not be stored in a refrigerator used to store laboratory materials.
6. Appropriate protective clothing ***shall*** be worn when in designated HSNO exempt laboratories at all times. A laboratory coat, overalls or similar protection, and closed-in, non slip shoes are the minimum requirements.

   Note: Laboratory coats should be removed when going from laboratory areas to the tea-rooms or office areas.

   Note: The MINIMUM Standard for the wearing of eye protection is "Eye protection MUST be worn by every person in a HSNO (Exempt) Laboratory when a hazardous substance is handled or in use by anyone in the laboratory"

7. Skin that has come into contact with hazardous substances (irrespective of the concentration) ***shall*** be washed.

8. Hands ***shall*** be washed after handling hazardous substances and before leaving the area where the hazardous substances were handled or used.

9. Safety carriers or trolleys (for large containers) ***shall*** be used for transporting plastic or glass containers of hazardous substances with a capacity of 2 litres or more.

10. 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 highly toxic, volatile or odoriferous substances, or particulate/dusty matter, to ensure a safe working environment, in accordance with the Safe Method of Use developed for the substance.

11. Waste hazardous substances, containers and packaging ***shall*** be disposed of in an appropriate way.

12. All hazard labels on surplus containers and packaging ***shall*** be defaced or rendered illegible before discarding.

Entry to SBS HSNO Laboratories

Only authorised persons are permitted entry to the laboratory areas. Non-authorised persons may enter the laboratory area provided they are under the supervision of an authorised person (see page 5 above or section 1.3 of the COP for CRI and University Exempt Laboratories).

Information and labelling Requirements for Containers of Hazardous Substances

This section should be read in conjunction with section 4.3 of the COP for CRI and University Exempt Laboratories.
All containers of hazardous substances will be labelled according to the COP for CRI and University Exempt Laboratories to provide information on the identity of the substance, the concentration, if applicable, and its hazardous properties.

The above requirements do not apply to permanently **sealed** containers (such as sealed specimen containers) where there is no release of hazardous substance (including diluent) or vapour and the container contents are not available for use under normal circumstances

Where working containers of hazardous substance are used to hold hazardous substances for 48 hours or more, a HSNO classification label must be applied. If the container is too small for a label (e.g.: eppendorff tubes), it shall be placed in a secondary receptacle container and this container will be labelled. The concentration and identity of the hazardous substance will be available on working containers, by permanent marker or printed labels. Where containers are too small, the above applies.

Reaction vessels must be labelled where the substance is to be contained for 24 hours or more. Where reaction vessels are in use, the contents must be identifiable. In all situations, details on how to manage the substance must be readily available.

Containers of substances must be checked regularly (at least annually) to ensure that no cracks or leaks are evident. Substances that have leaked on to shelving or similar will be cleaned immediately. Leaking containers must be disposed of immediately.

Personal Protective Equipment (PPE)

PPE requirements as specified by the SMOU and MSDS should be identified prior to the use of any hazardous substances. Where PPE is required it shall be readily available and staff will be trained in the correct use. PPE must be maintained in working order. Safety showers and/or eye wash facilities must be available within 10 meters of where corrosive substances and category A toxic substances are used.

Tracked Substances

- A record ***shall*** be kept of all containers of approved and unapproved hazardous substances falling within HSNO classifications that are required to be tracked under the Hazardous Substances (Tracking) Regulations..The record ***shall*** be kept for at least 12 months after the substance is used up or removed from the laboratory. The relevant hazard classifications are:

  Classes 3.1A and 3.2A
  Classes 4.1.2A and 4.1.2B
  Class 4.1.3A
  Classes 4.2A and 4.3A
  Class 5.1.1A
  Classes 5.2A and 5.2B
  Classes 6.1A, 6.1B and 6.1C
  Classes 9.1A, 9.2A, 9.3A and 9.4A

- In the case of *de novo* synthesis, by-products and intermediates that are unlikely to be present for longer than 24 hours or where small quantities that remain in a single room, a record in a laboratory book ***shall*** suffice.

