Chemical Risk Management Protocol

2.USING CHEMICALS

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Date	Page number	Nature of amendment

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1. Who are these guidelines for?

These guidelines are intended for Chemical Owners, Designated Laboratory Persons (DLPs), other staff, students and visitors using chemicals.

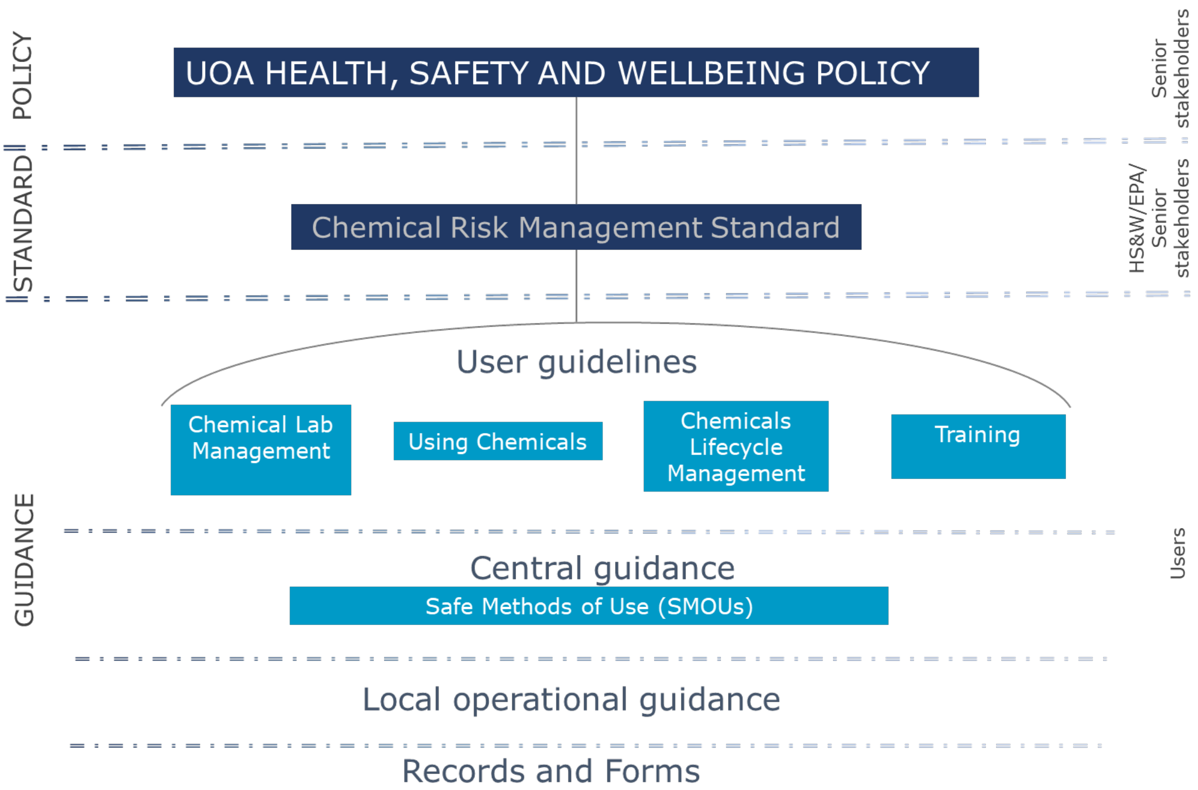
2. Purpose

The purpose of these guidelines is to describe:

- How to find and interpret safety information about chemicals.
- How to undertake a risk assessment for chemical hazards.
- Controls to be used in managing chemical risk.
- The correct processes to follow in case of chemical emergency.
- How to safely dispose of chemicals in the lab or workshop.

3. Documentation hierarchy

The present document is part of a series of document with the following hierarchy:



4. When is it necessary to identify chemical hazards?

Chemical hazards must be identified:

- Before purchasing or receiving chemicals
- Before using chemicals
- When synthesising/creating hazardous chemicals
- When determining appropriate storage for chemicals
- Before disposing of hazardous chemicals

This information will be used to create a risk assessment, and to inform what actions are required to mitigate any hazards.

5. How to identify chemical hazards?

5.1 Safety Data Sheets (SDS)

A chemical's Safety Data Sheet (SDS) is the primary source of hazard information. This should be provided by the supplier per request. Alternatively, you can search for an SDS using one of the databases that the university has access to (see section 5.2). It is important to identify the correct SDS for the correct form of the material (e.g., the correct concentration or particle size).

Chemical Owners are responsible to request the SDS of all the substances to which they are going to work with and confirm if they are classified as a Hazardous Substance.

An SDS provides safety information regarding hazards for an individual chemical and are a fundamental part of informing the risk assessment. Awareness of chemical hazards is essential for keeping lab users safe and the availability of SDSs is an important part of our compliance with regulatory obligations.

5.2 Sources of SDSs

Suppliers should provide Safety Data Sheet with their product. They can often be found on the supplier's website for that specific chemical. Keep all SDS on record particularly for products that are a mixture of chemicals or in a specific form (e.g., metal oxides can come in different forms and grain sizes, which alter the physical properties).

Gold FFX is available on the library database and provides SDSs tailored to NZ regulations for most chemicals. It is accessible on a 24/7 basis to all staff and students via the University Library Electronic Databases.

GoldFFX - University of Auckland Library (exlibrisgroup.com)

In SciTrack you can view Sigma Aldrich SDSs for many chemicals in the inventory.

Appendix 1 has a guide on how to use Gold FFX and SciTrack to view SDSs.

5.3 Limitations of SDS

The value of an SDS in a lab context is to provide information about the hazards and physical properties of the substance – rather than operating procedures. Use an SDS in conjunction with Safe Methods of Use (SMOU) and risk assessments. The amounts, procedures and reactions involving any chemical will have a huge impact on the risks and on the controls that need to be applied.

In the case of Novel Compounds, it would not be possible to create an SDS for each compound and the majority will not have an existing SDS with meaningful information. In these cases, the management of the novel compounds must rely on its Chemical Owner experience to estimate the likely hazards around the substance and its use (see section 9).

6. Chemical classification systems

6.1 UN Classification for Transport of Dangerous Goods (TDGR)

You will find this classification in the transport section of the SDS. It is referred to as the "UN DG Class" and used primarily for transport purposes. It identifies the most severe hazard class for a chemical, using a class and a packing group. Some chemicals will have a secondary class too.

Class 1 – Explosives

Class 2 – Gases

Class 3 – Flammable Liquids

Class 4 – Reactive Compounds

Class 5.1 – Oxidisers

Class 5.2 – Organic Peroxides

Class 6.1 – Toxic Substances

Class 6.2 – Infectious Substances

Class 7 – Radioactive Substances

Class 8 – Corrosive Substances

Class 9 – Miscellaneous (NB not to be confused with the GHS classification of class 9 as ecotoxic)

Most classes are assigned to packing groups (PG) in accordance with the degree of danger they represent:

PG I: high danger

PG II: medium danger

PG III: low danger

At the University we use this classification to identify the most highly hazardous compounds which require hazard approval, before purchasing.

Toxic Gases (Class 2.3)

Highly Reactive Compounds (Class 4.1 PG I; Class 4.2 PG I; Class 4.3 PG I)

Highly Toxic Compounds (Class 6.1, PG I)

Radioactive Substances (Class 7)

Chemical waste to be taken by a chemical contractor must be labelled with this UN DG class.

6.2 GHS Classification system

As of 30 April 2021, New Zealand adopted a new classification system for hazardous substances under the Hazardous Substances and New Organisms (HSNO) Act 1996. This is the Globally Harmonised System (GHS). There is a 4-year transition period to comply with the updated labelling, SDS and packaging notices.

The GHS hazard classification has two parts:

1. **Hazard class** – this refers to the nature of the hazard the substance poses. For toxicity, the route of exposure is identified.
2. **Hazard category** – this refers to hazard severity within a hazard class. The lowest category number indicates the most severe hazard, or greatest strength of evidence for the effect.

For example, "Acute oral toxicity Category 1"; acute oral toxicity is the hazard class, Category 1 is the category.

A substance with the hazard classification "acute oral toxicity Category 1" is a more potent toxicant than a substance with the hazard classification "acute oral toxicity Category 4".

6.2.1 Find the GHS classification in an SDS

In Chemwatch GoldFFX safety datasheets (see extract below), the GHS classification is the first classification section. [GoldFFX - University of Auckland Library](exlibrisgroup.com)

SECTION 2 Hazards identification

Classification of the substance or mixture

Classification [2]	Flammable Liquid Category 2, Acute Toxicity (Oral) Category 2, Acute Toxicity (Dermal) Category 3, Acut Irritation Category 2, Acute Terrestrial Hazard Category 4, Acute Toxicity (Inhalation) Category 3
Legend:	*1. Classified by Chemwatch; 2. Classification drawn from CCID EPA NZ; 3. Classification drawn from Re*
Gazetted by EPA New Zealand	3.1B, 6.1B (oral), 6.1C (dermal), 6.1C (inhalation), 6.4A, 9.2D, 9.3A

(exlibrisgroup.com)

6.2.2 GHS hazard classes explained

The hazards posed by chemicals may be physical, to health, or to the environment. Remember that the category associated with the class tells you the severity of the hazard, or the certainty with which it is known to be a health hazard. Category 1 is the most hazardous/certain.

GHS Physical Hazard class	**Risk posed (GHS definition)**
Flammable gas, liquid or solid	May catch fire or contribute to fire.
Self-reactive substances and mixtures	Thermally unstable liquids or solids, liable to undergo strongly exothermic decomposition even without the participation of oxygen (air).
Pyrophoric liquid or solid	Material which, even in small quantities, is liable to ignite within five minutes after coming into contact with air.
Self-heating substances and mixtures	Able to self-heat by reaction with air and without energy supply. Will ignite only in large amounts, after hours or days (unlike pyrophoric materials).
Substances and mixtures which in contact with water emit flammable gases	By interaction with water, are liable to become spontaneously flammable or to give off flammable gases in dangerous quantities.
Oxidising liquids, solids and gases	May cause or contribute to the combustion of other material (more than air does), generally by yielding oxygen.
Organic peroxides	Thermally unstable, may: undergo exothermic self-accelerating decomposition be liable to explosive decomposition burn rapidly be sensitive to impact or friction react dangerously with other substances
Corrosive to metals	Will materially damage, or even destroy, metals.
Desensitised explosive	Materials that are explosive in pure form, which have been stabilised by addition of other material to prevent mass explosion hazard. Will be considered explosive if the stabilising agent is removed.

GHS Health Hazard class	**Risk posed (GHS definition)**

Acute toxicity (oral, dermal or inhalation)	Serious adverse health effects, including lethality, after a single or short-term oral, dermal, or inhalation exposure.
Aspiration hazard	If the liquid or solid chemical is introduced to the lungs, severe adverse effects may occur such as chemical pneumonia.
Specific target organ toxicity	Specific, non-lethal toxic effects on target organs.
Skin corrosion	Produces irreversible damage to the skin; visible necrosis.
Skin irritation	Causes reversible damage to the skin.
Serious eye damage	Tissue damage in the eye, or serious physical decay of vision, which is not fully reversible.
Eye irritation	Changes to the eye which are fully reversible.
Respiratory sensitisation	May induce hypersensitivity of the airways following inhalation of the substance.
Skin sensitisation	May induce an allergic response following skin contact.
Germ cell mutagenicity	May cause mutations in the germ cells of humans that can be transmitted to the progeny
Carcinogenicity	Induction of cancer or an increase in the incidence of cancer.
Reproductive toxicity	Adverse effects on sexual function and fertility in adult males and females, as well as developmental toxicity in the offspring

7. Risk Assessments

7.1 Expectations

Risk assessments are an important step in protecting you, your colleagues, students, and others. They are also a legal requirement. The University’s Health and Safety Risk Management standard sets the expectations for managing risk across all our campuses and activities.

The standard and further information including templates to use are available on the Health, Safety and Wellbeing Risk Assessment website.

The general expectations in relation with the Risk Assessments are:

- Identify the cases when a Risk Assessment is necessary.
- Have a local repository for approved Risk Assessments.
- Implement and monitoring the controls identified in the Risk Assessments.
- Ensure that a control measure implemented is reviewed and, if necessary, revised in the following circumstances:
    - after a significant change to—
        - the safety data sheet for the relevant chemical; or
        - the information about that chemical in the inventory of hazardous substances.
    - after any notifiable event in the workplace involving a relevant hazardous substance:
    - at least once every 5 years

7.2 Chemical Risk Assessments

It is the responsibility of the Principal Investigator (or in absence of one, the person responsible for the activity) to determine whether chemical use presents a hazard that will need to be reduced to moderate or low risks by the implementation of controls before starting such activity. More information about the definitions, methodology and control can be found at : Risk assessments - The University of Auckland. The risk assessment should be completed by the Principal Investigator (or in the absence of one, the person responsible for the activity) in conjunction with the student/staff member who is carrying out the activity. In the case of a risk impacting a shared laboratory or in general multiple interconnected laboratories, you might want to consider a more general risk assessment that addresses the common space issues. This can be done in collaboration and with input from the technical team, even if responsibilities rests with PIs.

Chemicals that always require a risk assessment prior to use are those on the 'hazard approver' list as shown below.

Examples of Hazardous Substances per UN Class:

UN Class	Examples of chemicals in this class
2.3 Toxic Gas	Carbon monoxide, hydrofluoride gas
4.1 PG I Flammable Solids	Titanium powder, sodium tert-butoxide, sodium thiomethoxide, picric acid (wetted)
4.2 PG I Spontaneously combustible	n- or t-Butyllithium, diisobutyl aluminium hydride
4.3 PG I Substances which upon contact with water emit flammable gas	Sodium, sodium hydride, lithium aluminium hydride
6.1 PG I Highly toxic (acute)	Ethidium bromide, boron tribromide, bromine, potassium cyanide

7.3 What to consider when doing a Risk Assessment for a chemical

Start with:

- Identifying chemical hazards from the SDS (refer to guideline "Identify Chemical Hazards" for more information). Then it is important to consider:
- The amount of hazardous chemical(s) being used. Be sure to reassess the risk when scaling up experiments.
- The form of the chemical (solid, powder, nanoparticle, liquid, solution) and how/if that is different to the form described in the SDS. How does the form change the risk?
- Hazards introduced during the experiment, e.g. heating, combining chemicals that react violently together, formation or use of pressure.
- Hazards introduced in 'work-up', e.g. heat produced during quenching, neutralisation, additional chemicals to be used in purification or clean-up.

- By-products that may be formed at any stage of the experiment.
- How to deal with emergencies such as spills, fires, splashes/skin contact at any stage of the experiment, including when transporting chemical containers and dealing with waste disposal.

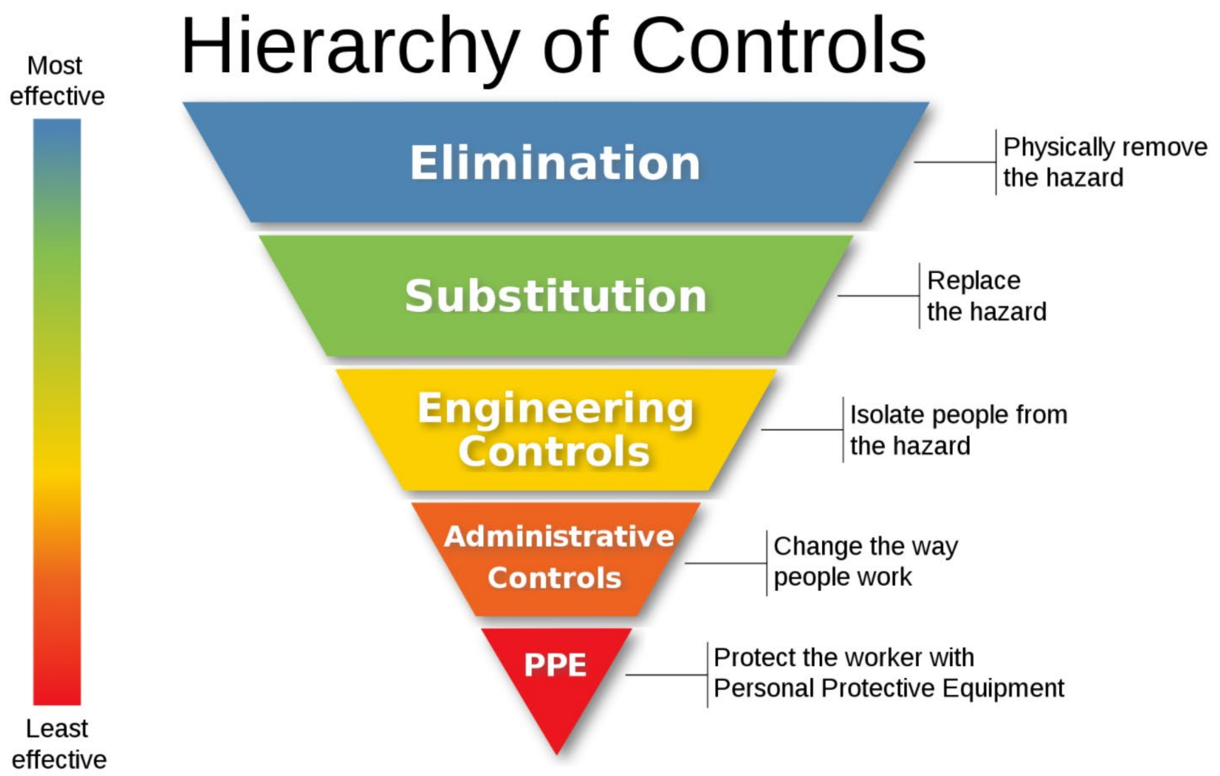
Additionally, consider:

1. Training: Is the person performing the experiment sufficiently trained, and is adequate supervision available if required?
2. Equipment: Is it in good condition, with safety features working? Is all necessary emergency equipment in place and readily accessible?
3. Informing others: How will others in the area be made aware of the risks, particularly if the experiment is left unattended?

8. Controls to minimise risk

The "hierarchy of controls" describes the most effective ways to control risk. Always try to eliminate or substitute the hazard before implementing other controls. Apply these principles in the following order:

1. Eliminate the substance/hazard entirely by changing the experimental procedure to avoid it.
2. Substitute with a less hazardous chemical or process.
3. Implement Engineering Controls to physically isolate people from the hazard and/or contain the hazard.
4. Implement Administrative Controls such as SOPs, training requirements, and rules to minimise risk.
5. Select appropriate PPE that must be used.



Examples of Elimination

Disposal of unwanted and waste chemicals to eliminate the hazards associated with storage of unwanted chemicals.

Examples of Substitution

Is there a viable alternative procedure that uses less hazardous chemicals or processes? For example, using an electrochemical etching process rather than using nitric acid.

Examples of Engineering Controls (Isolation)

Mandatory use of fume hoods when working with many chemicals. Flame-proof cabinets for solvent storage.

Examples of Administration Controls (Minimisation)

Safe Methods of Use are specific control documents to minimise the hazards associated with the safe use and storage of chemicals. Policies ensuring nobody works alone in a laboratory and that high-risk work is only undertaken during regular work hours.

Examples of PPE

Appropriate gloves, safety glasses or face shields, lab coats, aprons.

Additional support

To help inform your risk assessment, refer to the university's Safe Method of Use (SMOU) documents for how to safely use each class of hazardous chemical, as well as detailed instructions for some especially hazardous chemicals.

8.1 Engineering controls

Below there are some examples of engineering controls which include not only the classic fume hoods usage but also some good practice around transportation and storage. The use of specialised equipment for transportation and storage will strongly reduce the likelihood of incidents and by nature are included in the engineering controls.

8.1.1 Fume hoods and respiratory protection

1. **Flammable substances and substances toxic by inhalation** must be used under local exhaust ventilation (e.g. fume hood, Nederman arm, etc), unless a risk assessment deems it unnecessary and other effective controls are in place.
2. If an activity involving **flammable or toxic by inhalation chemicals** cannot be performed in a fume hood, other controls must be considered to minimise risk including:
   a) Use of appropriate respirators for all those potentially exposed
   b) Environmental or personal monitoring devices
3. **Toxic powders, including nanoparticles**, must be used in biosafety cabinets or fume hoods with specific filtration capabilities.
4. Where **asphyxiating or toxic gases** are used, respiratory protection and/or oxygen or other gas monitoring may be required. Please refer to the appropriate Safe Method of Use for detailed instructions.

8.1.1.1 General fume hood and respirator guidelines

- Ensure the fume hood is working by using a piece of paper taped to a vent to indicate airflow or checking the electronic display or indicator lights that show if the fan is working.

- Keep fume hoods tidy and free from clutter that can block the exhaust vents or impede airflow across the sash
- Chemicals should not be stored long-term in fume hoods unless they pose a significant toxicity risk by inhalation, such as toxic gases.
- Respirator guidelines:
    - Ensure the filter is fit for the intended purpose
    - Respirators must be fitted to an individual and used according to best practices
    - Be aware of the expiration dates.

8.1.2 Equipment for safe chemical transport within buildings

- Use a bottle carrier when carrying glass Winchesters outside of the lab.
- Use secondary containment when carrying chemicals in a trolley, to catch any spillage and to prevent mixing of incompatible chemicals.

8.1.3 Equipment for safe chemical storage

Chemicals must be stored appropriately to their hazard class. Certain hazard classes require specifically designed cabinets and storage conditions. This also helps to ensure incompatible chemicals are not stored together.

Note that chemical cabinets generally cannot be repurposed to hold a different class of chemical, as they are designed to specific standards.

8.1.4 Other safety equipment

Make sure you know the location of and how to use:

- Safety showers
- Eyewash stations
- Fire protection equipment
- Spill kits, including respirators where required.
- First aid kits

8.2 Administrative controls

Administrative controls are rules that may be implemented generally by a School/Department or be applied to a specific activity or experiment. They can be specified in a Local Operational Guidance

Examples of administrative controls:

- Ensuring at least one other person is within earshot
- Defining training requirements before starting certain activities
- Supervision requirements, based on risk level of activity and experience of the chemical handler.
- Rules on not working alone, and how to work safely after hours.
- Timing of higher risk work may be restricted to hours when more help and assistance is available.
- Use of unattended experiment forms.
- Requirement to consult the University's SMOU document relevant to a particular chemical or class of chemical before starting the activity.
- No wearing of headphones in the lab, to ensure you can hear what is happening around you.
- Identifying which activities may be carried out in a specific space.
- Always wash your hands before leaving the lab, and don't wear gloves outside of the lab. Lab coats may only be worn outside the lab if you are moving between labs, and should never be worn in office, kitchen, or bathroom areas.
- Long hair must be tied back.
- Access to Dangerous Goods (DG) Stores must be under supervision of specifically trained staff.

8.3 Personal Protective Equipment (PPE)

PPE is used to protect personnel when handling chemicals, to mitigate risk that cannot be controlled in other ways. This is typically comprised of combinations of the following:

- Laboratory coat or overalls
- Closed footwear
- Safety glasses

- Gloves

In specialised situations you may also need:

- Respirators or dust masks
- Face shields
- Aprons
- Specialised gloves (e.g. for handling cryogenic material)

The PPE worn should take into consideration all potential activities in a lab. Consider splash risk from someone else's activity, and contamination of lab surfaces.

8.3.1 Safety glasses

Properly rated safety glasses must be always worn when handling hazardous chemicals unless a specific risk assessment for that laboratory deems it unnecessary.

A full-face mask or equivalent is needed to protect the face in situations with significant risk of facial burn such as when pouring large quantities of corrosive or cryogenic liquid.

Prescription eyeglasses are not adequate as eye protection.

8.3.2 Gloves

Gloves are only a requirement where a risk assessment deems them necessary. The appropriate gloves must be worn when handling chemicals that present a health hazard.

8.3.2.1 Glove selection

Appropriate glove selection depends upon what you'll be handling. Consult the glove selection index in the SDS for the chemical. However, note that some of the sturdier gloves have very poor dexterity and so, if precise handling is required, then PVC or PVA gloves may not be the most appropriate choice.

Disposable gloves are not designed to be used with extremely hazardous chemicals or where you expect more than incidental contact with a chemical. In these situations, use a thicker glove.

Follow these guidelines:

- Change gloves immediately if contaminated, torn or punctured

- Don’t reuse gloves
- Take care to remove gloves properly to avoid contact with the outside of the glove
- Be aware of cross-contamination and have designated ‘glove-only’ equipment like pens. Don’t touch door handles with gloves on.
- Consider double gloving for short periods when handling unknown or highly hazardous chemicals. Double gloving gives you more time to remove contaminated gloves before the chemicals get through to your skin.
- Biodegradable gloves are likely comparable to other bottom-of-the-line 0.05 mm nitrile gloves. Therefore, they are not recommended for use where hazardous chemical contact is anticipated, such as with very toxic or corrosive chemicals.
- Consider using long cuff extra thickness nitrile gloves when chemical contact is more likely.
- Latex gloves can cause sensitisation in some people and should be avoided where possible. They do not provide good protection against most organic chemicals, and nitrile gloves are a better option in most cases. If you need to wear latex gloves:
    - Choose non-powdered gloves
    - Consider using cotton glove liners
    - Wash your hands after taking gloves off

Please see Annex 2- Chemicals and Glove uses

8.3.3 Lab Coats

Lab coats must be always worn and fastened correctly in the lab. Ensure a correct fit.

Lab coats must not be worn in office or eating areas. They should be stored in the lab or anteroom after use.

8.3.4 Lab Footwear

Closed toe shoes must always be worn in laboratories.

8.3.5 Lab Clothing

Please refer to the relevant SMOU for the chemical you are handling to check for other specific lab clothing requirements (e.g., when dealing with cryogenic materials).

Consider the flammability and coverage of any clothing you wear in the lab.

Long hair must be tied back.

9. Novel compounds

For novel compounds, where a SDS is not available or it lacks meaningful information, its management must rely on its chemical owner experience to estimate the likely hazards around the Hazardous Substance and its use. Typically, every new compound synthesised, should be regarded as moderately cytotoxic and chemical analogy to known compounds should be used to estimate risk in the absence of confirmatory data. The investigational compounds should be stored under lock and key.

Additionally, libraries than can hold commercially or academically sensitive chemical intermediates and investigational compounds and contain a complex associated set of data can be used for novel compounds aside of SciTrack, if they are defined in the Local Operational Guidance.

10. Preparing for emergencies

10.1 Inductions

All laboratory users will be given a safety induction to the lab, which includes being aware of the locations of all safety related equipment present in the lab, including but not limited to safety showers, eye wash stations, first aid kits, spill kits, telephone, fire alarm points, fire blankets/extinguishers and emergency exits. This is required for authorisation of lab access.

Lab users must know who is in charge at any given time, and how to contact them in case of emergency.

10.2 Risk assessments

Before starting an activity using chemicals, review the existing risk assessment or create a new one if needed that covers potential emergencies and how you would deal with them. Being prepared is key in being able to respond quickly and effectively to an emergency. For more information, refer sections 7 and 8 of this guidance. The Health, Safety and Wellbeing team delivers risk assessment training too.

11. Emergency Response

11.1 Major spills

- In the event of a major spill involving a toxic or flammable substance (where safety of lab personnel is at risk):
  1. Evacuate the immediate area.
  2. Call for assistance from capable personnel. (For example Chemical owner, technicians, etc)
  3. Extinguish any ignition sources if the chemical is flammable and it is safe to do so.
  4. Where available, activate the emergency shutdown button and/or spill button.
  5. Only where there is no risk to personnel, contain any further spill (seal off container, drop absorbent material on spill, and/or put barriers around the perimeter and over drains).
  6. If the spill can't be safely contained and it affects people or the environment, notify the Fire Service on 111 and state the following:
     - Name of caller
     - Exact location of spill
     - Substance involved in spill
     - Quantity of spilled material
     - Size of spill in square metres
  7. Assign a person—preferably the Laboratory Manager—to meet the Fire Service and inform the building warden.
  8. Evacuate the building if required.
  9. Comply with the Fire Service's instructions.

The definition of major spill depends on the nature of the chemical spilt and the spill kit capacity available. In areas such as Chemistry spills over 5-10 litres solvent would be considered a major spill. In other departments where there are less resources available, threshold volumes would be considerably smaller.

There should be at least one large spill kit per floor.

11.2 Minor spills

In the event of a spill which can be contained and cleaned up with little risk to personnel:

1. Ensure immediate area is cleared, and any ignition sources extinguished if the spilled chemical is flammable.
2. Call for assistance.
3. Wear appropriate personal protective clothing and equipment.
4. If safe to do so, stop the source (e.g., plug the leak, shut off valves, put solvent containers into flammables cabinets).
5. If the chemical is corrosive, consider neutralising it or use a spill kit designed for that particular class of chemical.
6. Use disposable cleaning equipment or spill kit.
7. Contain the spill to protect the environment. Use drip trays and absorbent material in spill kit to stop the spread and block off access to drains.
8. Wipe spill toward the centre and use damp cloths to pick up broken glass.
9. Notify the Lab Manager/supervisor.

11.3 Chemical Fire

Prompt action can often prevent a small fire in a laboratory from becoming a major disaster. However, only attempt to extinguish a fire if it is small and it is safe to do so.

11.3.1 Major fire

1. Evacuate the area and warn people in the vicinity by activating a manual fire alarm.
2. Call 111 and report the details of the fire including the location and nature of the fire, any specific hazards in the area, and whether there are casualties.
3. Laboratory Managers or Persons in Charge MUST be on hand to answer any questions asked by Emergency Services.

11.3.2 Minor fire

Where applicable, remove any source of heat and/or fuel that are contributing to the fire. For example, turn off heating elements, Bunsen burners, or flammable gas lines.

If the fire is in a reaction vessel, the fire may be smothered by covering the top, e.g., with a piece of glassware, wet towel, or fire blanket.

If the above steps are not feasible, a fire extinguisher may be used.

11.3.3 Use of fire extinguishers

Dry powder is effective on most chemical fires but creates a mess and can damage sensitive electronics. CO_2 extinguishers must not be used in small or poorly ventilated spaces because by reducing the amount of oxygen they create a hazard to human health.

Stand back from the fire and position yourself between the fire and the exit so you have a clear route of escape if required.

Pull the pin, Aim at the base of the fire, Squeeze the lever and Sweep the extinguisher from side to side. Remember this acronym as P.A.S.S.

> If the fire is put out after using one extinguisher or if you feel you will not be able to control the fire, immediately evacuate. Remember to sound the fire alarm prior to commencing any firefighting.

11.4 Chemical exposure and first aid

11.4.1 Chemicals in the eyes

1. As soon as possible, using clean cool water wash the eyes from near the nose outwards, not forgetting to wash under eyelids for 15-20 minutes. Ensure to irrigate for 20 minutes (or more) in case of contact with alkali chemicals, as these can cause serious damage even without much pain. Use an eye wash station where available.
2. Ask someone to check the chemical safety data sheet for further advice.
3. Seek medical attention.
4. Notify the Lab Manager/supervisor.

11.4.2 Chemical burns

1. Brush off dry chemicals.
2. Flush liquids from the skin with cool running water for at least 15 minutes. Use a safety shower where available.
3. Remove any contaminated clothing.
4. Wrap skin exposed to the chemical with a dry sterile dressing or clean cloth, protected from pressure and friction.
5. Watch for symptoms of shock: feeling faint, pale or breathing irregularly.
6. Seek medical attention.
7. Notify the Lab Manager/supervisor.

11.4.3 Chemical inhalation

1. Leave the area and get fresh air.
2. Consult the safety data sheet for advice.
3. Seek medical attention for serious or persistent symptoms.
4. Notify the Lab Manager/supervisor.

11.4.4 Chemical ingestion

1. Call the Poisons Information Centre for advice on 0800 764 766
2. Do not try to vomit or ingest fluids unless advised by the Poisons Information Centre or a medical professional.
3. Notify the Lab Manager/supervisor.

12. Clean-up/post-event actions

1. Ensure personal wellbeing.
2. Decontaminate yourself and others, including clothing.
3. Monitor for after-effects.
4. Administer/obtain medical care.
5. Dispose of contaminated materials.

6. Seal in plastic bags or containers all items used from spill kits and any other contaminated products. Take the bags/containers to an authorised disposals point complete with a hazardous waste declaration that identifies the materials.
7. Contact an authorised waste contractor to remove the waste.
8. Restock and review.
9. Raise an incident report using the university's accident/incident reporting system (see 12.1 below).
10. Re-stock spill kit.
11. Assess reasons for incident and implement corrective response as soon as practicable.
12. If the Fire Service was called, retain a copy of the fire crew's incident report.

12.1 Report

It is important that the university as an organisation can learn from incidents and keep other Lab Managers and Departments informed of potential risks and procedures that may minimise risk or deal with incidents effectively. There may be valuable lessons to be learned from each incident – please report all incidents using the university's incident reporting system and be frank in your assessment of the cause.

This website has the reporting form:

https://www.auckland.ac.nz/en/health-safety-wellbeing/report-concerns-hazards/injury-incidents-observations-reporting.html

Reporting an incident means first informing the Person In Charge and your manager. Then use the online reporting form to log an incident. Contact hsw@auckland.ac.nz as soon as the immediate risk has been dealt with in case of a serious incident, injury or near-miss.

13. Power failure

1. Secure all hazardous experiments. Make sure that any experiments in progress are stabilised and discontinued.
2. Securely cap all chemical containers, extinguish all flames, close gas valves (manually or using the BMS), store cultures and secure radioactive materials.

3. Completely close all fume hood sashes.
4. Power off equipment (particularly heating or vacuum equipment) that could result in damage if unattended when power is restored.
5. Check any equipment on emergency power. To prevent overload of emergency circuits, non-essential items should be disconnected during a power interruption.
6. Exit the lab and close all interior lab doors to reduce spread of fumes and reduce fire risk.

When the Power Returns

1. Reset/restart/check equipment.
2. Keep the fume hood sashes closed and do not use the hood until you are sure the hood exhaust system is working. Some newer hoods undergo a pre-purge cycle upon start-up. If your fume hood extraction has not automatically re-started, call Property Services.
3. Assessing safety before re-entry to the lab

14. Hazardous Chemical Waste

14.1 Definition of hazardous chemical waste

A chemical or chemical waste product is considered hazardous if it has one or more hazard classifications according to the HSNO Act legislation. The Gold FFX safety datasheet (SDS) for the chemical provides this information in Section 2. See examples below showing the difference between a hazardous and a non-hazardous chemical SDS.

It may not be possible to find a SDS for the exact mixture or concentration of chemicals in your waste. When in doubt, treat as hazardous.

SECTION 2 Hazards identification

Classification of the substance or mixture

Considered a Hazardous Substance according to the criteria of the New Zealand Hazardous Substances New Organisms legislation.
Classified as Dangerous Goods for transport purposes.

ChemWatch Hazard Ratings

		Min	Max
Flammability	3		
Toxicity	2		
Body Contact	2		
Reactivity	1		
Chronic	0		

0 = Minimum
1 = Low
2 = Moderate
3 = High
4 = Extreme

Classification [2]	Flammable Liquids Category 2, Acute Toxicity (Oral) Category 2, Acute Toxicity (Dermal) Category 3, Acute Toxicity (Inhalation) Category 3, Serious Eye Damage/Eye Irritation Category 2
Legend:	*1. Classified by Chemwatch; 2. Classification drawn from CCID EPA NZ; 3. Classification drawn from Regulation (EU) No 1272/2008 - Annex VI*
Gazetted by EPA New Zealand	3.1B, 6.1B (oral), 6.1C (dermal), 6.1C (inhalation), 6.4A

EXTRACT OF SDS FOR ACETONITRILE, CLASSIFIED AS HAZARDOUS.

SECTION 2 Hazards identification

Classification of the substance or mixture

Not considered a Hazardous Substance according to the criteria of the New Zealand Hazardous Substances New Organisms legislation. Not regulated for transport of Dangerous Goods.

ChemWatch Hazard Ratings

		Min	Max
Flammability	1		
Toxicity	0		
Body Contact	0		
Reactivity	0		
Chronic	0		

0 = Minimum
1 = Low
2 = Moderate
3 = High
4 = Extreme

Classification [1]	Not Applicable
Determined by Chemwatch using GHS/HSNO criteria	Not Available

EXTRACT OF SDS FOR 10% ETHANOL IN WATER, CLASSIFIED AS NON-HAZARDOUS

14.2 Disposal of hazardous chemical waste

The following chemicals, and waste containing them, must be disposed of by a licensed chemical disposal contractor (note this is an indicative list only)

1. Large quantities and/or surplus hazardous chemicals.
2. Reactive chemicals—UN Class 4 (flammable solids, self-reactive compounds, and those that emit flammable gas on contact with water), UN Class 5.1 (oxidisers) and 5.2 (organic peroxide) compounds.
3. Organic solvents that are not miscible with water—UN Class 3 flammable liquids such as ethers, xylene, acetonitrile.

4. Waste containing hazardous metals e.g. —salts of silver, lead, nickel, osmium.
5. Waste containing toxic chemicals—UN Class 6.
6. Chemicals or mixtures that are strongly acidic or strongly alkaline.
7. Buffer solutions containing ethidium bromide that have not been pre-treated to remove the ethidium bromide.

14.3 Disposal of solvents

Halogenated solvent waste (e.g., waste that includes dichloromethane/methylene chloride, chloroform) must be kept separate from non-halogenated solvent waste. Ensure any mixtures containing some halogenated solvents go into the halogenated waste bottles. Halogenated solvents have to be exported out of NZ to be treated.

14.4 Disposal of non-hazardous chemical waste

Chemicals that may be discharged to the sewer:

1. Small amounts of water-miscible solvents that are not highly toxic, e.g. ethanol and acetone flushed with water. Note that acetonitrile is classified as highly toxic.
2. Acidic/alkaline solutions that have been neutralised.
3. Buffer solutions (e.g. TAE, SSC, TBE, Tris/HCL) provided they do not contain toxic organic compounds, salts of heavy metals, ethidium bromide or metal azides.
4. Buffers containing ethidium bromide may be disposed in accordance with "SMOU Ethidium bromide disposal and decontamination".
5. Other liquids that are not considered a hazardous substance according to the HSNO Act definition.

14.5 Disposal of non-hazardous solid chemicals

Solid chemicals that are not considered hazardous according to the HSNO Act definition may be disposed of in general waste bins as long as the following considerations have been made:

Adhere to local operational guidance regarding disposal of generic solid lab waste (e.g., using appropriate bags for cytotoxic, infectious, or containment lab waste)

Solids must be sealed in a container or bag (preferably opaque), with all identifying labels removed. This is to prevent undue concern by that anyone who deals with the removal of the waste.

14.6 Disposal through a chemical waste contractor

14.6.1 Who can take our chemical waste?

It is crucial that the University disposes of chemical waste appropriately, which means only giving waste to companies that have been properly vetted.

This website has a list of contacts for each area who can assist with arranging disposal through the correct company:

https://www.auckland.ac.nz/en/health-safety-wellbeing/health-safety-topics/laboratory-safety/chemical-safety/purchase-storage-disposal-chemicals.html

Contact the Health, Safety and Wellbeing Service hsw@auckland.ac.nz for details of our current chemical waste contractor.

14.6.2 Packaging chemical waste for collection

Chemical waste must be:

- Clearly labelled with contents including approximate concentrations/amounts for mixtures/solutions.
- Held in secure containers that will not leak.
- Waste containers of UN Class 3, 4, and 5 must be kept apart, for example in separate boxes for collection.
- When requesting a quote from the company, you will need to provide:
    a. A list of items including approximate concentrations for mixtures/solutions.
    b. The UN DG Transport class for each item (refer to guide "Identify Chemical Hazards" or appendix for more information)
    c. Any unknown chemicals will be treated as the most dangerous and charged as such. Please make every effort to identify unknown chemicals.

14.7 Disposal of empty chemical containers and packaging

Remove/deface any chemical description or warning label on empty containers and packaging before disposal.

Empty solvent containers need to be triple rinsed.

If you cannot thoroughly clean an empty chemical container, it should be treated as hazardous chemical waste and picked up by a chemical disposal company.

14.8 Updating SciTrack

Remember to update SciTrack when disposing of chemicals. For more information, please see the quick guides on the SciTrack website.

http://auckland.ac.nz/scitrack

15. Definitions

The following definitions apply to this document:

Authorised person means a person who, in the normal course of their work, is required and permitted to enter the laboratory and therefore provided with personal access (i.e., own functioning access card). Additionally, anyone under the direct supervision of an authorised person is deemed authorised.

Buffer solutions are aqueous solutions containing a weak acid or base and its conjugate acid/base.

Chemical is a distinct compound or substance, especially one which has been artificially prepared or purified.

Co-locator means a separate legal entity that enters into an agreement with the University to receive negotiated use of space (office, laboratory and/or ancillary) and agreed ancillary support services for the purpose of deepening research-related relationships with the University.

Compound means any chemical combination of chemical elements.

Laboratory Manager Means the designated laboratory manager that meets the requirements of section 33 of the HSNO Act 1996 and Part 18 of the Health and Safety at Work (Hazardous Substances) Regulations 2017.

Chemical Owner Is the term that the UoA use to name the designated *Laboratory manager* (See Laboratory Manager definition)

It defines the person with ownership and responsibility for the chemicals. They may be a *Principal Investigator* (PI) or when a PI cannot be identified, the chemical owner is the person responsible for the facility in which the Hazardous substance is used and may be a senior technician or a technologist. In the case of 'communal' departmental/school chemicals, the academic head may be the chemical owner.

They have the responsibilities stated under responsibilities of a Laboratory Manager under the Health and Safety at Work (Hazardous Substances) Regulations, Part 18. For further details see the Chemical Ownership guidelines.

Designated laboratory person (DLP) means the trained person in each research group who has been given the authority to approve purchase requests made in SciTrack.

Forms are the blank templates to be filled in with information that will become these records.

Gold FFX is a database of safety datasheets (SDSs) that the University subscribes to. This can be accessed through the library database. Please see Annex 1 Guideline Using Chemicals for a description how to gain access to it.

Halogenated Solvents contain a halogen, usually chlorine, bromine or fluorine. Common examples include dichloromethane (methylene chloride), chloroform, and 1,1,1,3,3,3-hexafluoro-2-propanol (HFIP).

Hazard A hazard is a source or a situation with the potential for harm in terms of human injury or ill-health, damage to property, damage to the environment, or a combination of these.

Hazardous chemicals or Hazardous substance is any substance with 1 or more of the following intrinsic properties:

- explosiveness
- flammability
- a capacity to oxidise
- corrosiveness
- toxicity (including chronic toxicity)
- ecotoxicity, with or without bioaccumulations; or

Which on contact with air or water (other than air or water where the temperature or pressure has been artificially increased or decreased) generates a substance with any 1 or more or the properties specified above.

A hazardous substance has one or more hazard classifications in its safety data sheet.

Chemical Risk Management Protocol (The 'Protocol'): This protocol falls under the University's Health, Safety and Wellbeing Policy, and includes the Chemical Risk Management Standard and a set of guidelines on Hazardous Substance Risk Management topics.

Laboratory means a vehicle, room, building, or any other structure set aside and equipped for scientific experiments or research, for teaching science, or for the development of chemical or medicinal products

Laboratory Chemicals includes hazardous chemicals used in laboratories and workshops. It does not include commercial cleaning products or chemicals that you can buy from a supermarket or hardware store. Note however that large quantities of industrial chemicals such as isopropanol should be recorded in the laboratory's chemical inventory.

Line Manager refers to anyone working at the University of Auckland and who guides or controls research, teaching, budget, workspace or people (staff, visiting researchers or contractors)

Local Operational Guidelines. Generated by Schools, Departments, Specific Laboratories, Workshops or external organizations (Example: Procedures and Operational Instructions based on International Standards or best practices, etc). That have been approved by Line Manager or Academic Leaders to set performance standards for their specific area of responsibility.

Novel Compound may be described as a new chemical entity that has not been prepared before.

Principal Investigator (PI): An academic staff member who is the lead researcher responsible for project(s) such as laboratory study(ies) or clinical trial(s) and is usually the holder of and independent grant administered by the University. The phrase is also often used as a synonym for "head of the laboratory" or "research group leader." The Principal Investigator is responsible for assuring compliance with applicable University standards and procedures, and for the oversight of the research study and the informed consent process. Although the PI may delegate tasks to members of their research team or technical staff (is this is officially agreed), they retain responsibility for the conduct of the study and the Management of the Hazardous Substances under their ownership. PIs are Academic Leaders for the Health, Safety and Wellbeing Policy, and as such must accomplish with the responsibilities stayed in that Policy.

Records is what is chosen by the Line Manager or Academic Leader to demonstrate that the process and activities have been conducted in the way prescribed in the Local Operational Guidances.

Risk assessment is the process of evaluating the risk(s) arising from the hazard(s), considering the adequacy of any existing or potential controls, deciding whether or not the risk(s) is acceptable, and taking further action as required.

A risk assessment is created in alignment with the University's Health and safety risk management standard, using the prescribed format and authorised at the appropriate level.

SciTrack is the University's purchasing and inventory management system for chemicals and restricted biologicals. SciTrack suppliers include all University-approved suppliers of Hazardous laboratory chemicals and/or restricted biologicals. All purchases from SciTrack suppliers (including non-hazardous lab consumables) must go through SciTrack.

Staff members refers to individuals employed by the University on a full or part-time basis.

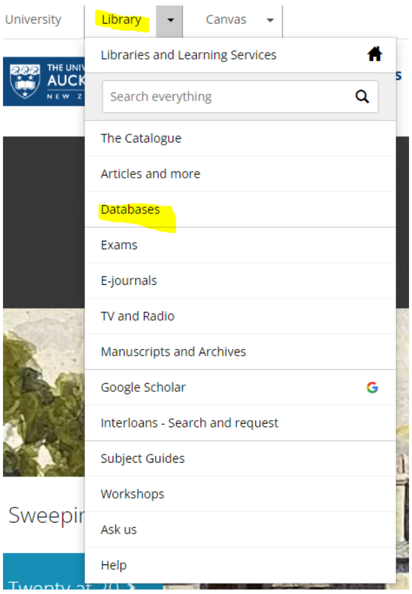
University means the University of Auckland and includes all of its subsidiaries.

16. Annexes

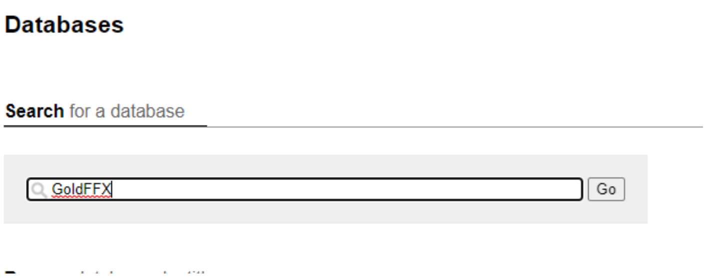
16.1 Annex 1 Guides to accessing Gold FFX and SciTrack for finding SDSs.

Gold FFX

1. Visit the University of Auckland Libraries and Learning Services Website [Libraries and Learning Services - The University of Auckland]()
2. Go to Library/Databases

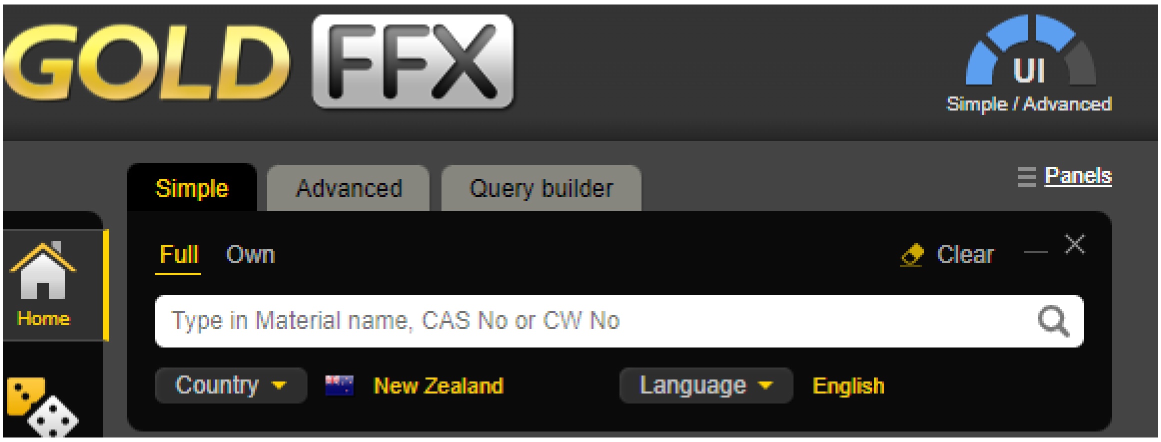


3. Search for GoldFFX



4. Press Direct connect

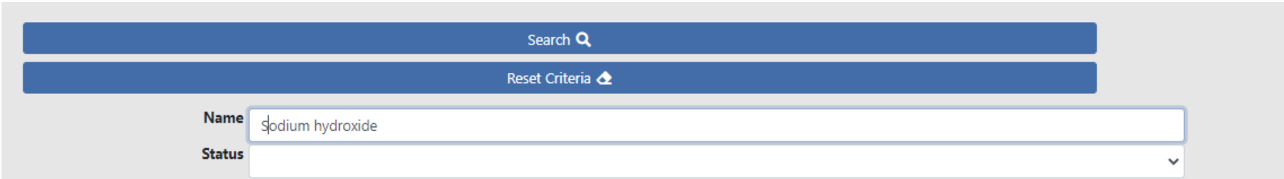
5. Once connected to the Database you can look for the MSDS, using the Material name, CAS or CW No



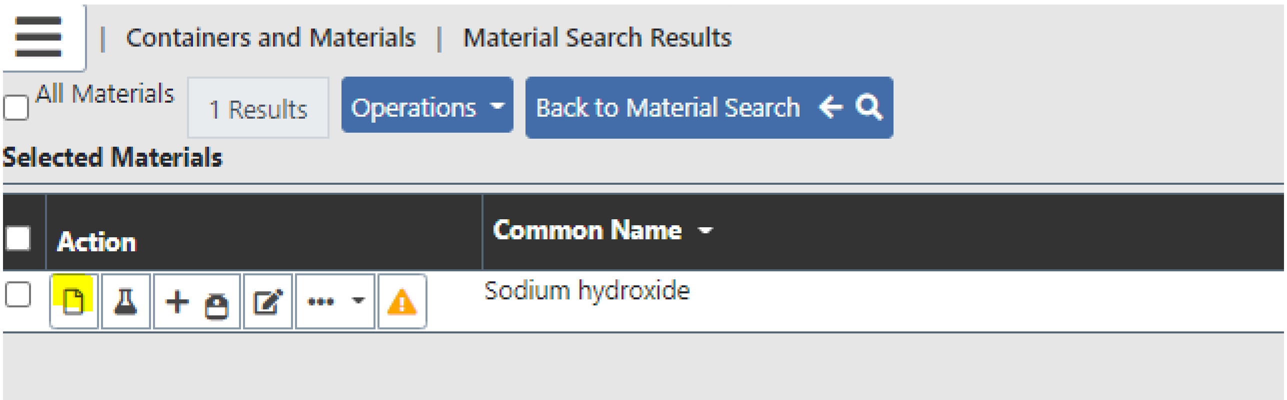
SciTrack

1. Go to Material Search in SciTrack

2. Type the Material name or CAS No



3. Press the view SDS Icon



Links for detailed help

Gold FFX:https://cdn.auckland.ac.nz/assets/auckland/health-safety-wellbeing/health-safety-topics/safety-in-labs/gold-ffx-user-guide-condensed-v2-sept-2019.pdf

SciTrack:

https://www.auckland.ac.nz/content/dam/uoa/auckland/health-safety-wellbeing/health-safety-topics/safety-in-labs/how-to-find-sds-in-scitrack-v1-sept-2019.pdf

16.2 Annex 2 Chemicals and Glove Use

Chemical (concentrated)	CAS No. (unique identifier)	Latex	Nitrile	Neoprene
Acetic Acid	64-19-7	G	G	E
Acetonitrile	75-05-8	F	NR	F
Ammonium Hydroxide	1336-21-6	G	E	E
Chloroform	67-66-3	NR	F	F
Chromic Acid	7738-94-5	NR	F	F
Dichloromethane	75-09-2	P	P	P
Dimethyl Formamide	68-12-2	E	NR	G
Ethanol	64-17-5	G	G	E
Ethyl Acetate	141-78-6	P	NR	F
Ethyl Ether	60-29-7	NR	E	E
Formaldehyde	50-00-0	E	E	E
Hexane	110-54-3	NR	E	E
Hydrochloric acid	7647-01-0	G	E	E
Isopropanol	67-63-0	E	E	E
Methanol	67-56-1	E	E	E
Nitric Acid	7697-37-2.	F	NR	G
Phenol	108-95-2	G	NR	E
Phosphoric Acid	7664-38-2.	G	E	E
Sodium Hydroxide	1310-73-2	E	G	E

Sulfuric Acid	7664-93-9	NR	NR	F
Xylene	106-42-3	NR	G	P

E=Excellent	
G=Good	
F=Fair	Change gloves after use
P=Poor	Change gloves immediately after contact
NR=Not Recommended	

MSDS for all chemicals are available via

https://jr-chemwatch-net.ezproxy.auckland.ac.nz/chemwatch.web/home

Using a CAS number (unique identifier) is the best way to get accurate details