- The record will include:

  I. The substance, CAS # and HSNO classification(s) of the substance.
  II. the unequivocal identification of the tracked container
  III. the size of the container.
  IV. the location of the tracked substance, with sufficient particularity to enable an enforcement officer to:
    (a) identify the exact location of the substance within 2 minutes of having obtained the record; and

    (b) physically locate the substance or its container at the place described in the record within 1 hour of arriving at the place or within the time specified in the emergency response plan, whichever is the shorter.

- Tracked substances will be identified by a "T" label affixed to the container(s).

- An example form for tracking containers is given in appendix 16.

Storage of Hazardous Substances in the Laboratory

All hazardous substances will be stored in accordance with the SMOU, the MSDS and Section 4.6 of the COP for CRI and University Exempt Laboratories.

Disposal of Hazardous Substances

All hazardous substances will be disposed of in a manner that complies with the requirements of the SMOU, the MSDS and those specified in Appendix 6 of the COP for CRI and University Exempt Laboratories.

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HAZARD REPORT FORM

Criteria: Complete this form only if no injury has occurred.
If an injury has occurred please complete an Accident / Incident Report Form
(http://www.victoria.ac.nz/healthandsafety/documents/accident-report-form.doc)

Instructions: Please complete section A and forward within 24 Hours of identifying a hazard to **Campus Safety, Level 3, 6 Wai-te-ata Road, Kelburn** or email safety@vuw.ac.nz

Section A: PERSON REPORTING TO COMPLETE

Title:	Surname:	Other Names:
☎ Work:	☎ Mobile	staff / student (please circle):
Faculty / School / Central Service Unit:		
Description of Hazard:		**Location of Hazard:**
		Time and Date Hazard was Identified:
Signed:		Date:

Section B: HEALTH AND SAFETY UNIT
REMEDIAL ACTION

Hazard Control Options	Action Required	By Whom	By When
1. Eliminate (eg remove)			
2. Isolate (eg. Separate from contact)			
3. Minimise (eg. Reduce hazard impact)			

Description		
	Work Order Raised	
	Work Order Number	
	Work Order Complete	
	Hazard Treatment	
	Eliminated	
	Isolated	
	Minimised	
	Recorded in Hazard Register	
	Feed back to person reporting	
	Date Received	
	Date Completed	
	Signature	

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ACCIDENT / INCIDENT REPORT

The person who had the accident / incident should complete part A of this form within 12 hours of the accident / incident and pass to their manager for completion of part B. If they are unable to do so, their manager or colleague should complete the relevant details.

Part A	**Information About the Person Who Had the Accident / Incident**

Name:_____ **Staff / Student / Visitor / Contractor / Child** (*Please circle one*)

Faculty / School / CSU:_____ **Job Title:**_____

Contact Telephone: Work:_____**Mobile**_____**Home**_____

When Did the Accident / Incident Happen ?

Date: **Time:**

Where Did the Accident / Incident Happen ?

Location:

Building, room number, area, sketch over if required

What Happened ?

Description:

Include details of any object, machine or substance involved, continue over if required

Work Related **Yes / No**

What Injury or Injuries Were Sustained ?	**What Treatment Was Received ?**		
	Source:	Tick	**Follow Up Treatment:**
Body Part Injured:	First Aid		
	Student Health		
	Physiotherapy		
Type of Injury:	Massage therapy		
	Doctor (GP)		
	Hospital		
	Other		

Declaration: The above report provides a true, accurate and complete account of the accident / incident.

_____ _____ _____

Name (please print Signature Date

Manager to Complete

Part B	**Manager's Preliminary Investigation**
What (in your opinion) were the causative factors of this accident / incident ?	**How can this accident / incident be prevented from recurring ?**

_____ _____ _____

Name (please print Signature Date

When completed forward this form to Health and Safety Unit

Name of person who had incident / accident: _____
Write / sketch any additional details here.

Health and Safety Unit Use

New Hazard Identified: Yes No Significant Yes No Eliminated Isolated Minimised Has OSH Been advised Yes No. Further Report / Investigation required Yes No	Action Summary: